State of California
AIR RESOURCES BOARD

EXECUTIVE ORDER D-92
Relating to Exemptions under Section 27156
of the Vehicle Code

THE KLANE CORPORATION
"AUTOMOTIVE PERFORMANCE SYSTEM"

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 Klane "Automotive Performance System" manufactured by The Klane Corporation of 131 West 14th Street, Ogden, Utah 84404 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 1979 and older, naturally aspirated, gasoline powered V-8 engines equipped with oxidation catalytic converters.

This Executive Order is valid provided that installation instructions for this device will not recommend tuning the vehicle to specifications different from those submitted by the device 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. Exemption of a kit shall not be construed as an exemption to sell, offer for sale or advertise any components of the kit as individual devices.

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 KLANE CORPORATION "AUTOMOTIVE PERFORMANCE SYSTEM".

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 El Monte, California, this 26th day of September, 1979.

K. D. Drachand, Acting Chief
Mobile Source Control Division

State of California
AIR RESOURCES BOARD

August 22, 1979

Staff Report

Evaluation of the Klane Corporation "Klane Automotive Performance System" in Accordance with Section 2222, Title 13 of the California Administrative Code

I. Introduction

Klane Corporation of 131 West 14th Street, Ogden, Utah 84404 has submitted a new application for exemption of its "Klane Automotive Performance (KAP) System" from the prohibitions of Section 27156 of the California Vehicle Code. Klane requests exemption for 1979 and older, gasoline powered V-8 engine equipped with oxidation catalysts. Diesel, turbocharged, and rotary engines are specifically excluded, as are vehicles equipped with three-way catalysts.

II. System Description

The KAP System is a water vapor induction device combined with an air bleed. The air and water are metered through separate orifices threaded into a tee fitting; the outlet leg of the tee carries the air/water mixture through a flow control valve to a heat exchanger. The heated mixture is then drawn into the intake manifold through the PCV valve hose or other source of manifold vacuum. Figure 1 is a schematic of the device components and flows.

KAP SYSTEM SCHEMATIC

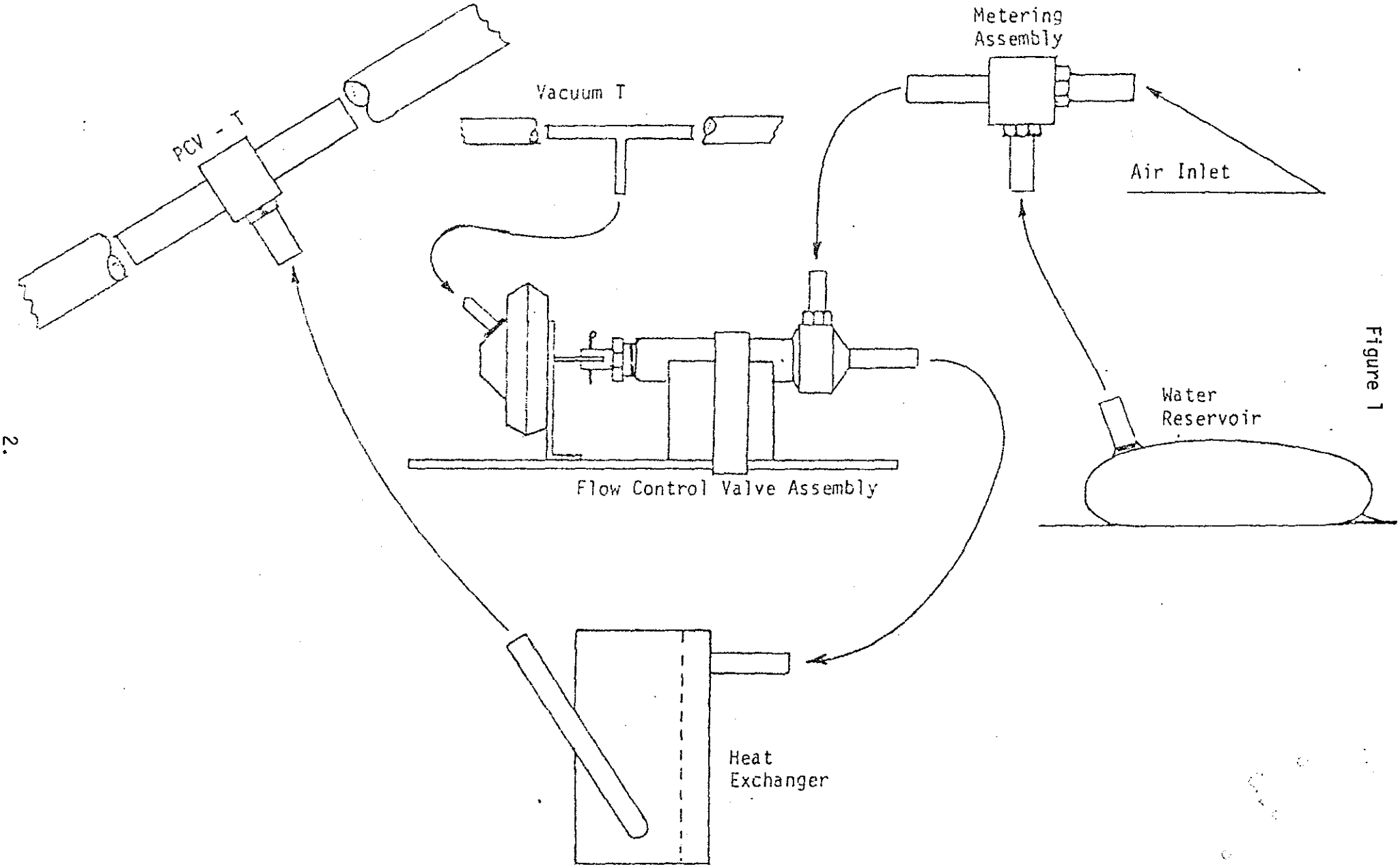


Figure 1

U.S. PATENT #4,125,092
OTHERS PENDING.

Once the location of the water reservoir, and the proper air and water orifices are determined for a given vehicle, the flow of water/air mixture is controlled by a spring-loaded tapered needle in the flow control valve operated by ported vacuum.

III. Applicant's Submittal

A. Beneficial Claims

The applicant claims that the installation and use of the KAP System will:

1. Eliminate detonation (ping) and dieseling.
2. Permit use of lower grade gasoline.
3. Improve performance.
4. Reduce NOx.

The claims for NOx reduction must be deleted under the terms of an Executive Order granting exemption from the prohibitions of VC 27156. The applicant makes no claims for fuel economy benefits.

B. Testing

Back-to-back CVS-75 tests were performed on a 49-state high altitude version of a 1977 Chevrolet Nova at Automotive Testing Laboratories (ATL), Inc. of Aurora, Colorado. The

test vehicle was equipped with a 4V carburetor, EGR valve, air injection pump and oxidation catalyst.

The results of the testing is given in Table I. The baseline vehicle was set to OEM specifications. The second test (modified w/o device) was run with the idle mixture screw (ATL report says "idle speed screw", but refers to idle mixture change to set carburetor richer) 3/4 turn richer and no other change. The third test (with device) is a test with the KAP System installed and vehicle specifications unchanged from the second test. Commercial unleaded fuel was used on all tests.

Table I - ATL, Inc. CVS-75 Test Results for a 1977 Chevrolet Nova

	HC (g/mi)	CO (g/mi)	NOx (g/mi)	FE (mi/gal)
Test #1 - baseline	0.87	12.38	1.81	13.65
Test #2 - modified w/o device	0.86	10.75	1.96	13.96
Test #3 - with device	0.71	7.68	1.34	14.97

C. Alterations of Previous System

The applicant has modified the application and design of the KAP System from his previous submittal as follows:

1. This application is limited to catalyst equipped V-8 engines.
2. The water consumption rate has been decreased.
3. The flow control needle design has been modified to change the flow schedule.
4. The calibration procedure has been modified.
5. Component air leaks have been eliminated.

IV. California Air Resources Board (CARB) Testing

Testing by the CARB was limited to evaluating the installation, calibration and checkout procedures of the KAP System on two vehicles; a 1979 Buick Regal, 305 CID, V-8, and a 1979 Ford Thunderbird, 351 CID, V-8. A set of the installation and checkout procedures is presented in Appendix I.

Tables IIA and IIIA show the EGR and ported vacuum signals at selected engine speeds at road load horsepower. The ported and EGR vacuum signals on the Buick are essentially equal, and are roughly half the ported vacuum signal on the Ford vehicle. The applicant allows for wide variation in ported vacuum and flow control by changing the spring in the flow control valve to suit the vacuum signal strength.

Table IIA - Ford Thunderbird RPM vs. Ported & EGR Vacuum

RPM	Ported Vac (in. Hg.)	EGR Vac Signal (in. Hg.)
640	0	0
800	0.3	0
1000	5.5	3.2
1200	8.2	3.3
1400	10.0	3.3
1600	11.3	3.4
1800	11.5	3.4
2000	11.4	3.5

Table IIB - Ford Thunderbird Calibration Water Flow Rate*

Volume Injection (ml)	Injection Time (sec)	Injection Rate (ml/min)
50	131.1	22.9
50	139.5	21.5
50	135.7	22.1
25	67.0	22.4
35	99.4	21.
	mean	22.0

*0.020 inch water orifice (green color code)
0.0875 inch air orifice (purple color code)

Table IIIA - Buick Regal RPM vs. Ported & EGR Vacuum

RPM	Ported Vac (in. Hg)	EGR Vac Signal (in. Hg)
700	0	0
900	0.8	0.8
1100	4.5	4.7
1300	5.3	5.5
1500	6.0	6.0
1700	6.4	6.4
1900	6.4	6.4
2100	6.4	6.4

Table IIIB - Buick Regal Calibration Water Flow Rate*

Volume Injected (ml)	Injection Time (sec)	Injection Rate (ml/min)
50	175.0	17.1
20	69.5	17.3
20	70.5	17.0
30	108.5	16.6
25	84.0	17.9
50	158.7	18.9
	mean	17.5

*0.020 inch water orifice (green color code)
0.093 inch air orifice (white color code)

Tables IIB and IIIB give the average injection rate during the calibration procedure which consists of timing the amount of water trapped in a container inserted into the line between the metering assembly and flow control valve when the flow control needle is pulled back by hand. The mean flow for the Ford 351 CID engine was 22.0 ml/min and for the Buick 305 engine it was 17.5 ml/min. Klane specifies flows as follows:

Nominal Engine Displacement (CID)	Water Flow (ml/min)
450	27
400	24
350	21
300	18

Each vehicle was subjected to a road test to determine actual water consumption under road conditions. The Ford 351 CID engine consumed 53.0 ml and 60.7 ml of water on two separate 28.3 mile runs. The Buick 305 engine consumed 8 ml and 442 ml on two 25 mile runs. The water bags were located in the vehicle trunk. The only change between the two runs on the Buick was to move the water reservoir from the trunk floor to the raised step over the rear axle, a vertical rise of about six inches. Driveability was good on all runs. No vacuum leaks were detected.

The emission results of the catalyst equipped 1975 Plymouth Fury, 360 CID, V-8 tested for the previous application are reviewed in Table IV.

Table IV - ARB Emission Results, 1975 Plymouth Fury

	HC (g/mi)	CO (g/mi)	NOx (g/mi)	FE (mi/gal)
Baseline CVS-75	0.53	8.00	1.26	12.0
Device (.020/.098)**	0.47	6.18	1.01	11.5
Baseline CVS-72	0.13	0.27	1.45	12.7
Device (.020/.098)*	0.18	0.37	1.08	12.3
Baseline HWY Cycle	0.07	0.08	1.52	16.9
Device (.020/.098)*	0.12	0.08	1.03	16.4

Loaded Mode*	HC (ppm)	CO (%)	NOx (ppm)	O_2 (%)	AFR	H/C
Baseline - High Cr	9	0.05	585	3.9	17.7	1.88
Device (.020/.098)	8	0.10	443	4.1	18.1	2.04
Baseline - Low Cr	9	0.05	225	5.1	18.9	1.88
Device (.020/.098)	9	0.10	116	5.1	19.2	2.03
Baseline - Idle	9	0.05	80	7.5	21.2	1.42
Device (.020/.098)	8	0.10	57	6.2	20.4	1.96

*air leak in system

**water/air orifice diameter, inches

V. Dicussion

The Klane Corporation has taken steps to remedy the problems noted in the previous staff report, i.e. emissions, air leak, and calibration problems.

Klane specifies a 8:1 to 11:1 fuel/water ratio depending on the type of driving where 6:1 was specified before (see previous staff report). This would tend to decrease HC emissions in non-catalyst cars; however, this system application is limited to catalyst equipped vehicles only, so that no HC or CO increase would be expected even at the old flow rate. The 1975 Plymouth Fury with an oxidation catalytic converter was tested (by the ARB laboratory) for the previous application and showed no significant HC or CO increases. The results of the emission test (by ATL, Inc.) submitted by the applicant also showed no adverse effects on emissions.

No siphoning or cold driveability problems are expected with the KAP system. The flow control valve spring provides positive flow cut-off at idle and when the engine is stopped. A small amount of water can be expected to condense in the heat exchanger after the engine is shut down and cools, but the effect on a cold start and cold drive-away would be negligible because 1) moisture is normally condensed on cold intake manifold surfaces and 2) the heat exchanger is located on the first part of the engine exterior to attain normal operating temperature.

The water flow calibration measurements prove to be accurate within approximately $\pm$ 1 ml as specified, but the road test results indicate that each KAP system must be tailored to the vehicle to obtain the 8:1 to 11:1 fuel/water ratio. All road tests showed much less than the desired water consumption which

should be approximately 600 ml minimum over a 25 mile course to maintain an 11:1 ratio on a car with a nominal 15 mpg fuel economy. The applicant will supply different water or air orifices and/or flow control metering springs on vehicles that require them at factory authorized installation stations and recommends a final check at such stations. This final adjustment will allow for variations in ported vacuum, manifold vacuum, vehicle condition and altitude that cannot reasonably be anticipated by device installation instructions.

VI. Conclusions and Recommendation

It is the staff's judgement that the KAP System will not adversely affect emissions of catalyst equipped vehicles if installed and adjusted according to device manufacturer's instructions; therefore, the staff recommends exemption of the Klane Automotive Performance System from the prohibition of Section 27156 of the Vehicle Code.

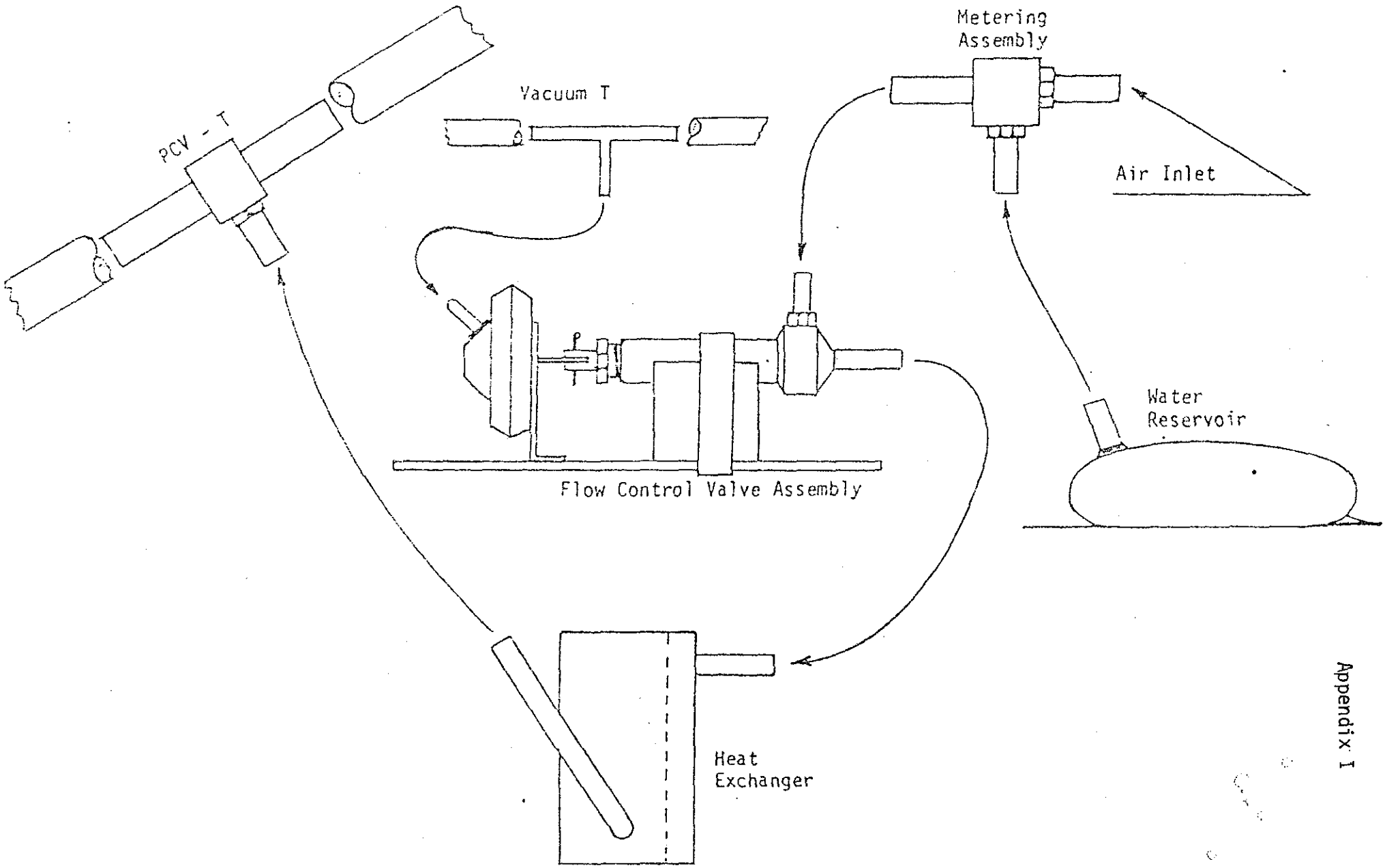
Appendix I

III. G.

INSTALLATION AND SERVICE INSTRUCTIONS

JUNE 1, 1979

KAP SYSTE[redacted]EMATIC



Appendix I

U.S. PATENT #4,125,092
OTHERS PENDING.

The Klane Automotive Performance (KAP) System will provide excellent service and add much to your driving pleasure. Because it is primarily associated with the fuel burning process, the engine must be in good mechanical and electrical condition prior to installation of the System.

Though the system is relatively simple, it is recommended that it be installed by a competent auto mechanic. The "do-it-yourselfer" could install the unit, however, final checkout should be performed at an automotive service center referred to by your KAP System dealer.

I. SPECIAL CONDITIONS

A. Additional materials required: Muffler repair tape for insulating the heat exchanger after installation and some soft tie-wire to over wrap the insulation. These must be purchased as separate items.

B. The flow control valve is vacuum operated. It requires a vacuum source which is zero when the accelerator throttle is closed (engine idle condition) and which increases proportionally as the accelerator throttle is opened.

C. For best overall performance do not remove or make inoperative the pollution control devices currently on your car.

II. INSTALLATION

A. Layout

1. On a clean work bench or other such area, lay out the components of the KAP System per schematic diagram.

2. Determine the general arrangement where parts will be located on your car. The basic considerations will be where to mount the heat exchanger on the exhaust pipe and where to locate the water reservoir.

   NOTE: Heat exchanger should be located as close to the exhaust manifold flange as possible.

   The reservoir can be located in most any convenient place - trunk, under seat, back of seat in pickup trucks, engine compartment, etc.

3. The metering assembly should be located in the general area of the reservoir, but above the water level. This seems most practical when the reservoir is mounted in the trunk of the car.

   NOTE: The assembly can be located in any convenient location. However, care must be exercised to assure that the assembly will remain above the reservoir water level at all times to prevent leakage of the water through the water orifice and air bleed.

II. (Continued)

4. The flow control valve should be mounted on the same side of the engine compartment as the heat exchanger. The front wheel splash guard makes a convenient location.

B. Procedure - Having determined the general location for the KAP System component parts on the car you can now proceed with the installation.

1. Install the water reservoir.

The water reservoir is made of 22 mil thick vinyl and is very durable. You will note that the reservoir has wide flanges. You can use the sheet metal screws and washers provided to secure the reservoir or you may prefer to install eyelets in the flange for securing the reservoir.

PRECAUTION: When installing be sure that there are no sharp edges that could cut the vinyl and that the water outlet is located in a low position.

2. Mount the metering assembly.

Using nylon ties strap the metering assembly in place.

3. Install the water line.

The water line connects the reservoir to the water (smallest) orifice of the metering assembly. Assemble the water line to the water reservoir by using the small piece of stiff tubing in the kit. Insert this tube into the clear vinyl tubing about 1/2 inch. Insert the other end into the red filler valve on the reservoir until vinyl tube and filler valve meet. Centering the small screw clamp over the joint and tighten the clamp securely.

Measuring the length of vinyl tubing required to reach the water orifice (allow some slack), cut the tube. Being careful not to overset the spring clamp, place it over the end of the tube and slip the tube over the water orifice. Make sure that joint is airtight.

4. Install the flow control valve.

Mount this valve pointing slightly downward (diaphragm end up).

5. Install the air/water line from the metering assembly to the flow control valve side port (at this time clamp the end fitting to the metering assembly only). The line must not be pinched or kinked as this will obstruct flow.

When routing the tubing, especially in trunk to engine compartment installation, if holes must be made in floor panels, be sure not to sever brake lines, gasoline lines or tank, or electrical wiring.

II. B. (Continued)

6. Install the heat exchanger.

The heat exchanger should be installed as close to the exhaust manifold flange as possible. Use the large screw clamp provided and mount with the long stem (exit stem) pointing up.

NOTE: Do not over tighten the screw clamp or the heat exchanger will be crushed.

To insure a snug fit, partially bend or expand the heat exchanger until a snug fit is achieved.

Now that the heat exchanger is installed, carefully wrap it with fiberglass muffler tape.

7. Connect the flow control valve to the heat exchanger.

Using the larger (1/4 inch inside diameter) rubber hose, connect the flow control valve outlet to the inlet (short) tube of the heat exchanger. The hose should be slipped only 1/2 inch over the heater tube leaving about 1/2 inch bare. This is to protect the tube from heat soak back from the heater at shutdown or idle conditions.

8. Connect the heat exchanger to the intake manifold inlet as follows:

Cut the PCV hose at a point 2 or 3 inches from the carburetor. Insert the 3/8 inch diameter aluminum tee fitting into the hose. Using the rubber hose supplied in the kit, slip one end over the outlet tube of heat exchanger about 1 to 1-1/2 inches. Slip the other end over the brass fitting of the tee previously installed in the PCV hose.

CAUTION: Keep hoses away from the exhaust manifold to keep them from scorching.

8.a. Alternate Installation

On some model cars the PCV line is not readily accessible or in a difficult location. If the car or light truck engine is equipped with an EGR valve, remove the valve and in the outlet side (chamber which goes to the intake manifold) carefully drill (drill size #3) and tap a 1/4 inch 28 thread. Remove the 1/4 inch fitting from the 3/8 inch tee and install on the EGR valve housing. Replace the EGR valve. Using 1/4 inch inside diameter rubber hose, connect this fitting to the outlet (long fitting of the heat exchanger).

II. B. (Continued)

9. Connect the ported vacuum source with the vacuum diaphragm on the flow control valve.

NOTES:

(a) If the car is used primarily for short trips which does not permit a good engine warmup, use the EGR vacuum source. Check this source to be sure that a good vacuum curve is shown as the engine is accelerated.

(b) If the car is used primarily for short trips which does not permit a good engine warmup and does not have a EGR or if the EGR vacuum is weak or tapers off, a thermal vacuum control assembly (extra cost) should be installed. See your dealer.

10. Air Connections.

If the metering orifice is mounted in the trunk of your car, simply place a short section 10 to 12 inches of remaining vinyl tube over the orifice. This will act as a silencer and cut down on the hissing sound when the system is operating.

If the metering orifice is mounted in the engine compartment, a filter should be installed over the air orifice.

11. Your KAP System is now installed and ready for checking.

III. SYSTEM AND ENGINE SET UP

1. Before starting the engine, track all lines and connections of the system to insure that they match the flow schematic.

2. Make sure that all hose connections are secure and airtight.

3. Connect the "water trap" between the unclamped end of the air/water line (see II.5) and the flow control valve (side fitting) and secure.

4. Using a "T", connect a vacuum gage into a line such that the intake manifold vacuum can be read.

5. Using a "T", connect a vacuum gage into the ported vacuum line which connects to the vacuum diaphragm of the flow control valve.

NOTE: At this time do not connect the flow control valve diaphragm to the ported vacuum line but simply plug off the free end of this line. The valve will thus remain inoperative and the system will be effectively shut down.

III. (Continued)

6. Connect the timing light to the engine.

   NOTE: If the vacuum spark advance is operated by intake manifold vacuum, the vacuum should be disconnected from the vacuum diaphragm and plugged.

7. Connect the "scope" or tachometer to the engine.

8. Start the I.R. exhaust gas analyzer so that it will be warmed up to operating temperature.

9. Start the engine and allow it to warm up to operating temperature.

   NOTE: Make sure that the car cannot move and the engine compartment is clear prior to starting the engine.

10. Fill the system reservoir with water.

11. Take the engine off of fast idle.

12. Insert the exhaust gas analyzer probe into the exhaust pipe.

13. Check the initial ignition timing. The reading should be per manufacturer's specification.

14. Connect the vacuum hose to the vacuum spark advance diaphragm if it was disconnected per step 6 above.

15. Check the engine idle speed. It should be per manufacturer's specification.

16. Zero set the exhaust gas analyzer and test exhaust gas for hydrocarbons and carbon monoxide. Note the readings and especially the steadiness of the hydrocarbon gage reading.

    If the hydrocarbon readout gage oscillates it reflects a misfire in the engine which must be corrected.

    Check for the following:

    a. vacuum leaks

    b. ignition misfiring

    c. lean misfire.

    Set the idle mixture to manufacturer's specification.

III. (Continued)

17. Check the intake manifold vacuum. It should be steady and read about 18 inches of mercury at sea level and proportionately less with altitude decreasing about one inch of mercury per 1,000 foot elevation. Correct the manifold vacuum to the above if readings are low.

18. Light up the converter by speeding up the engine to 2,000 RPM until the I.R. readings reach their lowest point, about two minutes and record the readings.

19. Water Flow Check

    a. Making sure that the water trap is tight, open the flow control valve by hand. Within a few seconds water will begin to flow and collect in the trap.

    b. Release the valve and discard the water.

    c. Repeat Step a. above and this time hold the valve full open for one minute.

    d. Measure the amount of water trapped, note the amount and discard the water.

    e. Repeat Steps c. and d. above. Both readings should be within ± 1 ml.

    The amount of water collected should be as follows:

Engine Displacement Nominal	Water Flow ml/min.
450	27
400	24
350	21
300	18

NOTE: The water flow can be varied by changing the water orifice or air bleed orifice. Decreasing the water orifice will decrease water flow and increasing the water orifice size will increase the water flow. Decreasing the size of the air orifice will increase water flow and increasing the size of the air orifice will decrease the water flow.

III. (Continued)

20. Flow Schedule Check

The flow control valve is operated by the vacuum signal from the ported vacuum port. The strength of this signal varies as the design and even with a same design or supposedly identical carburetor on a different engine. It is important therefore that a check be made to assure that the valve open position be checked relative to the vacuum signal of the engine on which the device is installed.

Do this as follows:

a. Connect the ported vacuum source with the vacuum diaphragm of the flow control valve (see III.5).

b. Accelerate the engine and determine the maximum steady state vacuum on the ported vacuum.

NOTE: Hold engine speed to under 2,500 RPM.

c. Take the reading (b.) above and multiply it by 0.7 and note.

d. Accelerate the engine and when the vacuum gage reads the number determined in c. above, the valve should be in the full open position.

NOTE: Hold engine speed under 2,500 RPM.

e. Minor adjustment can be accomplished regarding the spring compression by turning the adjusting nut in or out. However, when decreasing the compression, i.e., turning the nut out, care must be taken to insure that the valve still sits in the closed position when the throttle is closed. If said adjustment is not adequate, the spring must be changed to one with a lesser spring rate.

21. System Checkout

a. Accelerate and decelerate the engine to see that the flow control valve opens and closes and water flows.

b. Light the converter by speeding the engine to 2,000 RPMs and holding until exhaust gas analyzer shows minimum reading. The engine should accelerate smoothly without stutter or misfiring. The exhaust gas analyzer readings should compare favorably, i.e., equal to or lower than the readings taken in Step 18. If the readings are not equal or lower, increase the richness of the idle mixture until favorable readings are achieved but no more than a full turn richer on each idle mixture screw. Replace limiter caps.

III. (Continued)

NOTE: (1) On some cars there is a built-in maximum rich mixture limit (Chrysler).

(2) The above applies most generally when the initial mixture setting has been established by the "lean drop" method.

22. a. Remove all test equipment from the vehicle.

b. Make sure all hand tools have been removed.

c. Replace and attach all engine components that were removed.

d. Recheck to insure that all hoses and electrical connections are in place and secured.

23. Test drive the vehicle. It should start easily, accelerate strong and smoothly and hold low intermediate and high cruise speeds without faltering or surging.

24. When the system is working properly, the consumption of water relative to gasoline will be about one gallon of water to each nine gallons of gasoline, if the driving is predominantly of the highway cruise type. It will vary from this amount by the type of driving that is done. If the consistent variance shows more water usage than one gallon of water to eight gallons of gasoline or less water usage than one gallon of water to 11 gallons of gasoline the settings should be rechecked.

IV. CAUTION

A. If the water reservoir is installed in the trunk of the car and the metering assembly is installed in the engine compartment and the car is parked facing down, water may leak through the metering assembly. If this possibility exists and the flow of water would be objectionable, the metering assembly should be mounted in the trunk above the level of the water.

B. Your car's engine should be properly maintained. However, if it has problems starting, i.e., starts then stops or becomes difficult to start, the short intervals when it runs will draw water into the engine due to insufficient heating of the exhaust pipe. If the car is allowed to remain in this condition, water can collect on the spark plugs and further prevent starting. If this happens the spark plugs should be removed and cleaned and further attempts to start the engine done with the system disconnected. This is done by simply removing the vacuum line from the flow control valve and plugging the line.

V. MAINTENANCE

The KAP System will require very little maintenance, however, certain periodic checks should be made.

A. If the system ceases to use water, check the water orifice of the metering assembly. This orifice is small and can become clogged quite easily. It is important that water used be clean and that the system be maintained in a clean condition.

B. Check the flow control valve periodically per III.20. above for proper function.

C. Periodically inspect the hoses for mineral deposits and to insure that there are no leaks or breaks in them.

D. Once every 10,000 miles or as necessary, clean the heat exchanger of mineral deposits as follows:

1. Disconnect the heat exchanger hose at the PCV (T) and flow control valve.

2. Plug the PCV (T).

3. Using hoses to the heat exchanger pour white vinegar into the heat exchanger.

4. Start engine and let idle for ten minutes.

5. Stop engine - drain vinegar and flush with clean water.

6. Reconnect hoses to PCV (T) and flow control valve.

E. As with all machines keep your car's engine in good functional condition. Regular checks and correction as needed will prolong the life of your car.