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(12) **United States Patent**  
**Engelgau**

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(54) **ADJUSTABLE PEDAL ASSEMBLY WITH ELECTRONIC THROTTLE CONTROL**

5,056,742 10/1991 Sakurai ..... 244/235

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(57) **ABSTRACT**

(\* ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

A vehicle control pedal apparatus (12) includes a support (18) adapted to be mounted to a vehicle structure (20) and an adjustable pedal assembly (22) having a pedal arm (14) that is moveable in fore and aft directions with respect to the support (18). A pivot (24) pivotally supports the adjustable pedal assembly (22) with respect to the support (18) and defines a pivot axis (26). The control pedal apparatus (12) further includes an electronic throttle control (28) attached to the support (18) for controlling an engine throttle (30). The apparatus (12) is characterized by the electronic throttle control (28) being responsive to the pivot (24) for providing a signal (32) that corresponds to pedal arm position as the pedal arm (14) pivots about the pivot axis (26) between rest and applied positions. Thus, the control pedal apparatus (12) can adjust pedal arm position in fore and aft directions without having to move the electronic throttle control unit (28) along with the pedal arm (14). Additionally, the electronic throttle control (28) is responsive to the pivot (24) about which the adjustable pedal assembly (22) rotates.

(21) Appl. No.: **09/643,422**

(22) Filed: **Aug. 22, 2000**

**Related U.S. Application Data**

(63) Continuation of application No. 09/236,975, filed on Jan. 26, 1999, now Pat. No. 6,109,241.

(51) **Int. Cl.**<sup>7</sup> ..... **F02D 1/00**

(52) **U.S. Cl.** ..... **123/399; 74/560**

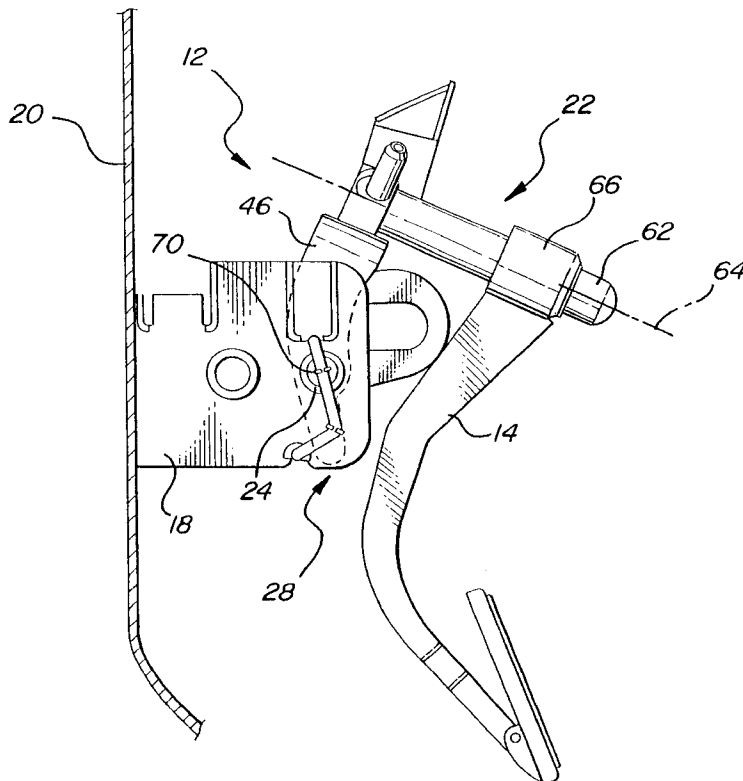
(58) **Field of Search** ..... **123/399; 74/560**

(56) **References Cited**

**U.S. PATENT DOCUMENTS**

4,470,570 9/1984 Sakurai et al. .... 244/235

**4 Claims, 4 Drawing Sheets**



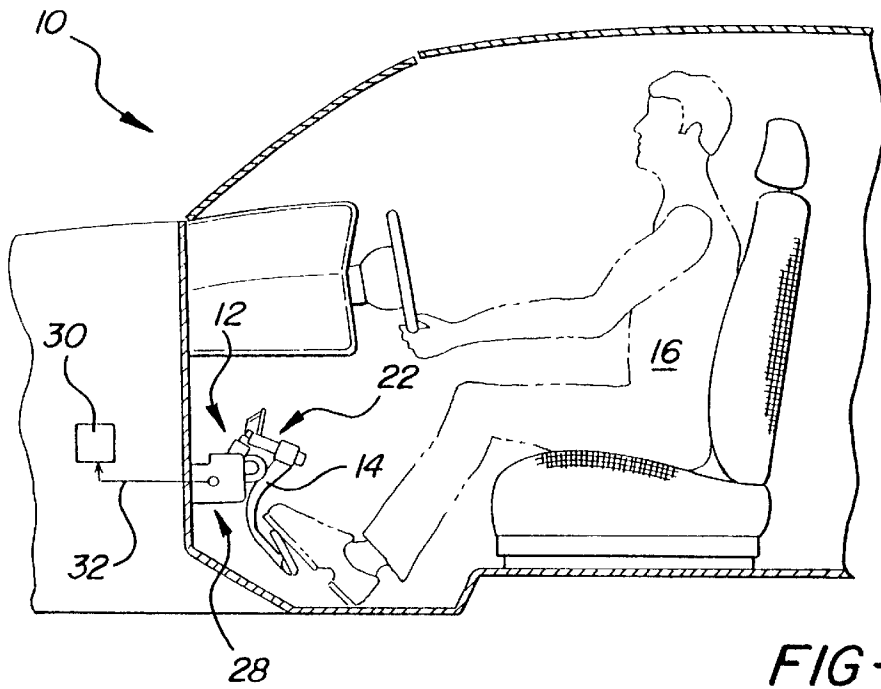


FIG-1

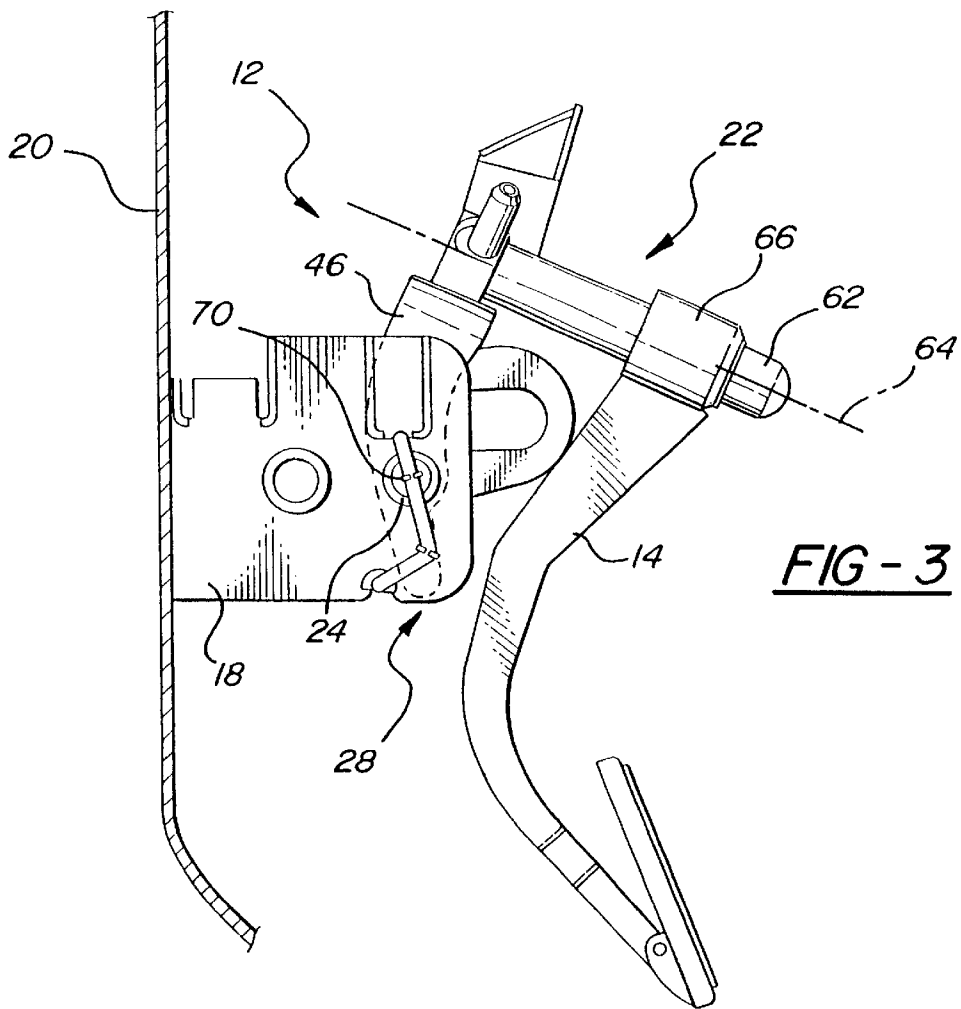


FIG-3



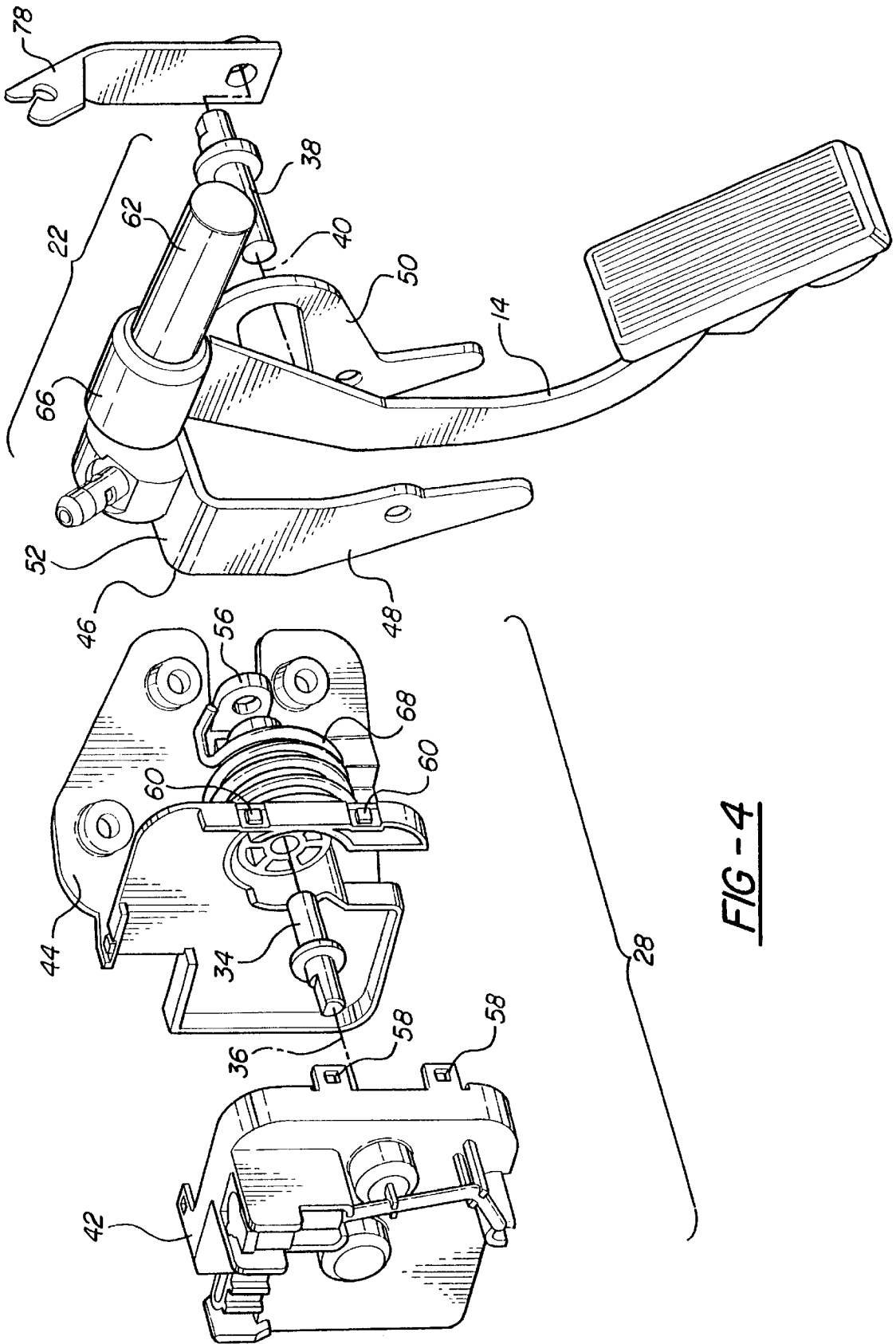


FIG - 4

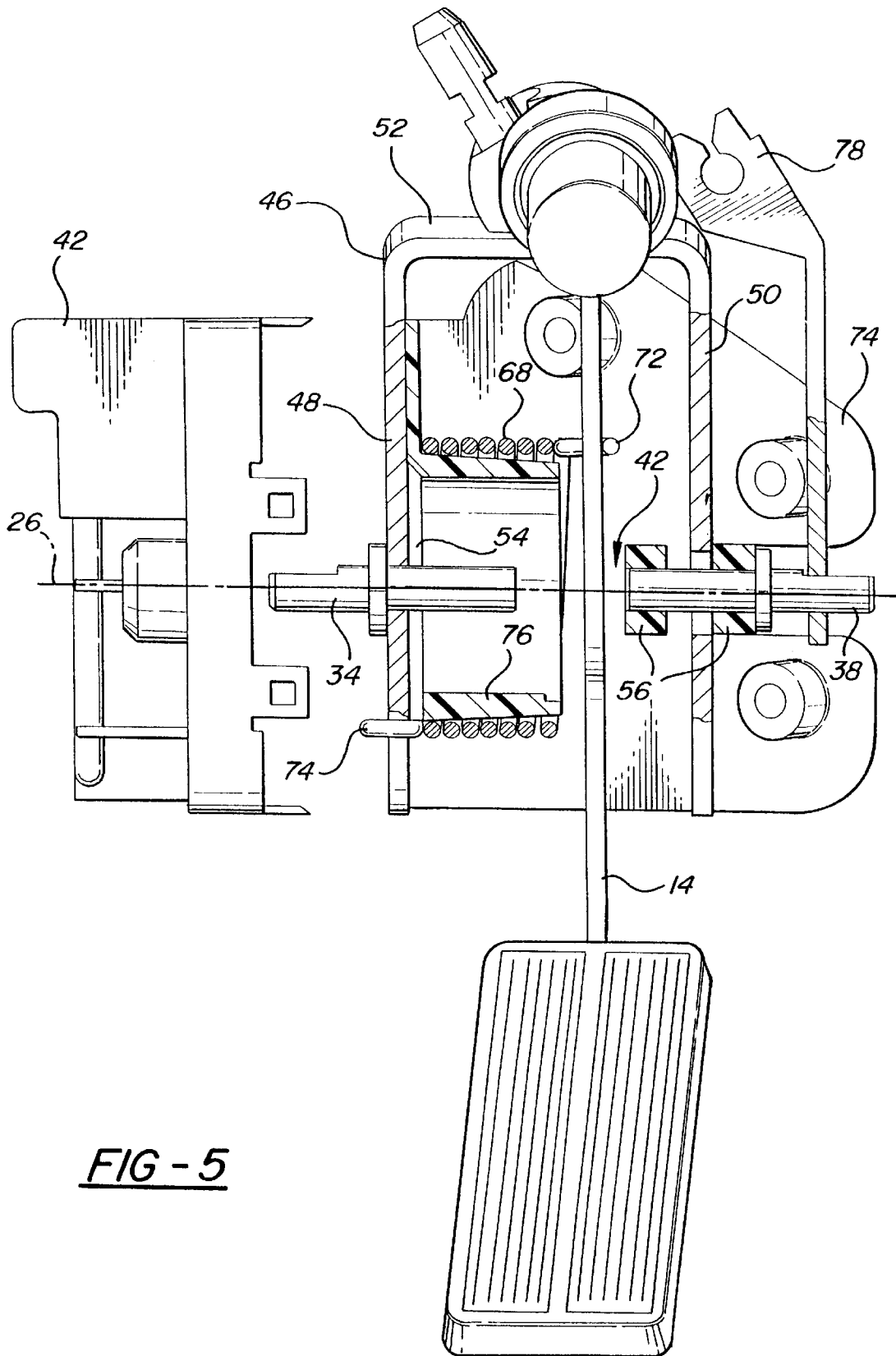


FIG - 5

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## ADJUSTABLE PEDAL ASSEMBLY WITH ELECTRONIC THROTTLE CONTROL

### RELATED APPLICATION

This application is a continuation of application Ser. No. 09/236,975, filed Jan. 26, 1999, U.S. Pat. No. 6,109,241.

### TECHNICALLY FIELD

The subject invention relates to vehicle control pedal assembly having an adjustment mechanism for moving a pedal arm in fore and aft directions and an electronic throttle control for controlling an engine throttle. Specifically, the pedal assembly includes a pivot about which the adjustment mechanism rotates when the pedal arm is actuated and which provides input to the electronic throttle control for providing a signal that corresponds to pedal arm position.

### BACKGROUND OF THE INVENTION

Pedal assemblies are used in vehicles to control the movement of the vehicle. For example, a vehicle driver applies a force to an accelerator pedal to move the pedal from a rest position to an applied position. In the applied position, the accelerator pedal typically actuates an engine throttle, which controls the acceleration and speed of the vehicle. Often these pedal assemblies include an adjustment apparatus that allows the position of a pedal arm and/or a pedal pad to be moved with respect to the driver. This allows the pedal assembly to accommodate drivers of various heights. Thus, the adjustment apparatus allows the pedal assembly to be moved closer to the driver when the driver is short and allows the pedal assembly to be moved further away from the driver when the driver is tall. Examples, of adjustable pedal assemblies are shown in U.S. Pat. Nos. 5,460,061 and 5,632,183 all assigned to the assignee of the subject invention.

Additionally, adjustable pedal assemblies can include an electronic throttle control assembly for a drive-by-wire system. The electronic throttle control assembly is used to generate an electrical signal that corresponds to the position of the accelerator pedal. The electronic throttle control assembly replaces traditional mechanical linkages between the pedal arm and the engine throttle. One such adjustment apparatus used with an electronic throttle control is shown in U.S. Pat. No. 5,819,593 assigned to the assignee of the present invention.

When a vehicle control pedal assembly includes both an adjustment apparatus and an electronic throttle control, the pedal assembly can be complex with a great number of parts. These control pedal assemblies can be expensive, time consuming to assemble, and require a significant amount of packaging space.

### SUMMARY OF THE INVENTION AND ADVANTAGES

A vehicle control pedal apparatus includes a support adapted to be mounted to a vehicle structure and an adjustable pedal assembly with a pedal arm that is moveable in fore and aft directions with respect to the support. A pivot pivotally supports the adjustable pedal assembly with respect to the support and defines a pivot axis. The control pedal apparatus further includes an electronic throttle control attached to the support for controlling an engine throttle. The apparatus is characterized by the electronic throttle control being responsive to the pivot for providing a signal corresponding to pedal arm position as the pedal arm pivots

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about the pivot axis between rest and applied positions. Accordingly, the subject invention provides a simplified vehicle control pedal assembly that is less expensive, and which uses fewer parts and is easier to package within the vehicle.

### BRIEF DESCRIPTION OF THE DRAWINGS

Other advantages of the present invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

FIG. 1 is a side view of a vehicle, partially in cross-section, including the subject pedal assembly,

FIG. 2 is a side view of the subject pedal assembly showing a pedal arm in fore and aft positions;

FIG. 3 is a side view of the subject pedal assembly in a pivoted position;

FIG. 4 is an exploded view of the pedal assembly shown in FIG. 3; and

FIG. 5 is a front view, partially in cross-section, of the pedal assembly shown in FIG. 3.

### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the Figures, wherein like numerals indicate like or corresponding parts throughout the several views, a vehicle **10** with a control pedal apparatus **12** is shown in FIG. 1. The control pedal apparatus **12** includes a pedal arm **14** that can be adjusted in fore and aft directions with respect to the vehicle **10** by a driver **16**. This adjustment capability allows the pedal arm **14** to be positioned to accommodate drivers **16** of various heights.

The vehicle control pedal apparatus **12** includes a support **18** adapted to be mounted to a vehicle structure **20** such as a firewall or dash member, for example. The support **18** can be a bracket, housing, or other structural support member known in the art. The support **18** can be a unitary member that is attached directly to the vehicle structure **20** or the support **18** can be comprised of a plurality of support members, one of which is attached to the vehicle structure **20**.

As shown in FIGS. 2 and 3, the control pedal apparatus **12** further includes an adjustable pedal assembly **22** with a pedal arm **14** that is moveable in fore and aft directions with respect to the support **18**. In FIG. 2, the pedal arm **14** is shown in the furthest adjustment position in the fore direction in solid lines and in the furthest adjustment position in the aft direction in dashed lines. The adjustable pedal assembly **22** preferably includes an electric motor (not shown) for controlling the movement of the pedal arm **14** in the fore and aft directions, as is well known in the art. The adjustable pedal assembly **22** can be any of various adjustable pedal assemblies known in the art. For example, the adjustable pedal assembly **22** could be similar to the adjustable pedal assembly in U.S. Pat. No. 5,632,183 assigned to the assignee of the present invention and incorporated herein by reference.

A pivot **24** pivotally supports the adjustable pedal assembly **22** with respect to the vehicle structure **20** and defines a pivot axis **26** (shown in FIG. 5). The pivot **24** is preferably comprised of a first pivot member **34** defining a first pivot member axis **36** and a second pivot member **38** defining a second pivot member axis **40**. The first **36** and second **40** pivot member axes are collinear to define the pivot axis **26**.

While two pivot members **34, 38** are preferred a single pivot could be used or additional pivot members could be used to provide additional pivotal support.

The first **34** and second **38** pivot members are longitudinally spaced apart from one another to define a clearance space **42** for the pedal arm **14** as the pedal arm **14** pivots about the pivot axis **26**. Thus, when the pedal arm **14** is moved from a rest position to an applied position, as shown in FIG. 3, the pedal arm **14** can move between the first **34** and second **38** pivot members without coming into contact with the pivot members **34, 38**. If only a single pivot member is used, the clearance space **42** between pivot members is not needed.

The control pedal apparatus **12** also includes an electronic throttle control mechanism **28** attached to the vehicle structure **20** for controlling an engine throttle **30** shown schematically in FIG. 1. The electronic throttle control **28** is responsive to the pivot **24** and provides a signal **32** that corresponds to pedal arm position as the pedal arm **14** pivots about the pivot axis **26** between rest and applied positions. Thus, the signal **32** will vary as the pedal arm **14** moves from the rest position to the applied position. The electronic throttle control mechanism **28** can be any of various electronic throttle control mechanisms known in the art, as the one described in U.S. Pat. No. 5,819,593 assigned to the assignee of the present invention and incorporated herein by reference.

The electronic throttle control **28** is preferably responsive to the first pivot member **34** to provide the signal **32** that corresponds to pedal arm position. The second pivot member **38** preferably provides pivotal balance for the pedal arm **14** as the pedal arm **14** pivots about the pivot axis **26**. It should be understood however that the electronic throttle control **28** could also be mounted on the opposite side of the control pedal assembly **12** such that the second pivot member **38** provides input to produce the signal **32** while the first pivot member **34** provides additional balance for the pedal arm **14** as it pivots.

The electronic throttle control mechanism **28** preferably includes a first housing portion **42** and a second housing portion **44**, shown in FIG. 4. In the preferred embodiment the housing portions **42, 44** partially serve as the support **18** for the control pedal apparatus **12** and are fixed relative to the vehicle structure **20**. The adjustable pedal assembly **22** is supported on a bracket **46** that is mounted to the housing portions **42, 44**. The second housing portion **44** includes a first pivotal support **54** and a second pivotal support **56**. The first pivotal support **54** receives the first pivot member **34** and the second pivotal support **56** receives the second pivot member **38**. As discussed above, the first **34** and second **38** pivot members form the pivot **24** about which the pedal arm **14** pivots.

The bracket **46** includes a first leg **48** and a second leg **50** that extend downwardly from a central base member **52**. While the bracket **46** is shown with two legs **48, 50**, the bracket **46** could also be configured to have only a single leg or could have additional leg members. The bracket **46** need only provide partial support for the adjustable pedal assembly **22**.

The bracket **46** is partially installed within the second housing member **44** such that the first pivotal support **54** is adjacent to the first leg **48** and the second pivotal support **56** is adjacent to the second leg **50**. The first housing portion **42** is attached to the second housing portion near the first pivotal support **54** to enclose the electronic throttle control **28**. The first housing portion **42** preferably includes tab

receivers **58** for snap fit attachment to tabs **60** located on the second housing portion **44**.

The bracket **46** pivots about the pivot axis **26** when a force is applied to the pedal arm **14** to move the pedal arm **14** from the rest to the applied position. The electronic throttle control **28** is fixed with respect to the vehicle structure **20** such that the pedal arm **14** moves in fore and aft directions with respect to the electronic throttle control **28** and with respect to the vehicle structure **20**. Thus, the adjustable pedal assembly **22** pivots with respect to the vehicle structure **20** and moves the pedal arm **14** in fore and aft directions with respect to the vehicle structure **20**, while the electronic throttle control **28** remains fixed with respect to the vehicle structure **20**. In other words, the pedal arm **14** moves independently from the electronic throttle control **28**. Additionally, the pedal arm **14** moves in fore and aft directions with respect to the pivot **24**.

The adjustable pedal assembly **22** includes a guide rod **62** for supporting the pedal arm **14** and which defines a longitudinal axis **64**. The pedal arm **14** moves in the fore and aft directions along the longitudinal axis **64**. The longitudinal axis **64** is perpendicular to the pivot axis **26**. Thus, the guide rod **62** is rotatable about the pivot axis **26** along with the bracket **46** when the pedal arm **14** pivots about the pivot axis **26**.

The adjustable pedal assembly **22** further includes a bearing member **66** for slidably supporting the pedal arm **14** on the guide rod **62**. The bearing member **66** is preferably a bushing, however, other bearing members well known in the art can be used. In the preferred embodiment, an electric motor is used to drive a screw drive mechanism housed within the guide rod **62**, which causes the bearing member **66** and the pedal arm **14** to move along the guide rod **62**.

The control pedal apparatus **12** also includes a resilient member **68**, shown in FIG. 5, which reacts between the pedal arm **14** and the bracket **46** for providing resistance as the pedal arm **14** is moved from the rest position to the applied position. This resistance provides a "feel" **16** as the pedal arm **14** pivots that corresponds to the feel that a driver experiences in pedal assembly having a cable assembly as part of a mechanical link to the engine throttle **30**. The resilient member **68** is preferably a coil spring with a spring center **70** that is concentric with the pivot **24**. The spring **68** has a first spring end **72** engaging the pedal arm **14** and a second spring end **74** engaging the bracket **46**. In addition to providing resistance as the pedal arm **14** is moved to the applied position, the spring **68** returns the pedal arm **14** to the rest position after a force applied to the pedal arm **14** has been removed.

The spring **68** is supported by a cylindrical portion **76** that extends inwardly from the second housing portion **44** of the electronic throttle control **28**, toward the pedal arm **14**. Thus, the cylindrical portion **76** is located between the pedal arm **14** and the first leg **48** of the bracket **46**.

While the spring **68** is shown as a coil spring that is supported about pivot **24**, other spring configurations known in the art could also be used. Also, the spring **68** could be located at a position other than about pivot **24**. The main function of the spring **68** is to act upon the pedal arm **14** to provide a feel to the driver as the pedal arm **14** pivots.

A cable attachment member **78** can optionally be supported on one of the pivot members **34, 38** to support a cable assembly for attachment to the engine throttle **30**. This configuration would be used in place of the electronic throttle control **28**; i.e., the configuration is used with a pedal assembly having a mechanical link to the throttle.

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The control pedal apparatus 12 of the subject invention provides both an adjustment apparatus 22 and an electronic throttle control 28 in an assembly that requires less packaging space and which requires fewer components than prior art control pedals. This reduces overall assembly time and reduces material costs. The control pedal apparatus 12 provides the additional benefits of having a single pivot (24) to pivotally support the pedal arm 14 in addition to providing input to the electronic throttle control 28. Thus, the control pedal apparatus 12 allows adjustment of the pedal arm 14 in fore and aft directions without having to move the electronic throttle control unit 28 along with the pedal arm 14, and the electronic throttle control 28 is responsive to the pivot 24 about which the adjustable pedal assembly 22 rotates.

The invention has been described in an illustrative manner, and it is to be understood that the terminology which has been used is intended to be in the nature of words of description rather than of limitation.

Obviously, many modifications and variations of the present invention are possible in light of the above teachings. It is, therefore, to be understood that within the scope of the appended claims, wherein reference numerals are merely for convenience and are not to be in any way limiting, the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. An adjustable pedal assembly for a vehicle comprising; a support (18) for mounting to a vehicle structure; an adjustable pedal assembly (22) having a guide member (62) rotatably supported by said support (18) for pivotal movement about a pivot axis (26); and a pedal arm (14) supported on said guide member (62) for rectilinear movement in fore and aft directions relative to said support (18), said guide member (62) and said pivot axis (26) between various adjusted positions; an electronic control (28) supported on said support (18) and responsive to pivotal movement of said pedal arm (14) and said guide member (62) about said pivot axis (26),

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said electronic control (28) being fixed relative to said support (18) such that said pedal arm (14) moves in fore and aft directions with respect to said electronic control (28), said electronic control (28) being responsive to pivotal movement of said guide member (62) about said pivot axis (26) for providing a signal (32) that corresponds to pedal arm (14) position as said pedal arm (14) pivots said guide member (62) about said pivot axis (26).

2. An assembly as set forth in claim 1 wherein said pedal arm (14) is in sliding engagement with said guide member (62) and extends from said guide member (62) to lower pad end.

3. An assembly as set forth in claim 2 including a drive for moving said pedal arm (14) along said guide member (62).

4. A vehicle control pedal apparatus (12) comprising: a support (18) adapted to be mounted to a vehicle structure (20);

an adjustable pedal assembly (22) having a pedal arm (14) moveable in fore and aft directions with respect to said support (18);

a pivot (24) for pivotally supporting said adjustable pedal assembly (22) with respect to said support (18) and defining a pivot axis (26); and

an electronic control (28) attached to said support (18) for controlling a vehicle system;

said apparatus (12) characterized by said electronic control (28) being responsive to said pivot (24) for providing a signal (32) that corresponds to pedal arm position as said pedal arm (14) pivots about said pivot axis (26) between rest and applied positions wherein the position of said pivot (24) remains constant while said pedal arm (14) moves in fore and aft directions with respect to said pivot (24).

\* \* \* \* \*



UNITED STATES PATENT AND TRADEMARK OFFICE  
**CERTIFICATE OF CORRECTION**

PATENT NO. : 6,237,565 B1  
DATED : May 29, 2001  
INVENTOR(S) : Steven J. Engelgau

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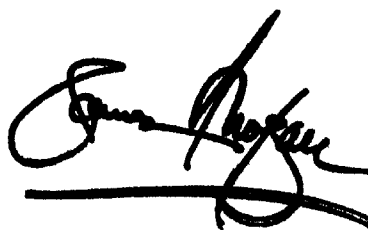
It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 6,

Line 21, please change "force" to -- fore --.

Signed and Sealed this

Fourth Day of February, 2003

A handwritten signature in black ink, appearing to read "James E. Rogan", written over a horizontal line.

JAMES E. ROGAN  
*Director of the United States Patent and Trademark Office*