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EPA Evaluation of the Jacona Fuel System Under Section 511 of the Motor Vehicle Information and Cost Savings Act

by

Edward Anthony Barth

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Test and Evaluation Branch
Emission Control Technology Divison
Office of Mobile Sources
U.S. Environmental Protection Agency

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The Motor Vehicle Information and Cost Savings Act requires that EPA evaluate fuel economy retrofit devices and publish a summary of each evaluation in the Federal Register.

EPA evaluations are originated upon the application of any manufacturer of a retrofit device, upon the request of the Federal Trade Commission, or upon the motion of the EPA Administrator. These studies are designed to determine whether the retrofit device increases fuel economy and to determine whether the representations made with respect to the device are accurate. The results of such studies are set forth in a series of reports, of which this is one.

The evaluation of the Jacona Fuel System was conducted upon receiving an application for evaluation from the inventor/marketer of the device. The device is claimed to improve a vehicle's fuel economy without adversely affecting emissions. The device is an electrically powered in-line fuel heater.

The following is a summary of the information on the device as supplied by the applicant and the resulting EPA analysis and conclusions.

1. Title:

   Application for Evaluation of Jacona Fuel System under Section 511 of the Motor Vehicle Information and Cost Savings Act

2. Identification Information:

   a. Marketing Identification of the Product:

      Trade name: JACONA FUEL SYSTEM

      Model Number: JE 6-2 (Electric Only)
      JEW (Electric and Water)

   b. Inventor and Patent Protection:

      (1) Inventor

      Jack R. Dodrill
      1510 Londondale Parkway
      Newark, Ohio 43055

      (2) "Patent applications are pending."

   c. Applicant:

      (1) Jacona, Inc.
      1510 Londondale Parkway
      Newark, Ohio 43055

(2) Principals

Jack R. Dodrill
1510 Londondale Parkway
Newark, Ohio 43055

John L. Gray
Emens, Hurd, Kegler & Ritter
250 East Broad Street
Columbus, Ohio 43215

(3) Jack R. Dodrill and John L. Gray are authorized to represent Jacona, Inc. in communication with EPA

d. Manufacturer of the Product:

(1) Heat Exchange & Transfer, Inc.
500 Superior Avenue
Carnegie, Pennsylvania 15106

(2) Principals

Howard E. Meyer, President

3. Description of Product (as supplied by Applicant):

a. Purpose:

"A method of treating fuel for an internal combustion engine."

b. Theory of Operation:

"Fuel, such as gasoline or diesel fuel is heated utilizing waste heat from the engine, to a critical temperature. The heated fuel is then introduced into the engine in the normal fashion. Fuel savings of 25 percent have been consistently achieved, and considerably higher results have also been obtained. Objectionable emissions have been kept below EPA maximums."

c. Construction and Operation:

"The device is a heat exchanger which is contained in an insulated shell and which contains a heat transfer fluid which is preferably ethylene glycol. The fuel traverses the cylindrical container in the fluid in a sealed, coiled tube which is preferably made of seamless copper tubing. Also immersed in the fluid and extending the length of the container is an electrical heating element which is controlled by a solid state thermostatic control utilizing a sensor which controls the temperature of the heat transfer fluid. Attached as Exhibit A is a drawing of the device." Exhibit A is Attachment A.

4. Product Installation, Operation, Safety and Maintenance (as supplied by Applicant):

a. Applicability:

"JE 6-2 is for all domestic and foreign automobiles, diesel or gas powered, fuel injection or conventional carburetors, up to a maximum size of 350 cu. in.

"JEW is useful for anything larger than that including diesel truck engines and off-the-road vehicles."

b. Installation - Instructions, Equipment, and Skills Required:

"The device is connected between the outlet of the fuel pump and the inlet of the carburetor. It is preferably mounted on the fenderwell of the car. The controls are mounted under the dashboard in the car. The electrical connections go to the positive and negative terminals of the battery. The device is wired to the igniton so that it is activated when the engine key is turned on."

c. Operation:

"The operation of the device is entirely automatic and there are no instructions needed for its use."

d. Effects on Vehicle Safety:

"The device utilizes ethylene glycol as an intermediate heat exchange agent and thus the fuel is not directly heated by the electrical heating units. The unit has a temperature sensor at the carburetor and at the unit, and either of these sensors can turn the unit off."

e. Maintenance:

"There is no maintenance required on the device."

5. Effects on Emissions and Fuel Economy (submitted by Applicant):

a. Unregulated Emissions:

"The device has been tested at A.P. Parts Company, Toledo, Ohio in October 1980 and passed the test. A.P. Parts Company is an EPA-approved testing facility and the test results are attached as Exhibit B." Exhibit B is Attachment B.

b. Regulated Emissions and Fuel Economy:

"The test results on emissions are summarized and included in the affidavits which accompanied the letter from John L. Gray to Merrill W. Korth dated July 27, 1981, a copy of which is attached and marked Exhibit C." This letter is Attachment C of

this evaluation. The emissions data submitted with the letter was the testing at A.P. Parts Company which is Attachment B. The affidavits are 18 notarized documents in which the vehicle operators stated their mileages with and without the device. These data are summarized in the letter of July 27, 1981.

6. Analysis

a. Identification Information:

(1) Marketing Identification: Although the application covered two models, JE 6-2 (electric only) and JEW (electric and water), the descriptions submitted appeared to apply only to the Jacona Fuel System model JE 6-2.

(2) Inventor and Patent Protection: Although EPA requested a copy of the patent application as an aid in evaluating the Jacona Fuel System (Attachment E), the applicant failed to provide either a copy of it or the application number.

b. Description:

(1) The primary purpose of the device is to improve fuel economy by heating the fuel. Since the model JE 6-2 (electric only) device is installed in the fuel line, it is judged to be able to heat the fuel to some limited extent. The ability of the model JEW (electric and water) to function is unknown since this model was not described.

(2) In describing the operation of the device in Section 3b, the applicant stated that the device heated the fuel, ". . . utilizing waste heat from the engine, to a critical temperature." However, neither the drawing of the device, its description, or the installation instructions include any use of "waste heat". For Model JE 6-2 the fuel appears to be heated only by electrical heating elements.

EPA requested (paragraph 1, Attachment E) the applicant to clarify what was meant by waste heat and to describe how it was used. Also what was the critical temperature and why was it critical. The applicant did not respond to this request.

(3) The description of the device given in Section 3c is a generalized, non-specific description of the device. It does not describe a device using waste heat. It does not provide sufficiently detailed information about the device's effect on the fuel. EPA requested (paragraph 3, Attachment E) additional details:

> ". . . , description of the device. What is the temperature set point of the thermostatic control? Please describe the control in greater detail. What is the heating capacity of the electric heating element? How much is the temperature of the fuel raised? Please provide representative fuel inlet and outlet temperatures for representative ambient conditions while the vehicle is operating."

No response was received. Thus, the heating capacity of the device is unknown.

In addition, neither the description of the device, drawings, nor schematics show the ". . . temperature sensor at the carburetor . . ." mentioned in Section 4d EPA requested (paragraph 7, Attachment E) additional information about this sensor but received no response.

(4) The device is claimed to consistently achieve fuel savings of 25 percent (Section 3b). This claim is apparently based on the driver testimonials contained in Attachment C. As described in Section 6d(2), these data do not represent a controlled evaluation of the device and, therefore, cannot support the claim for a fuel economy improvement for the device.

Emissions were claimed to be kept below EPA maximums (Section 3b). EPA requested the applicant to clarify this claim in paragraph 2 of Attachment E.

> "Exactly what is meant by this statement (were emissions lowered, unchanged, or raised but not over statutory limits)? Were these measured by the Federal Test Procedure (FTP)? Are there any emission test results besides those provided with the application?"

No clarification was received.

(5) No cost information was provided.

c. Installation, Operation, Safety and Maintenance:

(1) Applicability:

(a) Based on the limited information supplied by the applicant, the applicability of the product as stated in Section 4a to ". . . all domestic and foreign automobiles, diesel or gas provided, fuel injection or conventional carburetors, up to a maximum size of 350 cu. in." is judged to be reasonable for the model JE 6-2 (electric only).

The applicability of the model JEW (electric and water) to larger engines is unknown since the applicant provided no information about this model.

(b) The device apparently does not function for some ambient temperature conditions and types of driving. The applicant informed EPA (Attachment C) that

> ". . . a cold start at 72°F which limits the effectiveness of the Jacona Fuel System since at elevated temperatures (ambient temperatures above about 80°F) the Jacona Fuel System will only operate effectively if the vehicle is operating at highway speeds. Because of the limitations on the ability adequately to insulate the Jacona Fuel System at the present time from the higher temperature generated under the hood of the vehicle, the Jacona Fuel System at such temperatures is only effective at highway speeds."

The applicant was requested (paragraph 7, Attachment E) to explain this temperature limitation in greater detail. He was also asked to explain why it was necessary to insulate a heating device from the elevated temperatures under the hood. The applicant did not respond to these questions.

The applicant stated (Attachment C) that the device would ". . . operate effectively during the majority of normal driving conditions to which it is subjected . . ." However, the applicant did not define the normal driving and ambient temperatures for which this applied and did not respond to EPA's request (paragraph 10, Attachment E) for this information.

(2) Installation - Instructions, Equipment and Skills Required:

The installation instructions given in Section 4b are a generalized, nonspecific summary of how the device is to be installed. These instructions are inadequate for actual installation. EPA requested (paragraph 5, Attachment E) more detailed instructions and a detailed list of parts

> "Do you provide more detailed installation instructions? If so, please provide them. Is there an installation kit (hoses, fittings, wiring, etc.) which accompanies the device? If so, please describe."

The applicant did not respond to this request.

The schematic provided shows a light which apparently is used to indicate when the heater is operating. However, there was no mention of it in either the installation or operating instructions.

It appears that installation of the device would require at least moderate mechanical skills. The applicant provided no instructions or warnings related to the potential hazards likely to be encountered when working with fuel and electrical systems.

(3) Operation:

The schematic of the Jacona Fuel System Model JE 6-2 shows a system that could be installed entirely in a vehicle's engine compartment. However, in Section 4b, the applicant stated "The controls are mounted under the dashboard of the vehicle". This indicates that the operation may not be entirely automatic as stated in Section 4c.

Also, the description of the device and electrical schematic indicate that the device operates as soon as the ignition key is turned on. It appears that there is no over-ride when starting a vehicle in sub-freezing temperatures. Since, when ambient temperatures are low, electrical starting loads are high and battery output is low, the applicant was asked (paragraph 6, Attachment E) if the device caused starting problems for a vehicle. The applicant did not respond.

The device apparently has an indicator light. However, its purpose, usage, and location were not given.

(4) Effects on Vehicle Safety:

Since the applicant failed to submit sufficient information about the device and no sample was provided, EPA is unable to judge the safety of the actual device. However, assuming that good design, materials, and workmanship are used in manufacturing the system, it appears likely the device has the potential to be safe in normal vehicle usage (model JE 6-2 only).

The safety of the model JEW is unknown since no information was provided describing this model.

(5) Maintenance:

In section 4e, the applicant states that there is "no maintenance required on the device". For model JE 6-2, this statement is judged to be reasonable. However, the added fuel fittings and electrical components would require the normal periodic inspection accorded similar components in the vehicle. The maintenance requirements of the model JEW are unknown since no information was provided for this model.

d. Effects on Emissions and Fuel Economy:

(1) Unregulated Emissions:

The applicant submitted no test data and made no claims regarding unregulated emissions. The statements and data supplied in Section 5a relate to regulated emissions only. However, since the device probably does not appreciably modify the vehicle's emission control system or powertrain, the device would not significantly affect a vehicle's nonregulated emissions.

(2) Regulated Emissions and Fuel Economy:

The applicant did submit test data in accordance with the Federal Test Procedure but not the Highway Fuel Economy Test. These two test procedures are the primary ones recognized by EPA for evaluation of fuel economy and emissions for light duty vehicles.*

The limited test data submitted (Attachment B) consisted of replicate FTP tests on one vehicle. The results were:

	Federal Test Procedure			
	HC	CO	NOx	F.E.
Baseline #1	.54 g/mi	5.49 g/mi	1.97 g/mi	10.1 mi/gal
Baseline #2	.47	6.62	1.80	10.7
with Jacona #1	.47	4.77	1.67	10.3
with Jacona #2	.42	4.96	1.53	9.9

The fuel economy results were calculated from the emission values using the carbon balance technique. Since these data were for a 1978 Lincoln with a 400 CID engine, they were presumed to be for the Jacona Fuel System Model JEW (electric and water).

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*The requirement for test data following these procedures is stated in the policy documents that EPA sends to each potential applicant. EPA requires duplicate test sequences before and after installation of the device on a minimum of two vehicles. A test sequence consists of a cold start FTP plus a HFET or, as a simplified alternative, a hot start LA-4 plus a HFET. Other data which have been collected in accordance with other standardized procedures are acceptable as supplemental data in EPA's preliminary evaluation of a device.

This data did not indicate a fuel economy benefit for the device and the applicant was so advised (paragraph 8, Attachment E). The limited FTP data was inconclusive and showed no fuel economy change due to the device. Although the emission data did indicate an improvement in cold start (FTP bag 1) emissions, the overall effect is unknown due to the limited amount of test data provided.

The user testimonials given in Section 5b cannot be used to evaluate the effectiveness of the Jacona Fuel System because they are relatively uncontrolled tests. The applicant also recognized the problems involved in verifying the accuracy of these claims. He noted problems in controlling the vehicle usage, discounted negative results, and had to disregard an unrealistically large improvement (Attachment C).

Prior to the submittal of the application, Mr. Gray and Mr. Dodrill had claimed that the EPA test procedure was inappropriate for the evaluation of their device due to the unique characteristics of the device. However, their application did not adequately address this issue and they failed to respond to our subsequent request for information that would allow EPA to investigate their contentions.

The applicant was advised of our requirements for test data as outlined in the 511 application procedure. They were reminded of our test requirements and the obligation to publish the result of our evaluation. Although they were given adequate time to obtain the required information, no further data or information was provided. Therefore, this evaluation was completed on the basis of the information available.

e. Test Results of other Fuel Preheaters:

Previous EPA testing of a fuel preheater showed no fuel economy benefits. Also, the two previous fuel preheaters evaluated under the 511 process contained no valid data indicating either a fuel economy or emissions benefit.

7. Conclusions

EPA fully considered all of the information submitted by the applicant. The evaluation of the Jacona Fuel System device was based on that information.

The information supplied by the applicant was insufficient to adequately substantiate the claims for the device. The applicant failed to respond to repeated written and telephone requests for additional information.

The applicant was advised of our requirements for test data as outlined in the 511 application procedure. They were reminded of our test requirements and the obligation to publish the result of our evaluation. They were given adequate time to obtain the required information, yet no further data or information was provided. Therefore, our evaluation was completed on the basis of the information available.

The limited test data supplied by the applicant was inconclusive. These data showed no fuel economy improvement due to the device. The emission data did show an improvement in cold start (FTP bag 1) on one car emissions but the overall effects on emissions are unknown due to the limited test data provided.

Previous EPA testing of a fuel preheater had shown no fuel economy benefits. Applications for two other fuel preheaters provided no valid data indicating any effects on either fuel economy or emissions. Based on these results and on engineering judgment, it was concluded that there is no technical basis to justify an EPA confirmatory test program on the Jacona Fuel System or to support any claims for a fuel economy improvement due to its use.

FOR FURTHER INFORMATION CONTACT: Merrill W. Korth, Emission Control Technology Division, Office of Mobile Sources, Environmental Protection Agency, 2565 Plymouth Road, Ann Arbor, Michigan 48105, (313) 668-4299.

List of Attachments

Attachment A	Drawings of Jacona Fuel System, Figures 1 through 5 (provided with 511 application).
Attachment B	Letter of October 6, 1980 from A.P. Parts Company to Jack Dodrill of Jacona Fuel Systems (provided with 511 application and as an attachment to July 27, 1981 letter to EPA).
Attachment C	Letter of July 27, 1981 from John L. Gray to EPA (a copy was also provided as an attachment to the 511 application).
Attachemnt D	Letter of July 31, 1981 from EPA to John L. Gray in response to his request to review the test data on the Jacona Fuel System.
Attachment E	Letter of October 20, 1981 from EPA to John L. Gray acknowledging receipt of 511 application for the Jacona Fuel System and requesting clarification and additional information.
Attachment F	Letter of January 13, 1982 from EPA to John L. Gray reiterating previous requests for information.

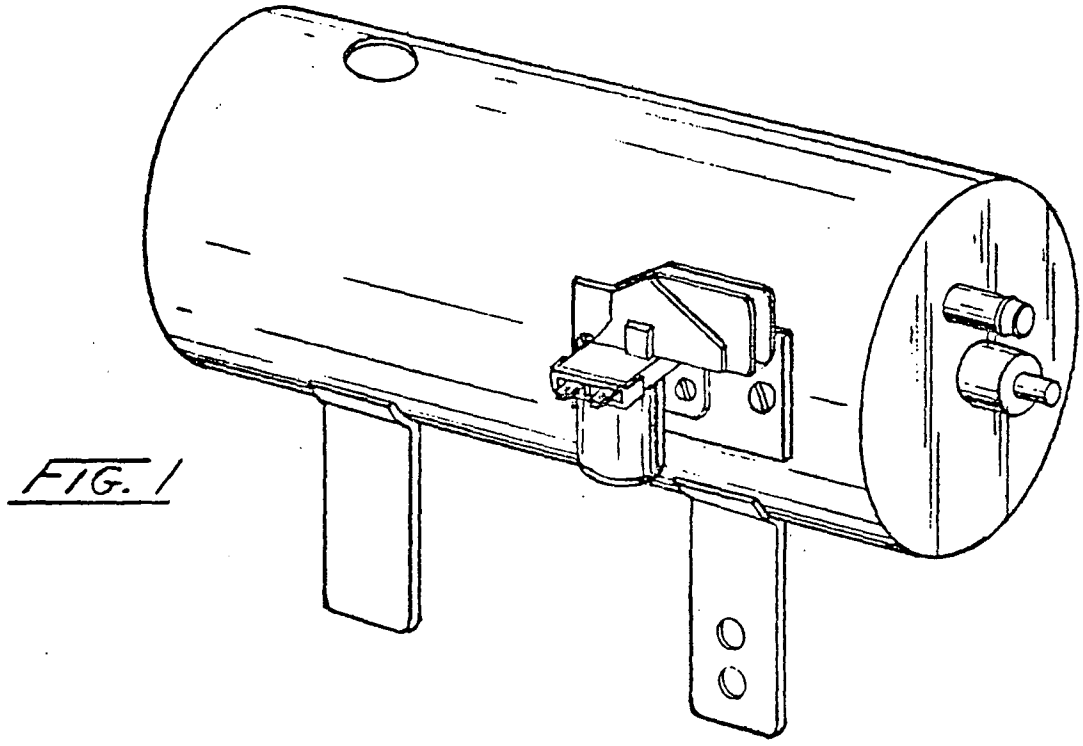


FIG. 1

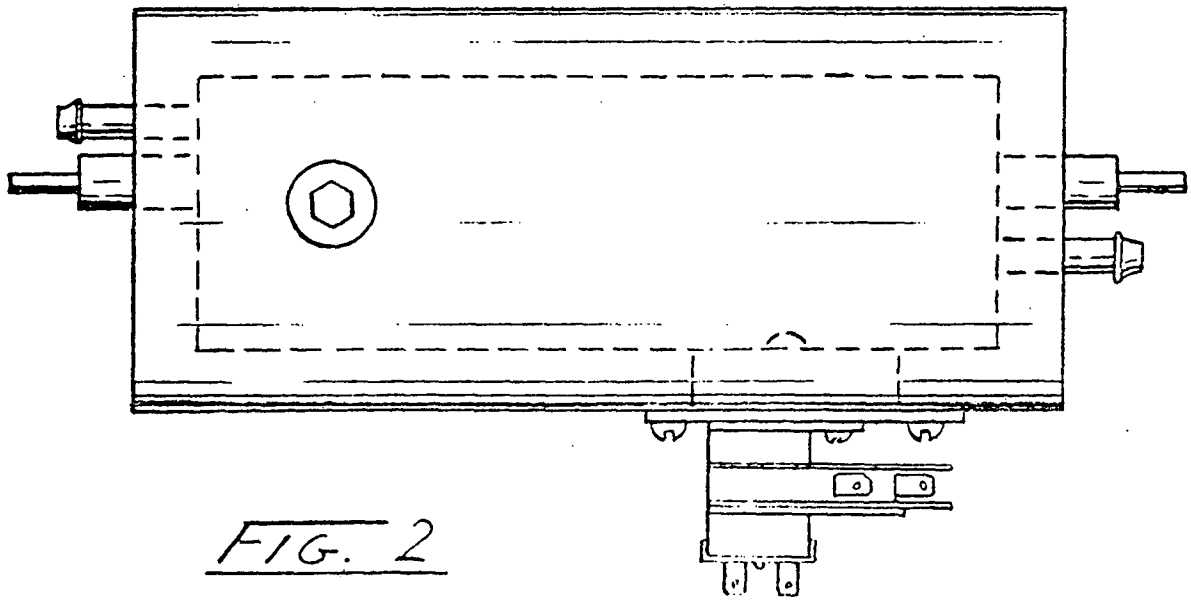
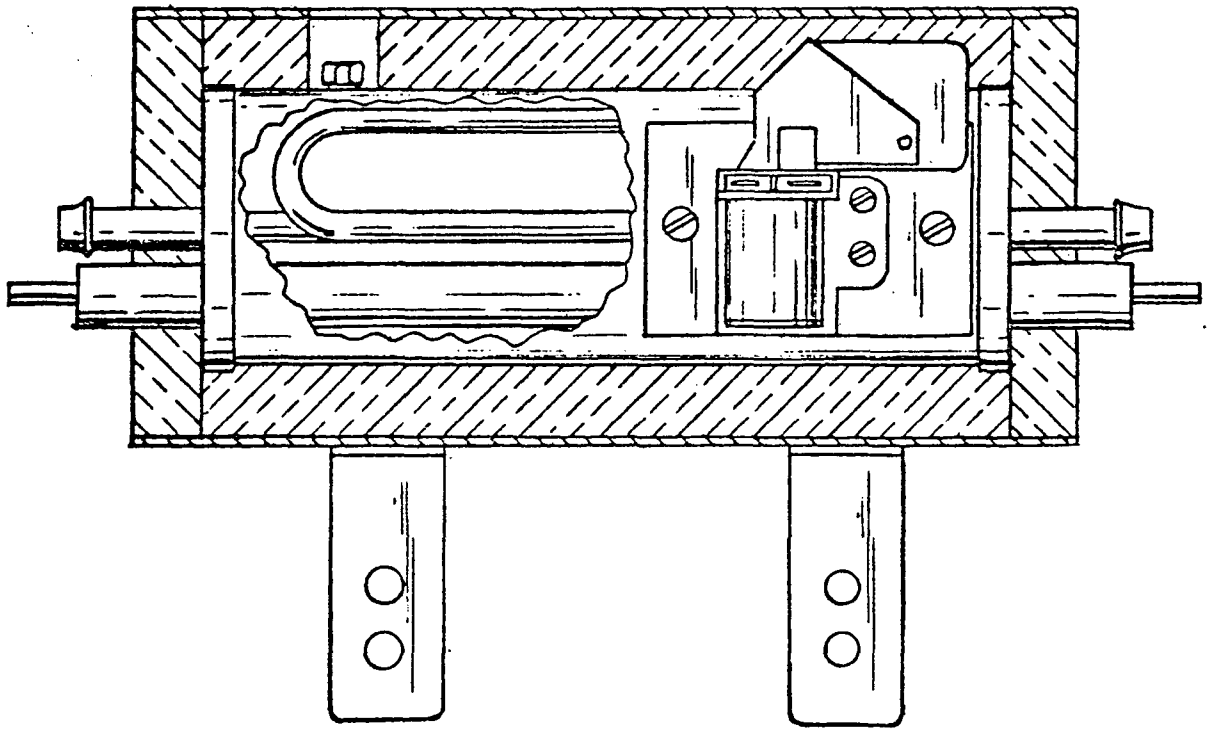


FIG. 2

FIG. 3



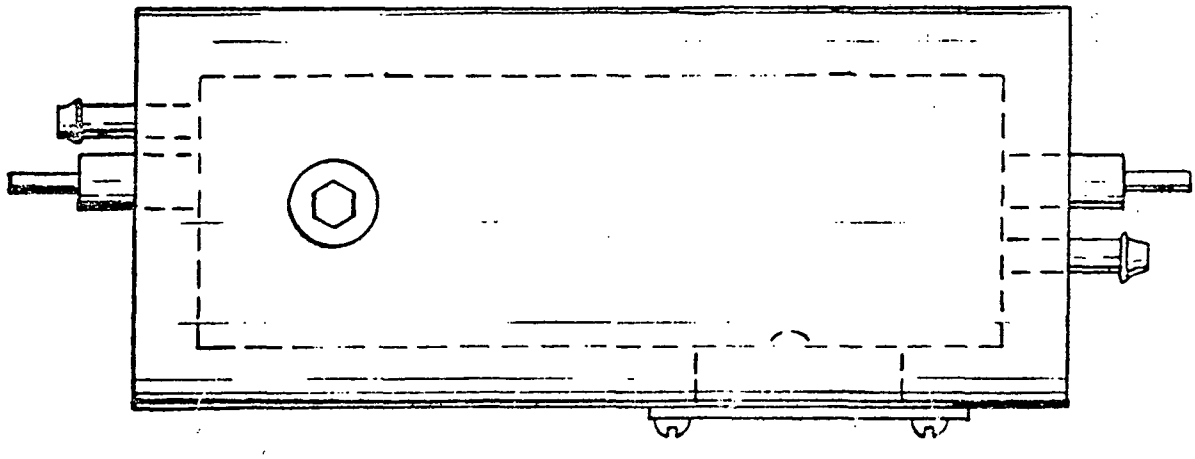


FIG. 4

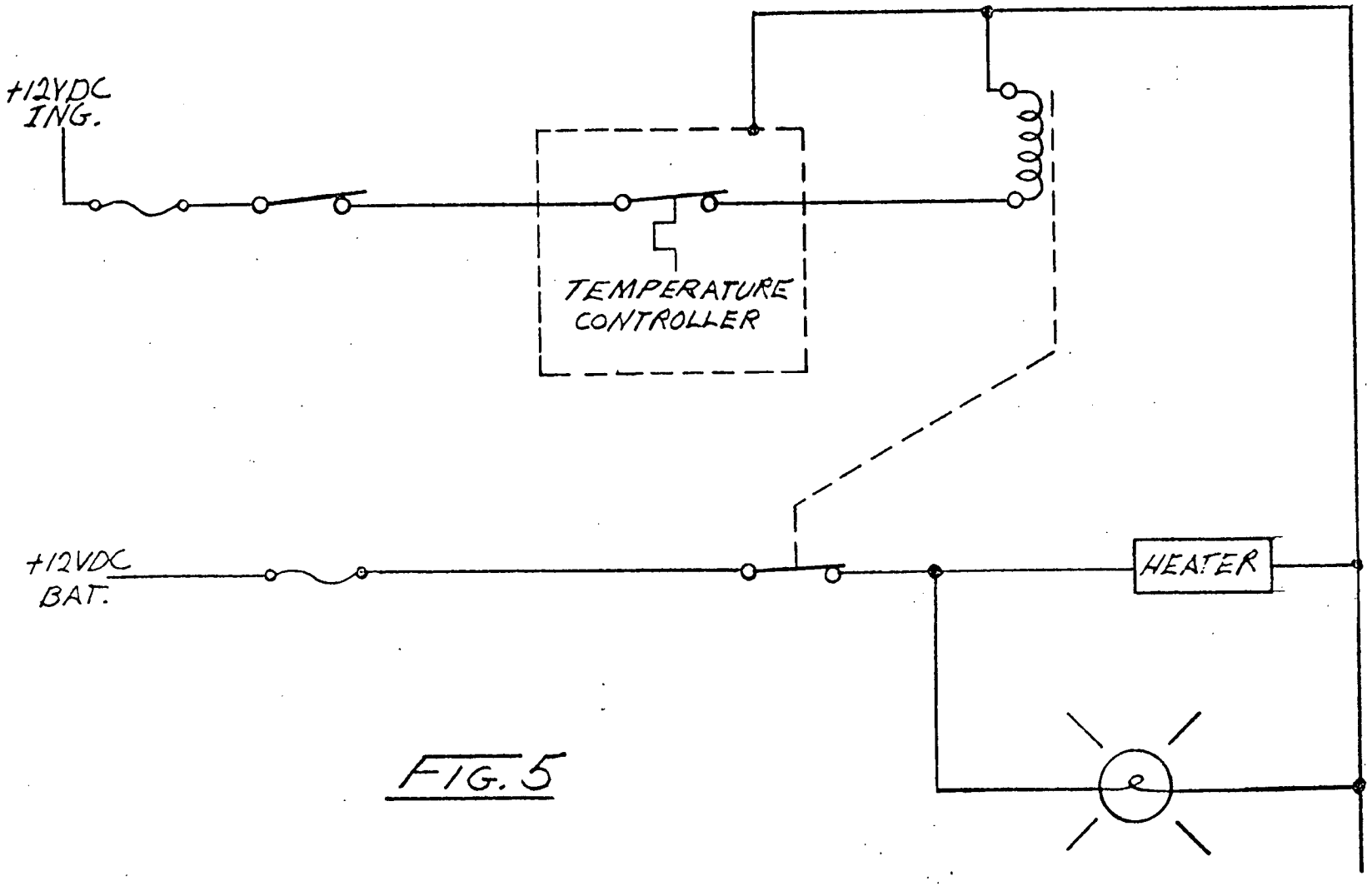


FIG. 5

EXHIBIT B

AP Parts Company
Engineering & Development Division
543 Matzinger Road
P O Box 1040
Toledo Ohio 43697
419 259 3461

October 6, 1980

Mr. Jack Dodrill
Jacona Fuel Systems
(Heath Auto Parts)
142 Union Street
Newark, OH 43055

Dear Jack:

Enclosed are copies of the computer print-out sheets for exhaust emissions tests on your 1978 Lincoln (Serial #F8Y89A816097F) the week of September 29, 1980. After reviewing all the input data and the final test results, no discrepancies could be found. Therefore, you can use these results to evaluate your system's emission performance.

The results for the acceleration tests run on the vehicle are as follows:

(4-Test Average)	w/o Device	With Device
0-30 mph	5.2 sec.	5.0 sec.
0-50 mph	9.6 sec.	9.0 sec.

We hope everything was satisfactory during your stay in Toledo and if you have any questions or wish to pursue further testing, please feel free to write or call.

Sincerely,

AP PARTS COMPANY

Todd Tracey

Todd C. Tracey
Supervisor, Dynamics and
Emissions Test Labs

TCT:tmi

cc: M. W. Clegg

Enclosures

CONSTANT VOLUME SAMPLER PARAMETERS

	COLD TRANS.	COLD STABL.	HOT TRANS.
TOTAL TIME	506.1	868.3	507.0
REVOLUTIONS	9092.0	15599.0	9100.0
AVE.INLET PRESS.(IN. H20)	383.21	382.96	383.04
AVE.INLET TEMP.(DEG. F)	124.33	124.00	123.67
CU.FT./MIN.(STP)	273.48	272.93	273.27
CU.FT./PHASE(STP)	2306.82	3951.87	2305.50
CU.FT./REV.(STP)	0.254	0.253	0.253
DILUTION FACTOR	5.482	6.909	5.570
HOT SOAK DURATION	601.0 SECS.		

INSTRUMENT CODE NO.

CO(NDIR)	CO2(NDIR)	HC(FID)	NO(CHEM)	NOX(CHEM)
QA 9	QA10	QA 7	QA 6	QA 6

MASS RESULTS

COLD TRANS.

	METER	RANGE	CONC	BACKGND	CORRECTED*	GMS.	GMS/MI
HC(F)	43.0	2	43.000	7.200	111.340	4.194	1.168
CO	69.0	5	711.075	11.925	701.326	53.34	14.858
CO2	20.0	1	2.361%	0.088%	22883.848	2737.100	762.446
NO	28.0	3	28.000	0.200	27.836	2.295	0.639
NOX	38.5	3	38.500	1.050	37.642	4.703	1.310
NO*H	28.0	3	28.000	0.200	27.836	2.368	0.660
NOX*H	38.5	3	38.500	1.050	37.642	4.853	1.352

COLD STABL.

	METER	RANGE	CONC	BACKGND	CORRECTED*	GMS.	GMS/MI
HC(F)	11.0	2	11.000	6.600	16.066	1.037	0.265
CO	6.0	6	24.330	7.663	17.777	2.32	0.592
CO2	63.5	3	1.934%	0.101%	18472.539	3785.108	968.095
NO	27.5	3	27.500	0.450	27.115	3.830	0.980
NOX	35.5	3	35.500	1.150	34.516	7.388	1.890
NO*H	27.5	3	27.500	0.450	27.115	3.952	1.011
NOX*H	35.5	3	35.500	1.150	34.516	7.624	1.950

HOT TRANS.

	METER	RANGE	CONC	BACKGND	CORRECTED*	GMS.	GMS/MI
HC(F)	25.5	2	25.500	8.000	56.809	2.139	0.599
CO	77.0	6	372.397	7.663	366.110	27.83	7.795
CO2	77.0	3	2.361%	0.088%	22886.385	2735.844	766.308
NO	55.0	3	55.000	0.500	54.590	4.498	1.260
NOX	69.0	3	69.000	1.000	68.180	8.513	2.385
NO*H	55.0	3	55.000	0.500	54.590	4.642	1.300
NOX*H	69.0	3	69.000	1.000	68.180	8.786	2.461

CONCENTRATIONS=PPM--HC CONCENTRATIONS=PPMC

**********WEIGHTED COMPOSITE VALUES**********

	CO	CO2	HC	NO	NOX	NO*H	NOX*H
GMS./MI.	5.488	870.869	0.542	0.986	1.905	1.017	1.966

****

STOP --

CONSTANT VOLUME SAMPLER PARAMETERS

	COLD TRANS.	COLD STABL.	HOT TRANS.
TOTAL TIME	505.8	868.2	505.8
REVOLUTIONS	9090.0	15604.0	9084.0
AVE.INLET PRESS.(IN. H2O)	380.56	380.56	380.56
AVE.INLET TEMP.(DEG. F)	124.33	124.33	124.33
CU.FT./MIN.(STP)	271.32	271.32	271.32
CU.FT./PHASE(STP)	2286.32	3926.75	2283.53
CU.FT./REV.(STP)	0.252	0.252	0.251
DILUTION FACTOR	5.335	7.418	5.925
HOT SOAK DURATION	601.0 SECS.		

INSTRUMENT CODE NO.

CO(NDIR)	CO2(NDIR)	HC(FID)	NO(CHEM)	NOX(CHEM)
QA 9	QA10	QA 7	QA 6	QA 6

MASS RESULTS

COLD TRANS.

	METER	RANGE	CONC	BACKGND	CORRECTED*	GMS.	GMS/MI
HC(F)	38.0	2	38.000	5.750	99.983	3.733	1.040
CO	54.0	4	877.304	24.330	857.534	64.64	18.006
CO2	20.5	1	2.412%	0.088%	23407.227	2774.828	772.956
NO	26.5	3	26.500	0.750	25.891	2.116	0.589
NOX	37.0	3	37.000	1.700	35.619	4.411	1.229
NO*H	26.5	3	26.500	0.750	25.891	2.172	0.605
NOX*H	37.0	3	37.000	1.700	35.619	4.529	1.262

COLD STABL.

	METER	RANGE	CONC	BACKGND	CORRECTED*	GMS.	GMS/MI
HC(F)	9.5	2	9.500	5.150	15.133	0.970	0.249
CO	10.0	6	46.206	16.647	31.803	4.12	1.057
CO2	59.0	3	1.799%	0.101%	17112.445	3484.129	894.057
NO	24.5	3	24.500	1.050	23.592	3.311	0.850
NOX	33.0	3	33.000	1.800	31.443	6.687	1.716
NO*H	24.5	3	24.500	1.050	23.592	3.400	0.872
NOX*H	33.0	3	33.000	1.800	31.443	6.866	1.762

HOT TRANS.

	METER	RANGE	CONC	BACKGND	CORRECTED*	GMS.	GMS/MI
HC(F)	20.0	2	20.000	5.900	45.287	1.689	0.471
CO	84.5	6	418.822	9.728	410.736	30.92	8.631
CO2	72.5	3	2.214%	0.088%	21404.707	2534.336	707.316
NO	47.5	3	47.500	1.000	46.669	3.809	1.063
NOX	65.5	3	65.500	1.550	64.212	7.941	2.216
NO*H	47.5	3	47.500	1.000	46.669	3.911	1.092
NOX*H	65.5	3	65.500	1.550	64.212	8.154	2.276

CONCENTRATIONS=PPM--HC CONCENTRATIONS=PPMC

**********WEIGHTED COMPOSITE VALUES**********

	CO	CO2	HC	NO	NOX	NO*H	NOX*H
GMS./MI.	6.619	818.101	0.473	0.854	1.752	0.877	1.799

****

STOP --

CONSTANT VOLUME SAMPLER PARAMETERS

	COLD TRANS.	COLD STABL.	HOT TRANS.
TOTAL TIME	506.1	868.3	505.9
REVOLUTIONS	9086.0	15590.0	9045.0
AVE.INLET PRESS.(IN. H2O)	379.88	379.88	379.88
AVE.INLET TEMP.(DEG. F)	123.67	124.00	124.00
CU.FT./MIN.(STP)	271.15	271.00	271.00
CU.FT./PHASE(STP)	2286.17	3920.15	2273.15
CU.FT./REV.(STP)	0.252	0.251	0.251
DILUTION FACTOR	5.049	7.006	5.832
HOT SOAK DURATION	601.0 SECS.		

INSTRUMENT CODE NO.

CO(NDIR)	CO2(NDIR)	HC(FID)	NO(CHEM)	NOX(CHEM)
QA 9	QA10	QA 7	QA 6	QA 6

MASS RESULTS

COLD TRANS.

	METER	RANGE	CONC	BACKGND	CORRECTED*	GMS.	GMS/MI
HC(F)	23.5	2	23.500	3.700	61.598	2.300	0.641
CO	64.5	6	311.664	7.663	305.519	23.03	6.415
CO2	84.5	3	2.616%	0.101%	25344.881	3004.328	836.885
NO	34.5	3	34.500	0.450	34.139	2.789	0.777
NOX	51.5	3	51.500	1.200	50.538	6.258	1.743
NO*H	34.5	3	34.500	0.450	34.139	2.878	0.802
NOX*H	51.5	3	51.500	1.200	50.538	6.456	1.798

COLD STABL.

	METER	RANGE	CONC	BACKGND	CORRECTED*	GMS.	GMS/MI
HC(F)	10.0	2	10.000	3.750	20.356	1.303	0.334
CO	12.5	6	59.626	5.748	54.698	7.07	1.814
CO2	62.5	3	1.904%	0.128%	17942.072	3646.897	935.825
NO	21.5	3	21.500	0.900	20.728	2.904	0.745
NOX	26.5	3	26.500	1.450	25.257	5.362	1.376
NO*H	21.5	3	21.500	0.900	20.728	2.996	0.769
NOX*H	26.5	3	26.500	1.450	25.257	5.532	1.420

HOT TRANS.

	METER	RANGE	CONC	BACKGND	CORRECTED*	GMS.	GMS/MI
HC(F)	23.0	2	23.000	4.550	57.690	2.141	0.598
CO	88.0	6	445.730	9.728	437.670	32.90	9.155
CO2	73.5	3	2.246%	0.114%	21512.609	2535.535	707.651
NO	49.0	3	49.000	0.800	48.337	3.927	1.096
NOX	58.5	3	58.500	1.200	57.506	7.080	1.976
NO*H	49.0	3	49.000	0.800	48.337	4.051	1.131
NOX*H	58.5	3	58.500	1.200	57.506	7.304	2.038

CONCENTRATIONS=PPM--HC CONCENTRATIONS=PPMC

**********WEIGHTED COMPOSITE VALUES**********

	CO	CO2	HC	NO	NOX	NO*H	NOX*H
GMS./MI.	4.767	853.125	0.469	0.848	1.616	0.874	1.667

****

STOP --

CONSTANT VOLUME SAMPLER PARAMETERS

	COLD TRANS.	COLD STABL.	HOT TRANS.
TOTAL TIME	506.1	868.5	506.0
REVOLUTIONS	9093.0	15613.0	9089.0
AVE.INLET PRESS.(IN. H2O)	380.24	380.32	380.41
AVE.INLET TEMP.(DEG. F)	123.67	123.67	124.00
CU.FT./MIN.(STP)	271.28	271.47	271.50
CU.FT./PHASE(STP)	2287.79	3926.40	2289.79
CU.FT./REV.(STP)	0.252	0.251	0.252
DILUTION FACTOR	4.992	6.846	5.577
HOT SOAK DURATION	601.0 SECS.		

INSTRUMENT CODE NO.

CO(NDIR)	CO2(NDIR)	HC(FID)	NO(CHEM)	NOX(CHEM)
QA 9	QA10	QA 7	QA 6	QA 6

MASS RESULTS

COLD TRANS.

	METER	RANGE	CONC	BACKGND	CORRECTED*	GMS.	GMS/MI
HC(P)	24.5	2	24.500	4.000	63.904	2.387	0.665
CO	56.0	6	267.803	7.663	261.675	19.74	5.498
CO2	85.5	3	2.650%	0.088%	25794.719	3059.823	852.344
NO	32.5	3	32.500	0.500	32.100	2.625	0.731
NOX	49.0	3	49.000	1.150	48.080	5.957	1.660
NO*H	32.5	3	32.500	0.500	32.100	2.718	0.757
NOX*H	49.0	3	49.000	1.150	48.080	6.169	1.718

COLD STABL.

	METER	RANGE	CONC	BACKGND	CORRECTED*	GMS.	GMS/MI
HC(P)	9.5	2	9.500	4.000	18.253	1.170	0.300
CO	11.5	6	54.334	5.748	49.426	6.40	1.642
CO2	64.0	3	1.949%	0.114%	18512.918	3768.933	967.141
NO	19.5	3	19.500	0.850	18.774	2.635	0.676
NOX	24.5	3	24.500	1.350	23.347	4.965	1.274
NO*H	19.5	3	19.500	0.850	18.774	2.728	0.700
NOX*H	24.5	3	24.500	1.350	23.347	5.141	1.319

HOT TRANS.

	METER	RANGE	CONC	BACKGND	CORRECTED*	GMS.	GMS/MI
HC(P)	19.0	2	19.000	5.550	43.335	1.620	0.452
CO	97.0	6	523.719	9.728	515.735	38.94	10.867
CO2	76.5	3	2.344%	0.101%	22612.988	2684.740	749.293
NO	41.0	3	41.000	0.650	40.467	3.312	0.924
NOX	50.5	3	50.500	1.050	49.638	6.156	1.718
NO*H	41.0	3	41.000	0.650	40.467	3.429	0.957
NOX*H	50.5	3	50.500	1.050	49.638	6.374	1.779

CONCENTRATIONS=PPM--HC CONCENTRATIONS=PPMC

**********WEIGHTED COMPOSITE VALUES**********

	CO	CO2	HC	NO	NOX	NO*H	NOX*H
GMS./MI.	4.956	883.991	0.417	0.755	1.475	0.782	1.527

****

STOP --

EMENS, HURD, KEGLER & RITTER

ATTORNEYS AT LAW

250 EAST BROAD STREET

COLUMBUS, OHIO 43215

TELEPHONE: (614) 221-6527

CABLE: LAW EHKR

TELEX: 246671

TIMOTHY J. BATTAGLIA
JACK A. BJERKE
J. RICHARD EMENS
LAWRENCE F. FEHELEY
JOHN L. GRAY
ALLEN L. HANDLAN
THOMAS W. HILL
DWIGHT I. HURD
CHARLES J. KEGLER
JOHN C. McDONALD
WILLIAM W. MILLIGAN
PAUL D. RITTER, JR.
JOHN R. THOMAS

STEPHEN E. CHAPPELEAR
EDWARD C. HERTENSTEIN
JOHN I. CADWALLADER
WILLIAM A. HOPPER, JR.
BEATRICE W. RAKAY
JOHN P. BRODY
NANCY A. DONALDSON
KEVIN L. SYKES
THOMAS E. DeBROSSE
RICHARD P. McHUGH
BARBARA L. SPENCER
BARBARA A. BELVILLE

HERMAN R. TINGLEY (1887-1973)
JOSEPH M. MILLIOUS
JOHN B. TINGLEY
S. NOEL MELVIN
COUNSEL

July 27, 1981

Mr. Merrill W. Korth
Device Evaluation Coordinator
Emission Control Technology Division
United States Environmental Protection
Agency
Office of Air, Noise and Radiation
2565 Plymouth Road
Ann Arbor, Michigan 48105

Dear Mr. Korth:

This firm represents Mr. Jack R. Dodrill and he has asked me to write to you in accordance with his recent discussion with you and your letter of July 23, 1981, so that you may be supplied with certain data which has been developed in the testing and evaluation of the Jacona Fuel System.

As was mentioned in his discussion with you by Mr. Dodrill, the standard EPA mileage test which is described in your letter of July 23, 1981, involves a cold start at 72°F which limits the effectiveness of the Jacona Fuel System since at elevated temperatures (ambient temperatures above about 80°F) the Jacona Fuel System will only operate effectively if the vehicle is operating at highway speeds. Because of the limitations on the ability adequately to insulate the Jacona Fuel System at the present time from the higher temperature generated under the hood of the vehicle, the Jacona Fuel System at such temperatures is only effective at highway speeds.

On the other hand, for normal driving with a start up at ambient temperatures, there is an opportunity for the Jacona Fuel System to operate effectively during the majority of the normal driving conditions to which it is subjected and, as a consequence, the test data that has been developed to show the significant improvement in mileage obtained with the Jacona Fuel System has been developed in real life driving conditions by a variety of different individuals located in three different states, which includes start up, city driving, and highway driving under ambient temperature conditions in late spring and early summer.

Enclosed, therefore, are the following:

1. Exhibit A--Affidavits of eight (8) individuals in Pennsylvania who utilized the device on their personal vehicles under their normal driving conditions.

2. Exhibit B--Affidavits of six (6) individuals who utilized the Jacona Fuel System on their personal and, in some cases, state-owned vehicles, under normal driving conditions for varying periods of time.

3. Exhibit C--Affidavits of four (4) individuals utilizing state-owned vehicles which achieved negative results.

4. Exhibit D--A communication dated October 6, 1980 and enclosures from Mr. Todd C. Tracey, Supervisor, Dynamics and Emissions Test Labs of AP Parts Company.

5. Exhibit E--A listing dated July 14, 1981 of the independent laboratories recognized by EPA as capable of performing emission tests on motor vehicles.

Set forth below is a summarization of the percentage changes in mileage accomplished by use of the Jacona Fuel System based on the information contained in the affidavits of Exhibits A, B, and C.

EXHIBIT A	Percentage Increase	Average %
	35	
	20	
	27	
	69	
	44	
	28	
	21	
	31	32
EXHIBIT B	8	
	22	
	4	
	31	
	133	
	10	35

EXHIBIT C	Percentage Decrease	Average %
	-20	
	-22	
	-11	
	-19	-18

The average of the results in Exhibits A and B is 33 percent, so it may be concluded from these data that there has been an overall average increase of 33 percent, if the negative results are completely discounted.

Of the negative results, three of the vehicles were AMC Concords and one was a Plymouth Fury. The data for these vehicles without the Jacona Fuel System was generated while the vehicles were primarily engaged in field work which involved considerable high mileage highway driving. After the Jacona Fuel System was installed on these vehicles they were used primarily for city driving for the motor pool with different drivers. This can be confirmed by Mr. James L. Nichols, head of Ohio's Department of Energy.

However, even if the negative results are averaged in with all of the positive results, the overall average increase from all three exhibits is 22 percent.

A more logical approach would be to throw out the negative results and the unusually large 133 percent result in Exhibit B and this produces an overall improvement in mileage of 26 percent.

It should be emphasized that these results were obtained while the vehicles were being used by the individuals in the normal way that he or she would drive: driving to work, driving out on the highway, stopping, starting, and in some cases on long trips, and thus is perhaps a fair representation of the kind of mileage increase that would be obtained with this device under normal rather than extreme test conditions.

Referring to Exhibit D, you will note that the emission test results for both hydrocarbons and carbon monoxide as tested by AP Parts Company, which is one of the independent laboratories recognized by the EPA as capable of performing emission tests on motor vehicles was well within tolerances so that it can be concluded that the addition of the Jacona Fuel

Systems to a motor vehicle does not result in any increase in objectionable emissions.

Exhibit E is a listing of independent laboratories recognized by EPA as capable of performing emission tests on motor vehicles.

In view of the data submitted, it is believed that it would be in the public interest for your office to recognize the value of the Jacona Fuel System and its attendant improvement in gasoline mileage.

Very truly yours,

John L. Gray

JLG/kk
Encs.

July 31, 1981

Mr. John L. Gray
Emens, Hurd, Kegler, and Ritter
250 East Broad Street
Columbus, OH 43215

Dear Mr. Gray:

This is in response to your letter dated July 27, 1981, dealing with the Jacona Fuel System, invented by Mr. Jack R. Dodrill. I have reviewed the information that you attached.

The last paragraph of your letter suggests that EPA "recognize the value of the Jacona Fuel System and its attendant improvement in gasoline mileage". The mechanism for doing such a thing is the EPA device evaluation program under Section 511 of the Motor Vehicle Information and Cost Savings Act. My letter to Mr. Dodrill on July 23, 1981 outlined the policy and procedures to be followed in undertaking such a program and enclosed an application format. If Mr. Dodrill is interested in an EPA evaluation of the Jacona Fuel System, he should prepare an application in accordance with the guidelines of the application format. EPA will perform a preliminary evaluation of all the data and information submitted nd advise Mr. Dodrill if EPA testing of his device is justified, or if more data is needed from one of the independent laboratories recognized by EPA. During that preliminary analysis, we will address Mr. Dodrill's contention that the EPA test procedure is inadequate due to the unique characteristic of his device.

I am looking forward to receiving Mr. Dodrill's application. If there are questions concerning these comments, I can be reached on (313) 669-4299.

Sincerely,

Merrill W. Korth, Device Evaluation Coordinator
Test and Evaluation Branch

October 20, 1981

Mr. John L. Gray
Emens, Hurel, Kegler & Retter
250 East Broad Street
Columbus, OH 43215

Dear Mr. Gray:

We received your letter of October 6, 1981 in which you applied for an EPA evaluation of the "Jacona Fuel Systems", a fuel economy retrofit device. Our Engineering Evaluation Group has made a preliminary review of your application and has identified several areas that require additional clarification prior to further processing of your application. Our comments below address the individual sections of your application.

1. Section No. 3 - Please provide a copy of the patent application.

2. Section No. 8(B) of the application states the device heats fuel "utilizing waste heat from the engine, to a critical temperature." However, the drawing of the device, its description, or the installation instructions do not include any use of "waste heat". The fuel appears to be heated by electrical heating elements. Please clarify what is meant by waste heat and how it is used? What is the critical temperatures and why is it critical?

3. Section No. 8(B) states "Objectionable emissions have been kept below EPA maximums." Exactly what is meant by this statement (were emissions lowered, unchanged or raised but not over statutory limits)? Were these measured by the Federal Test Procedure (FTP)? Are there any emission test results besides those provided with the application?

4. Section No. 8(C), description of the device. What is the temperature set point of the thermostatic control? Please describe the control in greater detail. What is the heating capacity of the electric heating element? How much is the temperature of the fuel raised? Please provide representative fuel inlet and outlet temperatures for representative ambient conditions while the vehicle is operating.

5. Section No. 10 gives a simplified overview of the device installation procedures. Do you provide more detailed installation instructions? If so, please provide them. Is there an installation kit (hoses, fittings, wiring, etc.) which accompanies the device? If so, please describe.

6. Section No. 11 states "The operation of the device is entirely automatic and there are no instructions needed for its use." Are there any possible starting problems due to the electrical requirements of the heating element, especially when starting the vehicle at sub-freezing temperatures?

7. Section No. 14 states "The unit has a temperature sensor at the carburetor and at the unit . . ." This is the only mention of a carburetor temperature sensor, it does not appear to be described elsewhere. Please provide a detailed description of it, its function, and mode of operation.

8. Section No. 15 provides the duplicate FTP test results on one vehicle only. As identified in your application, the results are:

	Federal Test Procedure			
	HC	CO	NOx	FE
Baseline #1	.54 g/mi	5.49 g/mi	1.97 g/mi	10.1 mi/gal
Baseline #2	.47	6.62	1.90	10.7
with Jacona #1	.47	4.77	1.67	10.3
with Jacona #2	.42	4.96	1.53	9.9

The fuel economy results were calculated from the emission values using the carbon balance technique.

As you are aware from our previous meeting and correspondence, EPA requires duplicate tests (FTP or hot start FTP plus HFET) before and after device installation on a minimum of two vehicles. Also, the data you submitted do not indicate a fuel economy improvement due to the device. Before we will undertake testing at our laboratory, we must have test results which show the potential for benefit. The guidelines for this improvement were stated in a previous letter to you.

9. Exhibit C states" . . . a cold start at 72°F which limits the effectiveness of the Jacona Fuel System since at elevated temperatures (ambient temperatures about 80°F), the Jacona Fuel System will only operate effectively if the vehicle is operating at highway speeds." Please elaborate on this in greater detail. Also, why is it necessary to insulate the device from higher underhood temperatures?

10. Exhibit C states ". . . for normal driving with a start up at ambient temperatures . . ." What is normal driving? What ambient temperatures/temperature range are these ambient temperatures?

Due to the need for clarification of details of the Jacona Fuel System, we are presently unable to address Mr. Dodrill's contention that the EPA test procedure is inadequate due to the unique characteristics of his device. On the other hand, we are prepared to assist you in developing a

test plan which will allow you do conduct appropriate testing at an independent laboratory.

Submittal of the information requested above will be necessary to further process your evaluation. In order for us to process Section 511 applications efficiently, we have established a schedule for each. I ask that you respond to this letter by November 6. If you have any questions or require further information, please contact me.

Sincerely,

Merrill W. Korth
Device Evaluation Coordinator
Test and Evaluation Branch

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ANN ARBOR, MICHIGAN 48105

January 13, 1982

OFFICE OF
AIR AND WASTE MANAGEMENT

Mr. John L. Gray
Emens, Hurel, Kegler, and Ritter
250 East Broad Street
Columbus, OH 43215

Dear Mr. Gray:

In a letter dated October 20, I asked for additional information on your application for an EPA evaluation of the "JACONA FUEL SYSTEM". Your response was due on November 6, but we have not yet received it. Several subsequent phone calls have also failed to produce a satisfactory response. As I noted in my letter, we still require this information prior to further processing of your application. Please provide the requested information immediately.

The Environmental Protection Agency is obligated to expeditously process your application. However, the information you previously submitted does not adequately describe your device and includes only limited test data following the proper EPA test procedures. Therefore, we presently have insufficient technical information to adequately evaluate your claims for the device.

Unless I receive a satisfactory response by February 9, 1982, we will complete the evaluation of your device using the information that is currently available.

Again, I welcome the opportunity to answer your questions and to work with you in designing a test plan to test your device at an independent laboratory. However, I will need the requested information to efficently assist you.

Please contact me immediately if you do not understand this course of action.

Sincerely,

Merrill W. Korth
Device Evaluation Coordinator
Test and Evaluation Branch

cc: Jack R. Dodrill
1510 Londondale Parkway
Newark, OH, 43055