

State of California
AIR RESOURCES BOARD

EXECUTIVE ORDER D-79
Relating to Exemptions under Section 27156
of the Vehicle Code

F.K. PRODUCTS
"FILTER KING UNIT NO. 5"

Pursuant to the authority vested in the Air Resources Board by Section 27156 of the Vehicle Code; and

Pursuant to the authority vested in the undersigned by Section 39515 of the Health and Safety Code and Executive Order G-30A;

IT IS ORDERED AND RESOLVED: That the installation of the Filter King Unit No. 5 manufactured by Alberto Malpassi, Italy, and to be marketed by F. K. Products, 5 Cottingham Road, Toronto, Ontario Canada, M4V1B1 has been found to not reduce the effectiveness of required motor vehicle pollution control devices and, therefore, is exempt from the prohibitions of Section 27156 of the Vehicle Code for installation on 1978 and older gasoline powered vehicles.

This Executive Order is valid provided that installation instructions for this device will not recommend tuning the vehicle to specifications different from those listed by the vehicle manufacturer.

Changes made to the design or operating conditions of the device, as exempted by the Air Resources Board, that adversely affect the performance of a vehicle's pollution control system shall invalidate this Executive Order.

Marketing of this device using an identification other than that shown in this Executive Order or marketing of this device for an application other than those listed in this Executive Order shall be prohibited unless prior approval is obtained from the Air Resources Board.

This Executive Order does not constitute any opinion as to the effect that the use of this device may have on any warranty either expressed or implied by the vehicle manufacturer.

THIS EXECUTIVE ORDER DOES NOT CONSTITUTE A CERTIFICATION, ACCREDITATION, APPROVAL, OR ANY OTHER TYPE OF ENDORSEMENT BY THE AIR RESOURCES BOARD OF ANY CLAIMS OF THE APPLICANT CONCERNING ANTI-POLLUTION BENEFITS OR ANY ALLEGED BENEFITS OF THE "FILTER KING UNIT NO. 5."

No claim of any kind, such as "Approved by Air Resources Board" may be made with respect to the action taken herein in any advertising or other oral or written communication.

Section 17500 of the Business and Professions Code makes untrue or misleading advertising unlawful, and Section 17534 makes violation punishable as a misdemeanor.

Section 43644 of the Health and Safety Code provides as follows:

"43644. (a) No person shall install, sell, offer for sale, or advertise, or, except in an application to the state board for certification of a device, represent, any device as a motor vehicle pollution control device for use on any used motor vehicle unless that device has been certified by the state board. No person shall sell, offer for sale, advertise, or represent any motor vehicle pollution control device as a certified device which, in fact, is not a certified device. Any violation of this subdivision is a misdemeanor."

Any apparent violation of the conditions of this Executive Order will be submitted to the Attorney General of California for such action as he deems advisable.

Executed at Sacramento, California, this 17th day of April, 1978.

original signed by
Thomas C. Austin
Deputy Executive Officer

State of California
AIR RESOURCES BOARD

February 24, 1978

Evaluation of the F. K. Products "Filter King Unit No. 5"
Device in Accordance with Section 2222, Title 13 of the
California Administrative Code

I. Introduction

F. K. Products, 5 Cottingham Road, Toronto, Ontario, Canada, M4V1B1, has applied for an exemption for the "Filter King" device from the prohibitions of Section 27156 of Vehicle Code (See Exhibit A). The device is manufactured by Alberto Malpassi, via Montebello, 56, 20038 Seregno, Italy. The applicant is requesting that an exemption be granted for 1978 and older gasoline powered vehicles.

II. System Description

The "Filter King" device is a fuel pressure regulator installed between the fuel pump and carburetor. It is designed to maintain the proper fuel flow to the carburetor at optimum pressure. The applicant claims that by regulating the pressure to what is actually needed to supply the engine with enough fuel, the device eliminates most or all of the fuel pulsations emanating from the fuel pump. It also prevents excess gasoline from flowing into the float bowl during periods of heavy fuel bowl slosh. As a result, the carburetor is able to maintain a more uniform level of fuel in the float bowl, thereby, reducing carburetor flooding and increasing fuel economy.

The device consists of an upper aluminum housing that contains the fuel inlet and outlet, the valve, and the spring loaded diaphragm that regulates the opening and closing of the valve, the lower glass container that holds the fuel and a high capacity fuel filter. Figure I shows a cross-section of the device.

Initially, fuel under pressure enters the pressure regulator into the glass compartment where the fuel is filtered. The proper amount of fuel is then metered past the valve, thence to the carburetor, by the action of the spring loaded diaphragm.

When the fuel pressure under the diaphragm is high the diaphragm moves up causing the valve to seat against the port reducing the output pressure. When the fuel pressure is low, the diaphragm moved down allowing the valve to open the port thus increasing the output pressure. The modulation of the diaphragm tends to smooth out the fuel pressure pulsation from the fuel pump. The pressure regulator output pressure can be adjusted by means of a screw located on the top of the aluminum housing.

III. System Evaluation

- A. Applicant's Submitted Documents - The applicant claims that the installation of the device on the motor vehicle's fuel system will not have any adverse affect on exhaust emissions. The following supporting documents were submitted to the ARB.
1. Evaluation of Filter King Pressure Regulator dated January 3, 1975 by Professor Franz Huf of Polytechnic of Konstanz, West Germany. The tests were conducted on a chassis dynamometer. The report concluded that back-to-back tests, with no vibration induced on the vehicles, showed no change in emissions. With vibration induced on the vehicles (simulating actual road conditions), the emissions decreased with the installation of the Filter King device. Test data was not included in the report but would be made available upon request.
 2. American Motors Corporation CVS-75 tests, dated September 30, 1977. Table I summarizes the test results. The test data indicate no significant change in the vehicle emissions when the Filter King was installed and set with fuel output pressure of 1.7 and 1.2 psig.
 3. Filter King is used as an original equipment part by several major Italian automobile manufacturers. The fuel output pressure is preset in the factory to "optimize" the effectiveness of the fuel pressure regulation.
- B. ARB Tests

The ARB Laboratory evaluation of the device consisted of parametric pressure tests at different speed and engine loading conditions to determine the effect of the Filter King device on a typical carburetor. The purpose was to identify any flow anomalies which might indicate potential conditions which could adversely affect exhaust emissions.

Tests were conducted on a 1976 Canadian Ford 302-2V non-catalyst engine installed on a chassis dyno test stand. The output fuel pressure of the device was adjusted by increments of 0.5 psig from maximum to minimum output allowed by the engine without causing fuel starvation. For each fuel pressure output setting, steady state tests were performed at Idle, 1,000, 1,500, 2,000 and 2,500 rpm with the engine loaded at 25%, 50%, and maximum torque at each speed setting. Fuel flow rates and exhaust emissions were measured and compared to baseline data. Table II summarizes the pertinent test data.

The test results show that the device can regulate fuel pressure from zero to fuel pump output pressure. The minimum pressure output that will not cause perceptible engine fuel starvation is 1.1 psig. At any one pressure setting the device regulates constant output pressure at all engine speed and loading conditions. At any particular combination of engine speed and loading condition, varying the output pressure setting down to 1.1 psig showed no change of fuel flow rate. This indicates the device pressure regulation down to 1.1 psig will not change the carburetor's air fuel mixtures, and consequently will not have any adverse affect on exhaust emissions. Measurements of HC, CO, and NOx exhaust emissions at these test conditions confirmed the above findings.

Since the device will be marketed as an off-the-shelf item, the owner of the vehicle attempting to install the device may set output pressure below the acceptable level which may result in an increase in vehicle emissions. This concern was relayed to the applicant. Subsequently, the applicant stated that the only device to be marketed in California will be Unit No. 5. This unit will be equipped with a modulating spring that will not allow fuel output pressure to fall below 1.25 psig. A sample of the spring was sent to the ARB for testing and was found to have a pressure cut off point of 1.6 psig. Since the spring is designed to have a minimum cut-off point of 1.25 psig, higher than the 1.1 psig found to have no adverse interaction with the carburetor, the ARB anticipates no problem in the field due to the adjustable feature of the device.

IV. Manufacturer's Claims

The applicant claims the installation of the device on vehicles will improve fuel economy up to 15% by reducing carburetor flooding. This statement was based on tests conducted by Prof Franz Huf of Polytechnic of Konstanz, West Germany. These data, however, were not made available to the ARB. Extensive fuel economy tests by AMC (see Table-I) only showed an average of 6% improvement in fuel economy.

It is the staff's opinion that the argument and supporting documents presented by the applicant regarding fuel economy benefits have merit and can be achieved under certain road driving conditions with the installation of the Filter King device.

V. Conclusion and Recommendation

The applicant submitted technical studies and emission tests showing that the installation of the "Filter King" device on typical in-use vehicles would not increase exhaust emissions.

ARB Laboratory flow tests showed that within the device operating range, and under all engine speeds and loading conditions, the fuel flow rates would not change with the installation of the "Filter King Unit No. 5". The device, therefore, would not adversely affect the carburetor's performance and hence no increase of vehicle emissions would result from the use of the device. This was demonstrated by the applicant's and the ARB emission test data.

Therefore, the staff recommends that F. K. Products be granted an exemption from the prohibitions of Vehicle Code Section 27156 for its "Filter King Unit No. 5" for 1978 and older gasoline powered vehicles.

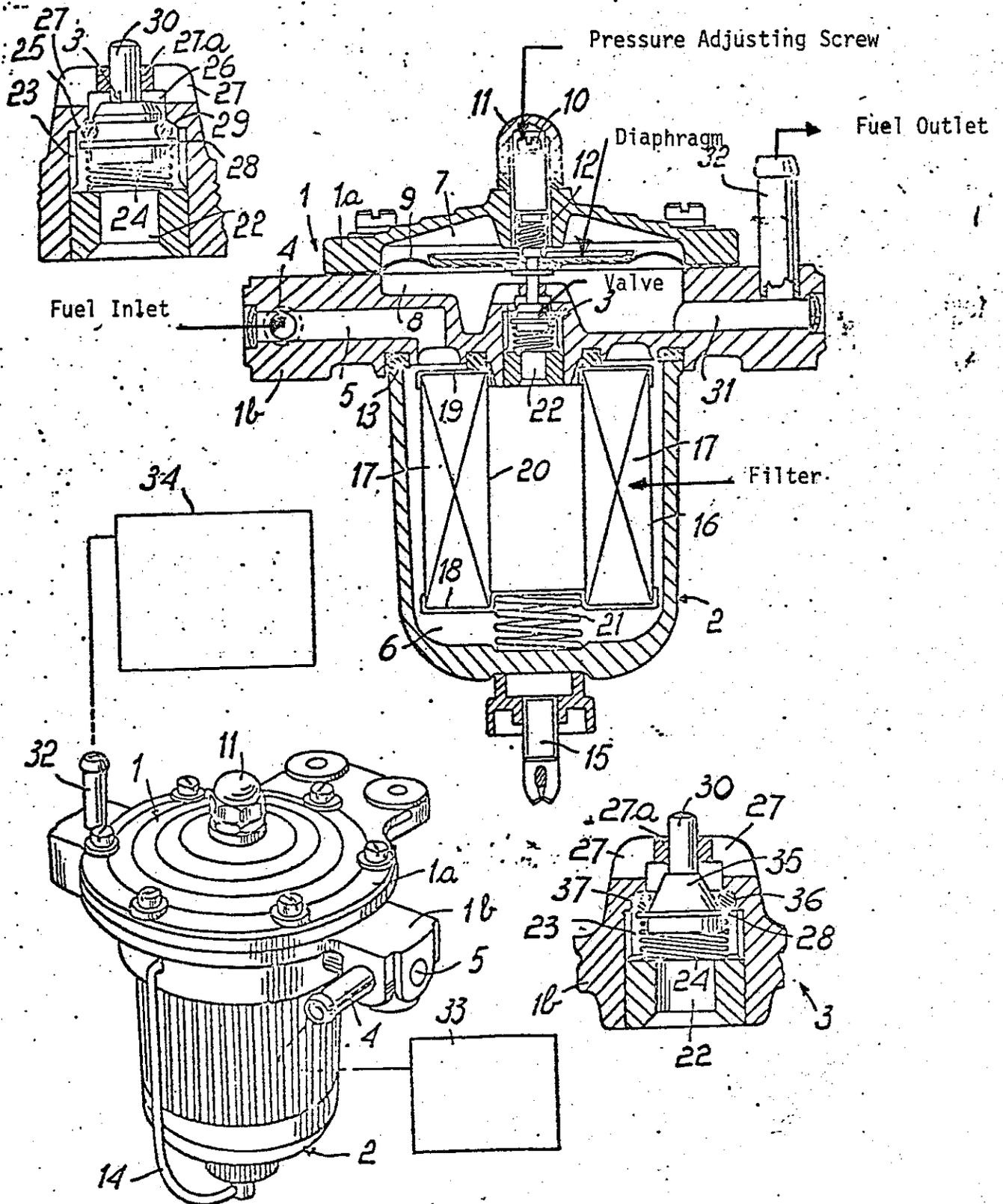


Fig. 1 - Filter King Pressure Regulator

Table I - Filter King Back-to-Back CVS-75 Test
 Data on a 1978 AMC I-3 Package (Test
 conducted by AMC)

	Grams per Mile			<u>City</u>	MPG	
	<u>HC</u>	<u>CO</u>	<u>NOx</u>		<u>Highway</u>	<u>Composite</u>
Baseline @ 5 psig.	0.52	5.4	1.23	16.6	25.8	19.8
Filter King @ 1.7 psig	0.49	4.1	1.51	17.5	26.5	20.6
Filter King @ 1.2 psig	0.52	5.0	1.32	17.8	27	21.0

Engine Speed (RPM)		900	1000			1500			2000			2500		
% of Max. Torque		Idle	100%	50%	25%	100%	50%	25%	100%	50%	25%	100%	50%	25%
Filter King Output Pressure psig	Baseline	5.5	5.1	4.9	4.3	4.4	4.5	4.6	4.2	4.5	4.5	4.2	4.3	4.4
	Device (1)	5.6	5.2	5.5	5.5	3.5	4.2	4.3	4.2	4.4	4.5	4.0	4.3	4.4
	Device (2)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
	Device (3)	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	2.0	2.0	1.9	2.0	2.0
	Device (4)	1.6	1.6	1.5	1.5	1.5	1.6	1.5	1.5	1.6	1.6	1.5	1.5	1.5
	Device (5)	1.1	1.1	1.1	1.1	1.1	1.0	1.0	1.0	1.1	1.1	1.0	1.1	1.1
Fuel Flow gm/sec	Baseline	0.9	2.7	1.4	1.1	4.2	2.1	1.4	5.8	2.9	1.9	7.2	3.8	2.4
	Device (1)	0.9	2.8	1.4	1.1	4.2	2.2	1.6	5.8	2.9	1.9	7.2	3.8	2.4
	Device (2)	0.8	2.9	1.4	1.1	4.2	2.1	1.4	5.7	2.9	1.8	7.1	3.7	2.4
	Device (3)	0.8	2.7	1.4	1.1	4.2	2.1	1.4	5.9	3.0	1.8	7.0	3.7	2.4
	Device (4)	0.8	2.7	1.4	1.1	4.1	2.1	1.4	5.7	2.9	1.8	6.9	3.7	2.1
	Device (5)	0.8	2.7	1.4	1.1	4.1	2.1	1.4	5.7	2.9	1.8	6.9	3.7	2.4
CO gm/min.	Baseline	0.70	*	1.4	0.8	*	4.1	1.4	*	9.7	2.9	*	21.6	6.7
	Device (1)	0.80	*	1.3	1.0	*	4.2	1.5	*	13.1	2.8	*	17.9	6.4
	Device (2)	0.65	*	1.2	0.9	*	4.7	1.5	*	11.2	2.4	*	17.6	5.0
	Device (3)	0.67	*	1.0	0.9	*	4.0	1.4	*	12.7	2.3	*	19.4	5.7
	Device (4)	0.7	*	0.9	0.8	*	3.2	1.3	*	10.7	2.1	*	16.8	5.5
	Device (5)	0.7	*	0.8	0.8	*	2.8	1.3	*	7.9	1.9	*	14.1	4.1
HC gm/min	Baseline	0.24	2.3	0.73	0.27	3.21	1.32	0.47	4.03	1.52	0.89	5.15	1.76	1.09
	Device (1)	0.26	2.36	0.81	0.28	3.33	1.40	0.51	4.46	1.91	0.98	5.36	1.83	1.12
	Device (2)	0.23	2.35	0.82	0.30	3.11	1.32	0.50	4.21	1.57	0.89	4.9	1.73	1.01
	Device (3)	0.22	2.18	0.79	0.33	3.29	1.38	0.56	4.58	1.84	0.96	4.9	2.07	1.26
	Device (4)	0.29	2.21	0.76	0.31	2.97	1.26	0.53	4.22	1.89	0.76	4.82	2.03	1.28
	Device (5)	0.22	2.10	0.72	0.32	3.13	1.26	0.80	4.16	1.74	0.94	4.74	1.92	1.18
NOx gm/min	Baseline	0.23	*	2.51	0.51	*	4.42	1.28	*	6.33	2.81	*	9.62	5.03
	Device (1)	0.25	*	2.57	0.48	*	4.40	1.36	*	7.34	3.03	*	9.96	5.13
	Device (2)	0.18	*	2.64	0.51	*	4.22	1.34	*	6.05	2.6	*	9.58	4.43
	Device (3)	0.14	*	2.71	0.50	*	2.94	1.96	*	7.44	2.65	*	10.75	4.97
	Device (4)	0.09	*	2.62	0.46	*	4.00	1.21	*	7.10	2.49	*	10.19	4.91
	Device (5)	0.08	*	2.39	0.30	*	4.11	1.08	*	7.51	2.22	*	10.84	4.78

Table - II Parametric Fuel Pressure Tests of Filter King Device on Ford 302 CID Engine Dyno

State of California
AIR RESOURCES BOARD

EXECUTIVE ORDER D-79-1
Relating to Exemptions under Section 27156
of the Vehicle Code

F. K. PRODUCTS
"FILTER KING, MODEL NO. 4"
"FILTER KING, MODEL NO. 5"

Pursuant to the authority vested in the Air Resources Board by Section 27156 of the Vehicle Code; and

Pursuant to the authority vested in the undersigned by Sections 39515 and 39516 of the Health and Safety Code and Executive Order G-45-5;

IT IS ORDERED AND RESOLVED: That the installation of the Filter King Unit No. 4 and Filter King Unit No. 5 manufactured by Alberto Malpassi, Italy and marketed by F. K. Products, 5 Cottingham Road, Toronto, Ontario, Canada M4V 1B1 has been found to not reduce the effectiveness of required motor vehicle pollution control devices and, therefore, is exempt from the prohibitions of Section 27156 of the Vehicle Code for installation on 1979 and older gasoline powered vehicles.

This Executive Order is valid provided that installation instructions for this device will not recommend tuning the vehicle to specifications different from those listed by the vehicle manufacturer.

Changes made to the design or operating conditions of the device, as exempted by the Air Resources Board, that adversely affect the performance of a vehicle's pollution control system shall invalidate this Executive Order.

Marketing of this device using an identification other than that shown in this Executive Order or marketing of this device for an application other than those listed in this Executive Order shall be prohibited unless prior approval is obtained from the Air Resources Board.

This Executive Order does not constitute any opinion as to the effect that the use of this device may have on any warranty either expressed or implied by the vehicle manufacturer.

THIS EXECUTIVE ORDER DOES NOT CONSTITUTE A CERTIFICATION, ACCREDITATION, APPROVAL, OR ANY OTHER TYPE OF ENDORSEMENT BY THE AIR RESOURCES BOARD OF ANY CLAIMS OF THE APPLICANT CONCERNING ANTI-POLLUTION BENEFITS OR ANY ALLEGED BENEFITS OF THE "FILTER KING" MODELS.

No claim of any kind, such as "Approved by Air Resources Board" may be made with respect to the action taken herein in any advertising or other oral or written communication.

F. K. PRODUCTS
"FILTER KING, MODEL NO. 4"
"FILTER KING, MODEL NO. 5"

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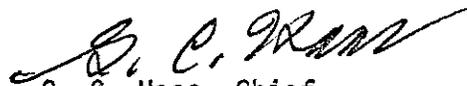
Section 17500 of the Business and Professions Code makes untrue or misleading advertising unlawful, and Section 17534 makes violation punishable as a misdemeanor.

Section 43644 of the Health and Safety Code provides as follows:

"43644. (a) No person shall install, sell, offer for sale, or advertise, or, except in an application to the state board for certification of a device, represent, any device as a motor vehicle pollution control device for use on any used motor vehicle unless that device has been certified by the state board. No person shall sell, offer for sale, advertise, or represent any motor vehicle pollution control device as a certified device which, in fact, is not a certified device. Any violation of this subdivision is a misdemeanor."

Any apparent violation of the conditions of this Executive Order will be submitted to the Attorney General of California for such action as he deems advisable.

Executed at El Monte, California, this 12 day of January, 1979.



G. C. Hass, Chief
Vehicle Emissions Control Division