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NOTICE OF ENTITLEMENT

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I (~~was~~) Edmond B. Cicotte
~~authorised by~~
 of 11086 Hedgeway, Utica, Michigan 48317 United States of America
 the applicant in respect of an application for a patent for an invention entitled
 Adjustable Automobile Pedal System
 filed under Australian Application No. 27700/92, state the following:

PART 1 - Must be completed for all applications.

The person(s) nominated for the grant of the patent

☒ is (~~are~~) the actual inventor(s)

or

☐ has, for the following reasons, gained entitlement from the actual inventor(s)

PART 2 - Must be completed if the application is a Convention application.

The person(s) nominated for the grant of the patent is (are):

☐ the applicant(s) of the basic application(s) listed on the patent request form

or

☐ entitled to rely on the basic application(s) listed on the patent request form by reason of the following:

The basic application(s) listed on the request form is (are) the first application(s) made in a Convention country in respect of the invention.

PART 3 - Must be completed if the application was made under the PCT and claims priority.

The person(s) nominated for the grant of the patent is (~~are~~):

☒ the applicant(s) of the application(s) listed in the declaration under Article 8 of the PCT

or

☐ entitled to rely on the application(s) listed in the declaration under Article 8 of the PCT by reason of the following:

The basic application(s) listed in the declaration made under Article 8 of the PCT is (~~are~~) the first application(s) made in a Convention country in respect of the invention.

Dated this 1st day of February 1994

Signed Edmond B. Cicotte Status

Signatory's Name



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- (56) Prior Art Documents
US 5010982
US 4989474
US 4875385
- (57) Claim

1. An adjustment device for adjusting a pedal arm adapted to rotate about an axis of arm rotation, said adjustment device comprising:

camming means rotatably mounted juxtaposed said pedal arm for rotating said pedal arm about said axis of arm rotation, said camming means having an axis of cam rotation;

means for locating said axis of cam rotation a predetermined distance from said axis of arm rotation, said locating means having one end pivotably mounted substantially concentric with said axis of arm rotation such that rotation of said camming means rotates said pedal arm about said axis of arm rotation; and

drive means juxtaposed said camming means, said drive means having a projecting portion engaging said camming means for driving said camming means about said axis of cam rotation;

whereby rotation of said camming means about said axis of cam rotation causes said pedal arm to be rotatively displaced about said axis of arm rotation.

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10. A method for adjusting an automobile pedal arm adapted to rotate about an axis of arm rotation, said method comprising the steps of:

positioning camming means, having an axis of cam rotation, juxtaposed said automobile pedal arm;

positioning said axis of cam rotation a predetermined distance from said axis of arm rotation; and

rotating said camming means about said axis of cam rotation such that said automobile pedal arm is rotatively displaced relative to said axis of arm rotation.

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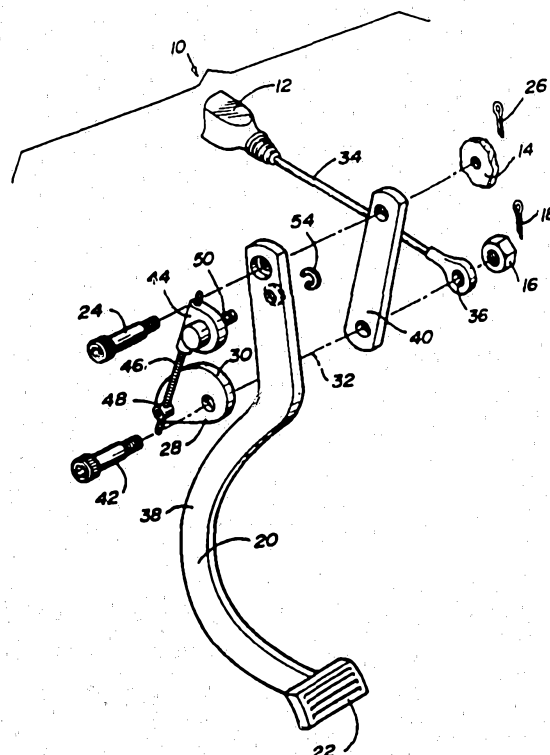
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(54) Title: ADJUSTABLE AUTOMOBILE PEDAL SYSTEM

(57) Abstract

An adjustment device for an automobile control pedal (10) which is capable of pivotably adjusting the control pedal (10) relative to a datum point, such as the eyelet (36) of a cylinder pushrod (34). The adjustment device allows the control pedal (10) to be optimally positioned to suit the needs of a particular driver. The control pedal (10) can be pivotally attached to a frame (14) in any conventional manner, such as with a pivot pin (24). The adjustment device is mounted alongside the control pedal (10) and to the pushrod eyelet (36) without the need of additional support hardware other than a means for maintaining a predetermined distance between the pushrod eyelet (36) and the pivot pin (24) of the control pedal (10). Consequently, the adjustment device can be readily adapted to fit conventional control pedal assemblies without significant modification. The adjustment device includes a camming device (28) which slidably abuts the pedal arm (20) such that rotation of the camming device (28) causes pivotable movement of the pedal arm (20) relative to the datum point. The camming device (28) preferably has its axis of rotation coincident with the datum point and is maintained a predetermined distance from the pivot of the control pedal arm (20) by a spacing device, such as a link (40). The adjustment device also includes a cam driving device (44) for rotating the camming device (28) about its axis of rotation to produce a corresponding displacement of the control pedal arm (20).



ADJUSTABLE AUTOMOBILE PEDAL SYSTEMBACKGROUND OF THE INVENTION1. FIELD OF THE INVENTION

5 The present invention generally relates to automobile control pedals, such as brake, clutch and accelerator pedals. More specifically, this invention relates to an adjustable automobile control pedal system whose pedals can be selectively adjusted to allow optimal positioning of the pedals relative to the driver of the automobile.

10 2. DESCRIPTION OF THE PRIOR ART

Automobiles are conventionally provided with foot-operated control pedals, such as an accelerator, brake and clutch pedal, which are used to control the motion and speed of the automobile. Typically, these control pedals are permanently
15 fixed to the vehicle chassis and rotate away from the driver when foot pressure is applied, and are not adjustable relative to the driver or their respective attachment points. Consequently, the control pedals must generally be attached so as to be positioned relative to the floor of the passenger compartment to afford
20 operation which is adequately comfortable for the "average" driver. However, some adjustment of the driver relative to the control pedals is clearly desirable.

Though the driver's seat is usually mounted so as to be slidable in a fore and aft direction to accommodate drivers of
25 different physiques, such an arrangement is only partially effective in positioning the driver relative to the control pedals. Seat adjustment allows the driver to position himself or herself relative to the automobile's steering wheel and the control pedals, to some degree improving the driver's comfort and
30 facilitating the driver's ability to operate the vehicle's primary controls. However, it is nearly impossible for such a solution to accommodate all possible variations in the human frame. In particular, proportional differences between the lengths of a driver's arms, legs and feet in relation to the driver's overall
35 physique cannot be readily accommodated by merely adjusting the

seat fore and aft with respect to the control pedals.

Accordingly, it has been recognized that some form of control pedal adjustment is desirable to provide optimal comfort to the driver while also ensuring that the driver can fully operate the control pedals at all times.

Many approaches to providing adjustable control pedals have been suggested in the prior art. One approach is to provide some form of ratchet device which allows the entire control pedal assembly to rotate about a primary pivot point. This approach rotates a frame to which the control pedals are each rotatably attached, thus providing rotation of the control pedals in unison relative to the driver. Examples of this approach are illustrated in U.S. Patent Nos. 3,282,125 to Dully; 3,400,607 to Smith; and 3,563,111 to Zeigler. A similar approach is to mount one or more control pedals to a frame which is slidable fore and aft as a unit relative to the driver, as illustrated in U.S. Patent Nos. 2,860,720 to Huff et al and 4,683,977 to Salmon, and British Patent No. 952,831 to Mussell. Yet another suggested approach is a variation on the two previously mentioned, employing a screw-actuated device to displace a frame to which one or more control pedals are rotatably mounted. The screw-actuated device can be used to either rotate the entire frame about a pivot point, as shown in U.S. Patent Nos. 3,151,499 to Roe, or the screw-actuated device can displace the frame fore and aft, as illustrated by U.S. Patent Nos. 3,301,088 to White; 3,643,525 to Gibas; 3,765,264 to Bruhn, Jr.; 4,870,871 to Ivan; 4,875,385 to Sitrin; and 4,989,474 to Cicotte et al. Typically, the screw-actuated device is disclosed to be driven by an eccentric motor which allows the control pedals to be selectively adjusted by the driver from an appropriate control switch mounted on the dashboard of the vehicle within the driver's reach.

As can be readily appreciated by those skilled in the art, the examples all require substantial hardware and space beneath the automobile's instrument panel to accommodate the device providing the adjustment feature. Much of the necessary

additional hardware can be attributed to the need to avoid effecting the operation of the brake and/or clutch pedals, during adjust, with their respective hydraulic cylinders.

Specifically, the approach chosen must avoid causing the pushrods which actuate the respective cylinder pistons to be displaced relative to their cylinders so as to ensure non-engagement of the brakes and/or the clutch.

In addition, it is generally preferable that the approach chosen have no affect on the mechanical advantage of the control pedal as determined by the control pedal's orientation relative to the pushrod. Generally, the mechanical advantage of a control pedal can be described as the relative effort required to apply the control pedal as compared to the actual force required to actuate the device controlled by the control pedal. For instance, mechanical advantage can be improved by moving the contact point between the control pedal and the cylinder's pushrod toward the pivot point of the control pedal.

To avoid changing the mechanical advantage, the adjustable control pedal assemblies of the prior art generally teach a device in which the control pedals are independently adjusted so as to produce no adverse effect with respect to repositioning of the pedal pivot point relative to the pushrods of the respective operating cylinders, as can be seen with the teachings of Cicotte et al. Alternatively, the adjustment device must be provided with a mechanism which simultaneously adjusts the length of the pushrod to accommodate the displacement of the control pedal assembly, as seen with the teachings of Bruhn, Jr.

Though regarding an unrelated and non-analogous problem associated with optimizing the mechanical advantage of a control pedal, U.S. Patent No. 3,798,995 to Schroter teaches the use of a variable-ratio control pedal utilizing a camming contour for amplifying the mechanical advantage of the control pedal in the latter stages of the control pedal stroke. The intent with such a device is to maximize the driver's braking capability without the need for excessive forces applied to the control pedal. However,

the teachings of Schroter are directed entirely toward achieving an optimal mechanical advantage and do not provide any adjustment of the control pedals with respect to the driver. Further, Schroter does not teach or suggest a solution to the problem of
5 adjusting the positions of the control pedals, nor does Schroter even recognize the problem to which the above prior art is directed.

From the above discussion, it can be readily appreciated that the prior art does not disclose an automobile control pedal
10 arrangement which can be adjusted to adapt to the particular physiological requirements of a driver, while simultaneously avoiding the requirement of mounting the entire control pedal assembly to a frame which is either pivotable or displaceable relative to the driver. Nor does the prior art teach or suggest
15 an apparatus which entails minimal additional hardware to achieve suitable adjustment of one or more control pedals to the effect that no repositioning of the prior art pivot point locations is required and, therefore, no significant structural changes need be made to a conventional control pedal arrangement.

Accordingly, what is needed is a cost-efficient
20 adjustment device for adjusting one or more automobile control pedals, the adjustment device being capable of spatially adjusting the control pedals without repositioning the pivot attachment of the conventional control pedal arrangement to adapt to the
25 physiological demands of a driver, while simultaneously requiring minimal structural reinforcements and modifications to achieve the desired results.

SUMMARY OF THE INVENTION

According to the present invention there is provided an
30 adjustment device for one or more automobile control pedals. The adjustment device is capable of pivotably adjusting, utilizing the conventional pivot point position of the control pedal to adjust one or more control pedals independently or in unison relative to a predetermined datum point. The datum point is
35 preferably the pivot eyelet of the master cylinder pushrod for the

clutch and/or brake pedals due to the need to leave the operation of the clutch and brake master cylinders unaltered during adjustment of the respective control pedals. In that the accelerator pedal is typically pivotably mounted to the firewall and actuates a flexible cable by which the fuel system is operated, the datum point may be any suitable reference point which allows conventional operation of the accelerator pedal with respect to the flexible cable. Being adjustably pivotable in this manner, the control pedals can be optimally positioned to suit the needs of a particular driver.

Conventionally, each control pedal includes an arm which is pivotably attached to a frame member beneath the automobile's instrument panel by means of a pivot pin and bushing or the like. Where the control pedal is the brake or clutch pedal, the adjustment device of the present invention is mounted alongside the conventional control pedal arm and pivotally attached at the datum point, such as the eyelet of the cylinder pushrod, without the need of any additional support hardware other than a device for maintaining a predetermined distance between the eyelet of the pushrod and the pivot attachment of the control pedal arm. Consequently, the adjustment device can be readily adapted to fit conventional control pedal assemblies without significant modification.

The adjustment device includes a camming device, such as a disc-shaped cam having a predetermined camming contour. The automobile pedal arm slidably abuts the camming device such that rotation of the camming device about its datum point causes pivotable movement of the automobile pedal arm relative to the datum point. By example, where the control pedal is the brake pedal, the brake pedal arm is displaced relative to the brake master cylinder's pushrod eyelet by the camming device.

The camming device preferably has its axis of rotation coincident with the axis of the pushrod eyelet and substantially parallel to the control pedal arm's axis of rotation about its corresponding pivot. The axis of rotation of the camming device

is maintained a predetermined distance from the pivot of the control pedal arm by a spacing device, such as a link. By maintaining this predetermined distance, the axes of the camming device and the pushrod eyelet are properly maintained relative to the control pedal arm to maintain a preferred constant mechanical advantage for the control pedal arm.

The adjuster device also includes a cam driving device for rotating the camming device about its axis of rotation. When the driving device causes the camming device to rotate, the camming contour of the camming device produces a corresponding displacement of the control pedal arm relative to its datum point. Thus, the control pedal arm is rotated relative to its respective pushrod eyelet, and thereby can be selectively adjusted relative to the driver of the automobile. As noted above, the link prevents any change in the spatial positioning of the pushrod eyelet to the pivot of the control pedal arm, preventing any change in the mechanical advantage of the control pedal. Further, there is no change in the position of the pushrod relative to the pushrod's corresponding cylinder to produce a partial application of the device which the control pedal operates.

According to a preferred aspect of this invention, both the the camming device and one end of the link are mounted directly to the eyelet of the pushrod, while the opposite end of the link is mounted to the control pedal arm's pivot point so as to be alongside the control pedal arm. In additional, the cam driving device is pivotably mounted relative to the control pedal arm. With this construction and arrangement, minimal additional hardware is necessary to implement the adjustment device of the present invention on conventional automobile control pedal assemblies. Consequently, little additional space is required to fit the hardware associated with the adjustment device in the conventional mounting space of the vehicle.

In addition, no independent adjustment is necessary to maintain the position of the cylinder pushrod relative to its cylinder in that the adjustment device of the present invention

provides control pedal adjustment with respect to the cylinder pushrod and does not require any relocation or cause any movement of the cylinder pushrod itself. The cylinder pushrod provides a stationary datum point throughout the adjustment of the control pedal with mechanical contact between the camming device and the control pedal arm being maintained such that the control pedal is displaced with respect to the cylinder pushrod. Accordingly, the operation of the pushrod with its cylinder is not affected by the adjustment device of the present invention. Moreover, no change in the mechanical advantage of the control pedal arm results.

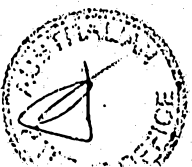
In addition, a significant advantage of the present invention is that the cam driving device can be electrically driven by a suitable motor to allow control pedal positioning with one or more controls made accessible on the automobiles instrument panel. With suitable control circuitry, several positions can be placed into a memory device such that a driver can preset an optimal control pedal position for his or her particular frame, allowing automatic recall of the memorized position.

~~Accordingly, it is an object of the present invention to provide an adjustment device for one or more automobile control pedals which is capable of optimally positioning the control pedals relative to the driver.~~

~~It is a further object of the invention that the adjustment device provide pivotable adjustment of the automobile control pedal relative to a predetermined datum, such as the pushrod eyelet of the hydraulic cylinder operated by the control pedal.~~

~~It is still a further object of the invention that the adjustment include a camming device which pivotably rotates the control pedal relative to the predetermined datum to achieve the desired adjustment.~~

~~It is another object of the invention that the camming device be positionally maintained relative to the control pedal arm during adjustment so as to maintain a preferred mechanical advantage.~~



Accordingly, in one aspect the present invention consists in an adjustment device for adjusting a pedal arm adapted to rotate about an axis of arm rotation, the adjustment device comprising:

camming means rotatably mounted juxtaposed the pedal arm for rotating the pedal arm about the axis of arm rotation, the camming means having an axis of cam rotation;

means for locating the axis of cam rotation a predetermined distance from the axis of arm rotation, the locating means having one end pivotably mounted substantially concentric with the axis of arm rotation such that rotation of the camming means rotates the pedal arm about the axis of arm rotation; and

drive means juxtaposed the camming means, the drive means having a projecting portion engaging the camming means for driving said camming means about the axis of cam rotation;

whereby rotation of said camming means about said axis of cam rotation causes said pedal arm to be rotatively displaced about said axis of arm rotation.

In a preferred embodiment of this aspect, the camming means is a disc having a camming surface radially spaced from the axis of cam rotation, the camming surface slidably contacting the pedal arm.

In a further preferred embodiment, the adjustment device further comprises a reaction member having one end secured to the locating means, with the means for locating further comprising a link member having one end pivotably connected to the pedal arm at the axis of arm rotation and a segment portion connected to the reaction member, and means for securing the reaction member to the link member.

In a still further preferred embodiment, the camming means is a cam member mounted to the link member, with the cam member further comprising:



a cam surface juxtaposed the pedal arm;
means for mounting the cam member to the link member;
and

further wherein the drive means is mounted to the link member, the drive means further comprising:
a drive housing mounted to the link member;
a drive motor located in the drive housing; and
gearbox means mounted in the drive housing complementary with the drive motor, the gear box means having a projecting portion extending in a direction towards the cam member and engaging the cam member to establish a driving relationship therewith, the gearbox means rotating the cam member in one direction when the drive motor is driven in a first direction and further rotating the cam member in a second opposite direction when the motor is driven in a second opposite direction such that as the cam member rotates the pedal arm is pivoted about the axis of arm rotation.

Preferably, the segment portion of the link member comprises an opposite end of the link member having an aperture defining a pivot axis centrally disposed with the aperture, the pivot axis of the opposite end of the link member being co-axial with the axis of cam rotation. In another embodiment the segment portion of the link member comprises an opposite end of the link member having an aperture defining a pivot axis centrally disposed with the aperture, and further wherein the axis of cam rotation is located between the pivot axis and the axis of arm rotation.

In a further embodiment, the camming means is a cam member mounted to the pedal arm with the cam member further comprising a cam surface juxtaposed the link member or the reaction member.

According to a second aspect, the present invention consists in an adjustment device for adjusting an



automobile pedal arm adapted to rotate about an axis of arm rotation, the adjustment device comprising:

camming means rotatably mounted juxtaposed said automobile pedal arm for rotating the automobile pedal arm about the axis of arm rotation, the camming means having an axis of cam rotation substantially parallel to the axis of arm rotation, said camming means further having a camming surface slidably contacting the automobile pedal arm;

means for locating the axis of cam rotation a predetermined distance from the axis of arm rotation, the locating means having one end pivotably mounted substantially concentric with the axis of arm rotation; and

drive means mounted to the automobile pedal arm for rotating said camming means about the axis of cam rotation;

whereby rotation of the camming means about the axis of cam rotation causes the camming surface to urge the automobile pedal arm to be rotatively displaced about the axis of arm rotation.

According to a third aspect, the present invention consists in a method for adjusting an automobile pedal arm adapted to rotate about an axis of arm rotation, the method comprising the steps of:

positioning camming means, having an axis of cam rotation, juxtaposed the automobile pedal arm;

positioning the axis of cam rotation a predetermined distance from the axis of arm rotational and

rotating the camming means about the axis of cam rotation such that the automobile pedal arm is rotatively displaced relative to the axis of arm rotation.

Preferably, the step of rotating includes rotating the camming means with a drive shaft which is rotatably driven by a drive motor. In a preferred embodiment of



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this aspect, the method further comprises the step of maintaining a constant distance between the axis of cam rotation and the axis of arm rotation.



Other advantages of this invention will be more apparent after a reading of the following detailed description taken in conjunction with the drawings provided.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is an exploded view of an automobile control pedal unit provided with an adjustment device in accordance with one preferred embodiment of this invention;

Figure 2 is a side view of the automobile control pedal unit of Figure 1; and

Figure 3 is a front view of the automobile control pedal unit taken along lines 3-3 of Figure 2.

Figures 4A and 4B are side and frontal views, respectively, of an automobile control pedal unit provided with an adjustment device in accordance with a second embodiment of this invention;

Figures 5A and 5B are side and frontal views, respectively, of an automobile control pedal unit provided with an adjustment device in accordance with a third embodiment of this invention;

Figures 6A and 6B are side and cross-sectional views, respectively, of an automobile control pedal unit provided with an adjustment device in accordance with a fourth embodiment of this invention;

Figures 7A and 7B are side and frontal views, respectively, of an automobile control pedal unit provided with an adjustment device in accordance with a fifth embodiment of this invention;

Figures 8A and 8B are side and cross-sectional views, respectively, of an automobile accelerator pedal unit provided with an adjustment device in accordance with a sixth embodiment of this invention;

Figures 9A and 9B are side and cross-sectional views, respectively, of an automobile accelerator pedal unit provided with an adjustment device in accordance with a



seventh embodiment of this invention; and

Figures 10 and 11 are detailed cross-sectional views of the automobile control pedal units of Figures 4 and 7 and Figures 5 and 6, respectively, in accordance with this invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

With reference to Figure 1, there is shown an exploded view of an automobile control pedal 10. As illustrated, the automobile control pedal represents a brake or clutch control pedal for actuating a master cylinder 12 located within the engine compartment of the automobile. The following description will specifically refer to the use of the present invention within the environment of a brake or clutch control pedal for purposes of clarity so as to assist in the understanding of the disclosure. However, the teachings of the present invention are not limited to the brake or clutch control pedals of an automobile, and can be readily adapted by one skilled in the art to an automobile's accelerator control pedal (not shown).

Conventionally, the control pedal 10 is suspended just above the compartment floor on the driver's side of the



automobile. The control pedal 10 is initially spaced a nominal distance from the driver's seat so as to be operable by a driver having an "average" physique. Conventionally, a driver's seat is adjustable fore and aft so as to bring the driver closer to the control pedal 10, or to displace the driver further from the control pedal 10, respectively, depending upon the driver's particular physique and preference. To supplement the adjustable feature of the driver's seat, an adjustment unit according to the present invention is secured to the control pedal 10.

The control pedal 10 generally includes a pedal arm 20 and a pedal foot pad 22. The pedal arm 20 is typically attached to a frame member 14 located beneath the instrument panel (not shown) of the automobile such that the pedal arm 20 is rotatable in a direction away from the driver. The pedal arm 20 is secured to the frame member 14 by a pivot pin 24 which is shown as a threaded fastener with a cotter key 26 to prevent the pivot pin 24 from becoming loosened from the frame member 14. It may also be preferable to provide a pivot bushing (not shown) in conjunction with the pivot pin 24 to reduce friction between the pedal arm 20 and the frame member 14.

The pedal arm 20 is typically maintained in a forward position by the biasing effect of a master cylinder pushrod 34 which is conventionally biased toward the automobile's passenger compartment by a spring (not shown) within the master cylinder 12. The pedal arm 20 may also be biased toward the pushrod 34 by a suitable helical spring (not shown) so as to maintain positive engagement between the pedal arm 20 and the pushrod 34. The pushrod 34 is slidable in the axial direction to actuate a piston (not shown) within the master cylinder 12 for purposes of selectively engaging or disengaging the automobile's brakes or clutch, respectively. Conventionally, the pushrod 34 would be rotatably attached directly to the pedal arm 20 with a pivot pin which passes through both the pedal arm 20 and an eyelet 36 located on the end of the pushrod 34. However, as can be seen in Figures 1 through 3, the pedal arm 20 of the present invention is indirectly actuated by the pushrod 34 through a cam 28. The cam 28

is pivotably attached to the eyelet 36 of the pushrod 34 with a pivot pin 42 such that the cam's axis of rotation 32 coincides with the axes of the pivot pin 42 and the eyelet 36. The pivot pin 42 can be secured to the cam 28 by any suitable means, such as the nut 16 and cotter key 18 shown.

The cam 28 is preferably disc-shaped with a cam contour 30 disposed on an outer surface spaced radially outward from the cam's axis of rotation 32. As best seen in Figure 2, the cam contour 30 constitutes a significant portion of the cam's outer surface such that the cam 28 can be rotated as much as 180 degrees while still operating within the range of the cam contour 30. The cam contour 30 is slidably disposed against a camming surface 38 provided on the forward surface of the pedal arm 20. As a result, rotation of the cam 28 causes fore or aft pivoting of the pedal arm 20, depending upon the cam's direction of rotation.

The rate of rotation of the pedal arm 20 is also determined by the cam contour 30. Depending upon the preferred control parameters with which the pedal arm 20 is to be adjusted relative to the driver's seat, the cam contour 30 can be radially spaced from the cam's axis of rotation 32 so as to cause a constant rate of rotation of the pedal arm 20 given a constant rate of rotation of the cam 28. Alternatively, the cam contour 30 can be shaped to provide a rate of rotation which varies as the pedal arm 20 rotates, providing finer adjustment of the pedal arm 20 where the pedal arm's rate of rotation is lowest.

As can be best seen in Figures 1 and 3, the position of the cam 28 relative to the pedal arm 20 is maintained by a pivot link 40 which extends between the cam's axis of rotation 32 and the pivot of the pedal arm 20 as defined by the pivot pin 24. Preferably, the pivot link 40 is pivotably attached at its upper end to the frame member 14 with the pivot pin 24 so as to extend alongside the pedal arm 20. The lower end of the pivot link 40 can be secured to the cam 28 with the cam pivot pin 42, coinciding with the cam's axis of rotation 32. As such, the pivot link 40 ensures that the cam 28 will remain positioned to cam against the

camming surface 38 of the pedal arm 20. With the biasing effect of the pushrod 34, positive contact can be maintained at all times between the cam surface 30 of the cam 28 and the pedal arm surface 38 of the pedal arm 20 to ensure positive mechanical action therebetween. As previously noted, a helical spring (not shown) can also be provided to either act upon the pedal arm 20 to bias the pedal arm 20 against the cam 28, or act through the link 40 to bias the cam 28 against the pedal arm 20. In addition, the pivot line 40 prevents the rotation of the cam 28 from altering the position of the pushrod eyelet 36, and thereby the pushrod 34, relative to the master cylinder 12. Accordingly, any articulation of the pushrod 34 is avoided during the adjustment made to the pedal arm 20 by the cam 28.

As shown in Figures 1 through 3, the rotation of the cam 28 is preferably achieved with a drive motor 44 which actuates a rod or lead screw 46 rotatably engaged with the cam 28. Though any suitable type of drive motor 44 can be used, it is preferable in the environment of an automobile's passenger compartment to use an electric drive motor which generates minimal noise. As illustrated, the drive motor 44 can be pivotably attached directly to the pedal arm 20 by a pivot pin 50 and retained with a C-clip 54. The rod 46 is preferably a helical drive screw 46 which is rotated by the drive motor 44. The helical drive screw 46 is pivotably attached to the cam 28 with a pivot pin 48 pivotably secured to the cam 28. The helical drive screw 46 is threadably engaged with a diametrically threaded bore 52 (shown in Figure 3) through the pivot pin 48 which is oriented to be perpendicular to the pivot axis of the pivot pin 48. Consequently, when the helical drive screw 46 is rotated by the drive motor 44, the pivot pin 48 is driven up or down the length of the helical drive screw 46, depending upon the direction of rotation of the helical drive screw 46. As the pivot pin 48 follows the helical drive screw 46, the cam 28 is forced to rotate about its axis of rotation 32, causing a corresponding rotation in the pedal arm 20 relative to the cam's axis of rotation 32 and the pushrod eyelet 36.

A significant advantage of the adjustment device of the present invention is that by selectively energizing the drive motor 44, the cam 28 can be rotated to select an optimal fore or aft position of the pedal arm 20 relative to the needs of the driver. Consequently, not only can the driver adjust the driver's seat to position himself or herself relative to the control pedal 10, but the driver can also adjust the control pedal 10 itself such that it is positioned to provide optimal comfort to the driver. The use of the invention may result in significant simplification of seat adjuster mechanisms since the function of providing adjustment of the seat to enable reaching of the pedals need no longer be considered. The control pedal with this invention will be pivotally adjustable towards the seat.

In addition, where all of the automobile's control pedals - namely, the brake, clutch and accelerator pedals are provided with the adjustment device of the present invention, each control pedal can be adjusted individually or collectively so as to provide optimal positioning of the control pedals for the particular physique of the driver. The control pedals 10 can be independently adjusted, or the drive motors 44 for each control pedal 10 can be controlled by a single electronic device (not shown) which appropriately adjusts the individual control pedals 10 according to a single command initiated by the driver. Under some circumstances, a single drive motor 44 could be used to rotate cams 28 which are each assigned to an individual control pedal 10. With either approach, the controls for the drive motor 44, and thus the adjustment of each control pedal 10, can be located to be accessible to the driver, such as on the automobile's instrument panel.

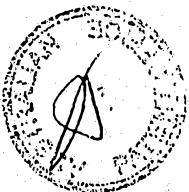
Another significant advantage of the present invention is that metal-to-metal contact is assured to provide positive actuation between the pedal arm 20 and the master cylinder pushrod 34 at all times without the need for significant additional structure. The cam 28 is pivotally secured to the pushrod 34 such that the cam 28 is maintained in metal-to-metal contact with the

pedal arm 20 either by the biasing effect of the pushrod 34 alone, or as supplemented by a helical spring which urges the pedal arm 20 against the cam 28. Moreover, the cam's axis of rotation 32 coincides with the axis of the pushrod eyelet 36 and is maintained a predetermined distance from the pivot pin 24 of the pedal arm 20 by the pivot link 40 such that the cam 28 and the pushrod 34 are properly maintained relative to the pedal arm 20 to maintain a constant preferred mechanical advantage. Also, there is no movement of the pushrod 34 relative to the pushrod's corresponding master cylinder 12 during adjustment of the control pedal 10, thereby preventing the control pedal's adjustment from causing partial operation of the device which it controls.

In addition, the advantages of the adjustment device can be realized with minimal additional hardware and can be readily adapted to a conventional control pedal. Accordingly, excessive space beneath the instrument panel is not required to accommodate the adjustment device, nor is there a significant penalty in terms of added weight.

Accordingly, the present invention provides an automobile control pedal adjustment device which is readily adaptable to conventional automobile control pedals for selective adjustment of the control pedals relative to the driver's seat, supplementing the adjustment capability conventionally provided with a driver's seat. The control pedal adjustment device can be actuated with a switch conveniently located on the instrument panel to position the control pedals according to the desires of the driver. The adjustment device can be electrically operated and can be provided with controls which are integrated with the central control module of the automobile to provide a memory capability, allowing several drivers to store a preselected control pedal position that can be recalled.

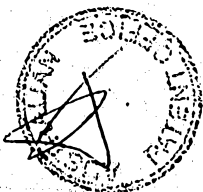
~~While the invention has been described in terms of a preferred embodiment, it is apparent that other forms could be adopted by one skilled in the art. For example, the cam 28 could be positionally maintained by any other suitable device so as to~~



With reference to Figures 4A and 4B, there is shown an automobile control pedal assembly 200 in accordance with a second embodiment of this invention, with the same reference numerals representing identical or similar components of Figs. 1 to 3. As illustrated, the automobile control pedal assembly 200 represents a brake or clutch control pedal for actuating a master cylinder (not shown) located within the engine compartment of an automobile. The following descriptions pertaining to Figures 4A through 7B will each refer to the use of the present invention within the environment of a brake or clutch control pedal. Figures 8A through 9B illustrate the teachings of the present invention as adapted for use with an automobile's accelerator control pedal 60.

Conventionally, the control pedal assembly 200 illustrated in Figures 4A and 4B is suspended just above the compartment floor on the driver's side of the automobile. The control pedal assembly 200 is initially spaced a nominal distance from the driver's seat so as to be operable by a driver having an "average" physique. Typically, a driver's seat is adjustable fore and aft so as to bring the driver closer to the control pedal assembly 200, or to displace the driver further from the control pedal assembly 200, respectively, depending upon the driver's particular physique and preference. To supplement the adjustable feature of the driver's seat, an adjustment unit according to the present invention is secured to the control pedal assembly 200.

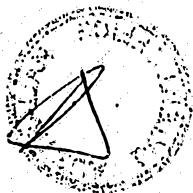
As illustrated in Figures 4A and 4B, the control pedal assembly 200 generally includes a pedal arm 20 and a pedal foot pad 22. The pedal arm 20 is typically attached to a frame member 14 located beneath the instrument panel (not shown) of the automobile such that the pedal arm 20 is rotatable in a direction away from the driver. The pedal arm 20 is secured to the frame member 14 by a pivot



pin 24 which is shown as being retained by a cotter key 26 to prevent the pivot pin 24 from becoming loosened from the frame member 14. It may also be preferable to provide a pivot bushing (not shown) in conjunction with the pivot pin 24 to reduce friction between the pedal arm 20 and the frame member 14.

The pedal arm 20 is typically maintained in a forward position by the biasing effect of a master cylinder pushrod 34 which is conventionally biased toward the automobile's passenger compartment by a spring (not shown) within the master cylinder. The pedal arm 20 may also be biased toward the master cylinder pushrod 34 by a suitable helical spring (not shown) so as to maintain positive engagement between the pedal arm 20 and the master cylinder pushrod 34. The master cylinder pushrod 34 reciprocates in its axial direction to actuate a piston (not shown) within the master cylinder for purposes of selectively engaging or disengaging the automobile's brakes or clutch, respectively. Conventionally, the master cylinder pushrod 34 would be rotatably attached directly to the pedal arm 20 with a pivot pin which passes through both the pedal arm 20 and an eyelet 36 located on the end of the master cylinder pushrod 34.

However, as can be seen in Figures 4A and 4B, which illustrate the second embodiment of this invention, the pedal arm 20 of the present invention is indirectly actuated by the master cylinder pushrod 34 through a cam 28. The cam 28 is pivotably attached to a pivot link 40 which rotatably interconnects the eyelet 36 of the master cylinder pushrod 34 with the pivot pin 24 of the pedal arm 20. The cam 28 is preferably disc-shaped with a cam contour 30 disposed on an outer surface spaced radially outward from the cam's axis of rotation. As shown in Figure 4A, the cam contour 30 may constitute essentially the entire perimeter of the cam 28, such that the cam 28



can be rotated as much as 360 degrees while still operating within the range of the cam contour 30. The cam contour 30 is slidably disposed against a camming surface 38 provided on the forward surface of the pedal arm 20. As a result, rotation of the cam 28 causes fore or aft pivoting of the pedal arm 20, depending upon the cam's direction of rotation.

The rate of rotation of the pedal arm 20 is determined in part by the cam contour 30. Depending upon the preferred control parameters with which the pedal arm 20 is to be adjusted relative to the driver's seat, the cam contour 30 can be radially spaced from the cam's axis of rotation so as to cause a constant rate of rotation of the pedal arm 20 given a constant rate of rotation of the cam 28. Alternatively, the cam contour 30 can be shaped to provide a rate of rotation which varies as the pedal arm 20 rotates, providing finer adjustment of the pedal arm 20 where the pedal arm's rate of rotation is lowest.

As noted above, the position of the cam 28 relative to the pedal arm 20 is maintained by being rotatably mounted to the pivot link 40. Preferably, the pivot link 40 is pivotably attached at its upper end to the frame member 14 with the pivot pin 24 so as to extend alongside the pedal arm 20. The lower end of the pivot link 40 is secured to the eyelet 36 of the master cylinder pushrod 34 with a pin 42. As such, the pivot link 40 ensures that the cam 28 will remain positioned to cam against the camming surface 38 of the pedal arm 20. With the biasing effect of the master cylinder pushrod 34, positive contact can be maintained at all times between the cam surface 30 of the cam 28 and the camming surface 38 of the pedal arm 20 to ensure positive mechanical action therebetween. As previously noted, a helical spring (not shown) can also be provided to either act upon the pedal arm 20 to bias the pedal arm 20 against the cam



28, or act through the pivot link 40 to bias the cam 28 against the pedal arm 20. In addition, the pivot link 40 prevents the rotation of the cam 28 from altering the position of the pushrod eyelet 36, and thereby the master cylinder pushrod 34, relative to the master cylinder. Accordingly, any articulation of the pushrod 34 is avoided during the adjustment made to the pedal arm 20 by the cam 28.

The rotation of the cam 28 is preferably achieved with a drive motor 44 which rotates the cam 28 through a gearbox 148 and shaft 146 assembly. Though any suitable type of drive motor 44 can be used, it is preferable in the environment of an automobile's passenger compartment to use an electric drive motor which generates minimal noise. A suitable output speed for the drive motor 44 through the gear box 148 is of the order of about 10 to 12 rpms, though it is foreseeable that different motors could be matched with different gearboxes to produce higher or lower output speeds. As illustrated in Figure 4A, the drive motor 44 and the gearbox 148 are attached directly to the pivot link 40 by a pair of threaded fasteners 150. The shaft 146 extends from the gearbox 148 through an aperture 132 in the pivot link 40 to the cam 28. A detailed view of this arrangement is illustrated in Figure 10, which more clearly illustrates the manner in which the cam 28 is pivotably mounted to the link 40, and secured with a clip 54. Consequently, when the shaft 146 is rotated by the drive motor 44, the cam 28 is also rotated about its axis of rotation, causing a corresponding movement of the pedal arm 20 relative to the cam's axis of rotation and the pushrod eyelet 36.

Figures 5A and 5B illustrate a control pedal assembly 110 in accordance with a third embodiment of this invention, with the same reference numerals representing identical or similar components of Figures 1 to 4B, but

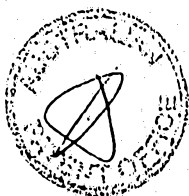


interconnected in a different manner. Primarily, the embodiment of Figures 5A and 5B differs from that of Figures 4A and 4B, in that the axis of rotation of the cam 28 coincides with the eyelet 36 of the master cylinder pushrod 34, and the drive motor 44 rotates the cam 28 through a gear 58 mounted to the shaft 146 and in mesh with a gear tooth form 56 provided on the cam 28. A detailed view of this arrangement is illustrated in Figure 11. Otherwise, the basic characteristics of the control pedal assembly 200 of Figures 4A and 4B still apply, with rotation of the cam 28 causing the pedal arm 20 to be rotated toward or away from the eyelet 36 of the master cylinder pushrod 34.

Figures 6A and 6B illustrate a control pedal assembly 210 in accordance with a fourth embodiment of this invention, again with the same reference numerals representing the identical or similar components of Figures 1 through 5B, but interconnected in a different manner. Primarily, the embodiment of Figures 6A and 6B differs from that of Figures 4A and 4B, in that both the cam 28 and the drive motor 44 are mounted to the pedal arm 20, instead of the pivot link 40, with the cam 28 being supported on a pivot pin 152. Also, in a manner essentially identical to that of Figures 5A and 5B, the drive motor 44 rotates the cam 28 through the gear 58 mounted to the shaft 146, as represented by Figure 11.

A further variation of the control pedal assembly of Figures 4A and 4B is illustrated in Figures 7A and 7B, representing a control pedal assembly 310 in accordance with a fifth embodiment of this invention.

Again, the same reference numerals are used to represent identical or similar components, which are interconnected in a different manner. This embodiment differs from that of Figures 4A and 4B by the shape of the pivot link 40, and the position of the drive motor 44 and



the cam 28 on the pivot link 40. Shifting the position of the drive motor 44 toward the center of the pivot link 40 allows the pivot link 40 to be aligned substantially parallel with the pedal arm 20, as can be seen in Figure 7A, such that the control pedal assembly 310 is more compact. In a manner essentially identical to that of Figures 4A and 4B, the cam 28 is secured to the shaft 146 as shown in Figure 10.

With reference to Figures 8A through 9B, there is shown an automobile accelerator pedal assembly 60 in accordance with sixth and seventh embodiments of this invention. As illustrated, the accelerator pedal assembly 60 is conventional to the extent that it serves to actuate a cable 84 connected to the fuel metering system of an automobile. Similar to the pedal systems of Figures 4A through 7B, the accelerator pedal assembly 60 is suspended just above the compartment floor on the driver's side of the automobile. However, an adjustment unit according to the present invention is secured to the accelerator pedal assembly 60 to supplement the adjustable feature of the driver's seat.

As illustrated in Figure 8A, the accelerator pedal assembly 60 generally includes a pedal arm 70 and a foot pad 72. The pedal arm 70 is pivotably attached with a pin 74 to the upper end of a link 62, to which the accelerator cable 84 is directly attached. The link 62 has a U-shaped cross section, as shown in Figure 8B, such that the pedal arm 70 can nest within the link 62. The pedal arm 70 also has a U-shaped cross section for added stiffness and strength. The lower end of the link 62 is pivotably attached with a pin 66 to a frame member 68 located beneath the instrument panel of the automobile, such that the link 62 can be pivoted about the pin 66 in order to pull the accelerator cable 84 in a direction toward the driver. As shown in Figure 8A, the pedal arm



70 is maintained in a forward position with a cam 78 pivotably mounted within the link 62 on the pin 66. Bushings 76 allow the pin 66 to rotate relative to the link 62. The pin 66 is press fit onto the cam 78, such that the cam 78 can be rotated by a drive motor, such as that illustrated in Figures 4A through 7B, through a coupling 86. Consequently, the accelerator pedal system 60 can be operated off a drive motor which is simultaneously used to adjust the brake and/or clutch pedals. As before, the cam 78 is preferably disc-shaped with a cam contour 80 disposed on an outer surface spaced radially outward from the cam's axis of rotation. The cam contour 80 may constitute essentially the entire perimeter of the cam 78, such that the cam 78 can be rotated as much as 360 degrees while still operating within the range of the cam contour 80. The cam contour 80 is slidably disposed against a camming surface 88 provided on the forward surface of the pedal arm 70, which is biased against the camming contour 80 by any suitable spring or the like (not shown). As a result, rotation of the cam 78 causes fore or aft rotation of the pedal arm 70 about the pin 74, depending upon the cam's direction of rotation.

As a result of the above, the cam 78 also serves as a fulcrum, such that the act of the driver depressing the pedal arm 70 causes the pedal arm 70 and the link 62 to rotate together about the pin 66. As noted before, rotation of the link 62 serves to pull the accelerator cable 84 for the purpose of actuating the automobile's fuel metering system. However, as can be seen in Figures 8A and 8B, the position of the pedal arm 70 can be altered by rotating the cam 78 about the pin 74 in a manner similar to that described in the previous embodiments of this invention.

A final version of the accelerator pedal assembly 60 of this invention is illustrated in Figures 9A and 9B.



The same reference numerals are used to represent identical or similar components which are interconnected in a different manner. This embodiment differs from that of Figures 8A and 8B by the shape of the link 62 and the position of the cam 78 on the link 62. As shown, in lieu of using the same pin 66 on which the cam 78 is supported, a second pin 82 is used to rotatably secure the lower end of the link 62 to the frame member 68. As a result, the forces imposed on the pin 66 are significantly reduced. In addition, the link 62 is modified to more fully enclose the cam 78.

It will be appreciated by persons skilled in the art that numerous variations and/or modifications may be made to the invention as shown in the specific embodiments without departing from the spirit or scope of the invention as broadly described. The present embodiments are, therefore, to be considered in all respects as illustrative and not restrictive.



THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:-

1. An adjustment device for adjusting a pedal arm adapted to rotate about an axis of arm rotation, said adjustment device comprising:

camming means rotatably mounted juxtaposed said pedal arm for rotating said pedal arm about said axis of arm rotation, said camming means having an axis of cam rotation;

means for locating said axis of cam rotation a predetermined distance from said axis of arm rotation, said locating means having one end pivotably mounted substantially concentric with said axis of arm rotation such that rotation of said camming means rotates said pedal arm about said axis of arm rotation; and

drive means juxtaposed said camming means, said drive means having a projecting portion engaging said camming means for driving said camming means about said axis of cam rotation;

whereby rotation of said camming means about said axis of cam rotation causes said pedal arm to be rotatively displaced about said axis of arm rotation.

2. The adjustment device of claim 1 wherein said camming means is a disc having a camming surface radially spaced from said axis of cam rotation, said camming surface slidably contacting said pedal arm.

3. The adjustment device of claim 1 wherein said means for locating comprises a link extending between said axis of arm rotation and said axis of cam rotation, said link having one end pivotably connected to said pedal arm at said axis of arm rotation and an opposite end connected to said camming means at said axis of cam rotation.

4. The adjustment device of claim 1 wherein said drive means comprises:

a drive motor pivotably attached to said pedal arm;
and



wherein said projecting portion comprises a helical drive shaft having one end rotatably engaged with said drive motor and an opposite end pivotably secured to said camming means at a location spaced from said axis of cam rotation, said helical drive shaft rotating said camming means in one direction when said drive motor is driven in a first direction, said helical drive shaft further rotating said camming means in a direction opposite to said one direction when said drive motor is driven in a second opposite direction.

5. An adjustment device for adjusting an automobile pedal arm adapted to rotate about an axis of arm rotation, said adjustment device comprising:

camming means rotatably mounted juxtaposed said automobile pedal arm for rotating said automobile pedal arm about said axis of arm rotation, said camming means having an axis of cam rotation substantially parallel to said axis of arm rotation, said camming means further having a camming surface slidably contacting said automobile pedal arm;

means for locating said axis of cam rotation a predetermined distance from said axis of arm rotation, said locating means having one end pivotably mounted substantially concentric with said axis of arm rotation; and

drive means mounted to said automobile pedal arm for rotating said camming means about said axis of cam rotation;

whereby rotation of said camming means about said axis of cam rotation causes said camming surface to urge said automobile pedal arm to be rotatively displaced about said axis of arm rotation.

6. The adjustment device of claim 5 wherein said camming means is a disc having a camming surface radially spaced from said axis of cam rotation and slidably engaging said



automobile pedal arm.

7. The adjustment device of claim 5 wherein said means for locating comprises a link extending between said axis of arm rotation and said axis of cam rotation, said link having one end pivotably connected to said automobile pedal arm at said axis of arm rotation and an opposite end connected to said camming means at said axis of cam rotation.

8. The adjustment device of claim 5 wherein said drive means comprises:

a drive motor pivotably attached to said automobile pedal arm; and

a helical drive shaft having one end rotatably engaged with said drive motor and an opposite end pivotably secured to said camming means at a location spaced a predetermined distance from said axis of cam rotation, said helical drive shaft rotating said camming means in one direction when said drive motor is driven in a first direction, said helical drive shaft further rotating said camming means in a direction opposite said one direction when said drive motor is driven in a second opposite direction.

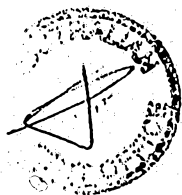
9. The adjustment device of claim 7 further comprising a cylinder pushrod having one end attached to said opposite end of said link; and

means for connecting said one end of said pushrod and said opposite end of said link about said axis of cam rotation.

10. A method for adjusting an automobile pedal arm adapted to rotate about an axis of arm rotation, said method comprising the steps of:

positioning camming means, having an axis of cam rotation, juxtaposed said automobile pedal arm;

positioning said axis of cam rotation a predetermined distance from said axis of arm rotation; and



rotating said camming means about said axis of cam rotation such that said automobile pedal arm is rotatively displaced relative to said axis of arm rotation.

11. The method of claim 10 wherein said step of rotating includes rotating said camming means with a drive shaft which is rotatably driven by a drive motor.

12. The method of claim 10 further comprising the step of maintaining a constant distance between said axis of cam rotation and said axis of arm rotation.

13. The adjustment device of claim 3 wherein said drive means comprises:

a drive motor pivotably attached to said pedal arm;
and

wherein said projecting portion comprises a helical drive shaft having one end rotatably engaged with said drive motor and an opposite end pivotably secured to said camming means at a location spaced from said axis of cam rotation, said helical drive shaft rotating said camming means in one direction when said drive motor is driven in a first direction, said helical drive shaft further rotating said camming means in a direction opposite to said one direction when said drive motor is driven in a second opposite direction.

14. The adjustment device of claim 7 wherein said drive means comprises:

a drive motor pivotably attached to said automobile pedal arm; and

a helical drive shaft having one end rotatably engaged with said drive motor and an opposite end pivotably secured to said camming means at a location spaced a predetermined distance from said axis of cam rotation, said helical drive shaft rotating said camming means in one direction when said drive motor is driven in a first direction, said helical drive shaft further rotating said camming means in a direction opposite said



one direction when said drive motor is driven in a second opposite direction.

15. The adjustment device as claimed in claim 1 further comprising:

a reaction member having one end secured to said locating means; and

wherein said means for locating further comprises:

a link member having one end pivotably connected to said pedal arm at said axis of arm rotation and a segment portion connected to said reaction member; and

means for securing said reaction member to said link member.

16. The adjustment device as claimed in claim 15 wherein said camming means is a cam member mounted to said link member, said cam member further comprising:

a cam surface juxtaposed said pedal arm;

means for mounting said cam member to said link member; and

further wherein said drive means is mounted to said link member, said drive means further comprising:

a drive housing mounted to said link member;

a drive motor located in said drive housing; and

gear box means mounted in said drive housing complementary with said drive motor, said gear box means having a projecting portion extending in a direction towards said cam member and engaging said cam member to establish a driving relationship therewith, said gear box means rotating said cam member in one direction when said drive motor is driven in a first direction and further rotating said cam member in a second opposite direction when said motor is driven in a second opposite direction such that as said cam member rotates said pedal arm is pivoted about said axis of arm rotation.

17. The adjustment device as claimed in claim 16 wherein said segment portion of said link member comprises an



opposite end of said link member having an aperture defining a pivot axis centrally disposed with said aperture, said pivot axis of said opposite end of said link member being coaxial with said axis of cam rotation.

18. The adjustment device as claimed in claim 16 wherein said segment portion of said link member comprises an opposite end of said link member having an aperture defining a pivot axis centrally disposed with said aperture, and further wherein said axis of cam rotation is located between said pivot axis and said axis of arm rotation.

19. The adjustment device as claimed in claim 15 wherein said camming means is a cam member mounted to said pedal arm, said cam member further comprising a cam surface juxtaposed said link member; and wherein said locating means comprises means for mounting said cam member to said pedal arm, said drive means comprising:

a drive housing mounted to said pedal arm;

a drive motor located in said drive housing;

gear box means mounted in said drive housing complementary with said drive motor, said gear box means having a projecting portion extending in a direction towards said cam member and engaging said cam member to establish a driving relationship therewith, said gear box means rotating said cam member in one direction when said drive motor is driven in a first direction and further rotating said cam member in a second opposite direction such that as said cam member rotates said pedal arm is pivoted about said axis of arm rotation; and

means for mounting said drive means to said pedal arm.

20. The adjustment device as claimed in claim 15 wherein said camming means is a cam member mounted to said pedal arm, said cam member further comprising a cam surface juxtaposed said reaction member; and wherein said locating means comprises means for mounting said cam member to said



pedal arm, said drive means comprising:

a drive housing mounted to said pedal arm;

a drive motor located in said drive housing;

gear box means mounted in said drive housing

complementary with said drive motor, said gear box means having a projecting portion extending in a direction towards said cam member and engaging said cam member to establish a driving relationship therewith, said gear box means rotating said cam member in one direction when said drive motor is driven in a first direction and further rotating said cam member in a second opposite direction when said drive motor is driven in a second opposite direction such that as said cam member rotates said pedal arm is pivoted about said axis of arm rotation; and

means for mounting said drive means to said pedal arm.

21. The adjustment device as claimed in claim 15 wherein said link member further comprises an opposite end portion having an aperture defining a pivot axis, said pivot axis of said opposite end portion of said link member being coaxial with said axis of cam rotation.

22. The adjustment device as claimed in claim 21 wherein said drive means is remotely located with respect to said camming means and further wherein said camming means is a cam member mounted to said link member and having a cam surface radially spaced from said axis of cam rotation, said cam surface being juxtaposed said pedal arm; and means for mounting said cam member to said link member; and further wherein said projecting portion extends in a direction towards said cam member and is fixedly secured thereto such that as said drive means and associated projecting portion is rotated in a first direction said cam member rotates in said first direction, said drive means and associated projecting portion rotating said cam member in a second opposite direction when said drive means rotates in a second opposite direction.



23. The adjustment device as claimed in claim 2 further comprising:

a reaction member having one end secured to said locating means; and

wherein said means for locating further comprises:

a link member having one end pivotably connected to said pedal arm at said axis of arm rotation and a segment portion connected to said reaction member; and

means for securing said reaction member to said link member.

24. The adjustment device as claimed in claim 23 wherein said camming means is a cam member, said cam member further comprising:

a camming surface juxtaposed said pedal arm;

means for mounting said cam member to said link member; and

wherein said drive means is mounted to said link member, said drive means further comprising:

a drive housing mounted to said link member;

a drive motor located in said drive housing; and

gear box means mounted in said drive housing

complementary with said drive motor, said gear box means having a projecting portion extending in a direction towards said cam member and engaging said cam member to establish a driving relationship therewith, said gear box means rotating said cam member in one direction when said drive motor is driven in a first direction and further rotating said cam member in a second opposite direction when said drive motor is driven in a second opposite direction such that as said cam member rotates said pedal arm is pivoted about said axis of arm rotation.

25. The adjustment device as claimed in claim 23 wherein said segment portion of said link member comprises an opposite end of said link member having an aperture defining a pivot axis centrally disposed with said



aperture, said pivot axis of said opposite end of said link member being coaxial with said axis of cam rotation.

26. The adjustment device as claimed in claim 23 wherein said camming means is a cam member, said cam member further comprising a camming surface juxtaposed said link member; and wherein said locating means comprises means for mounting said cam member to said pedal arm, said drive means comprising:

a drive housing mounted to said pedal arm;

a drive motor located in said drive housing;

gear box means mounted in said drive housing complementary with said drive motor, said gear box means having a projecting portion extending in a direction towards said cam member and engaging said cam member to establish a driving relationship therewith, said gear box means rotating said cam member in one direction when said drive motor is driven in a first direction and further rotating said cam member in a second opposite direction when said drive motor is driven in a second opposite direction such that as said cam member rotates said pedal arm is pivoted about said axis of arm rotation; and

means for mounting said drive means to said pedal arm.

27. The adjustment device as claimed in claim 24 wherein said segment portion of said link member comprises an opposite end of said link member having an aperture defining a pivot axis centrally disposed with said aperture, and further wherein said axis of cam rotation is located between said pivot axis and said axis of arm rotation.

28. An adjustment device for adjusting a pedal arm adapted to rotate about an axis of arm rotation substantially as described with reference to the accompanying drawings.

29. A method for adjusting an automobile pedal arm adapted to rotate about an axis of arm rotation



- 31 -

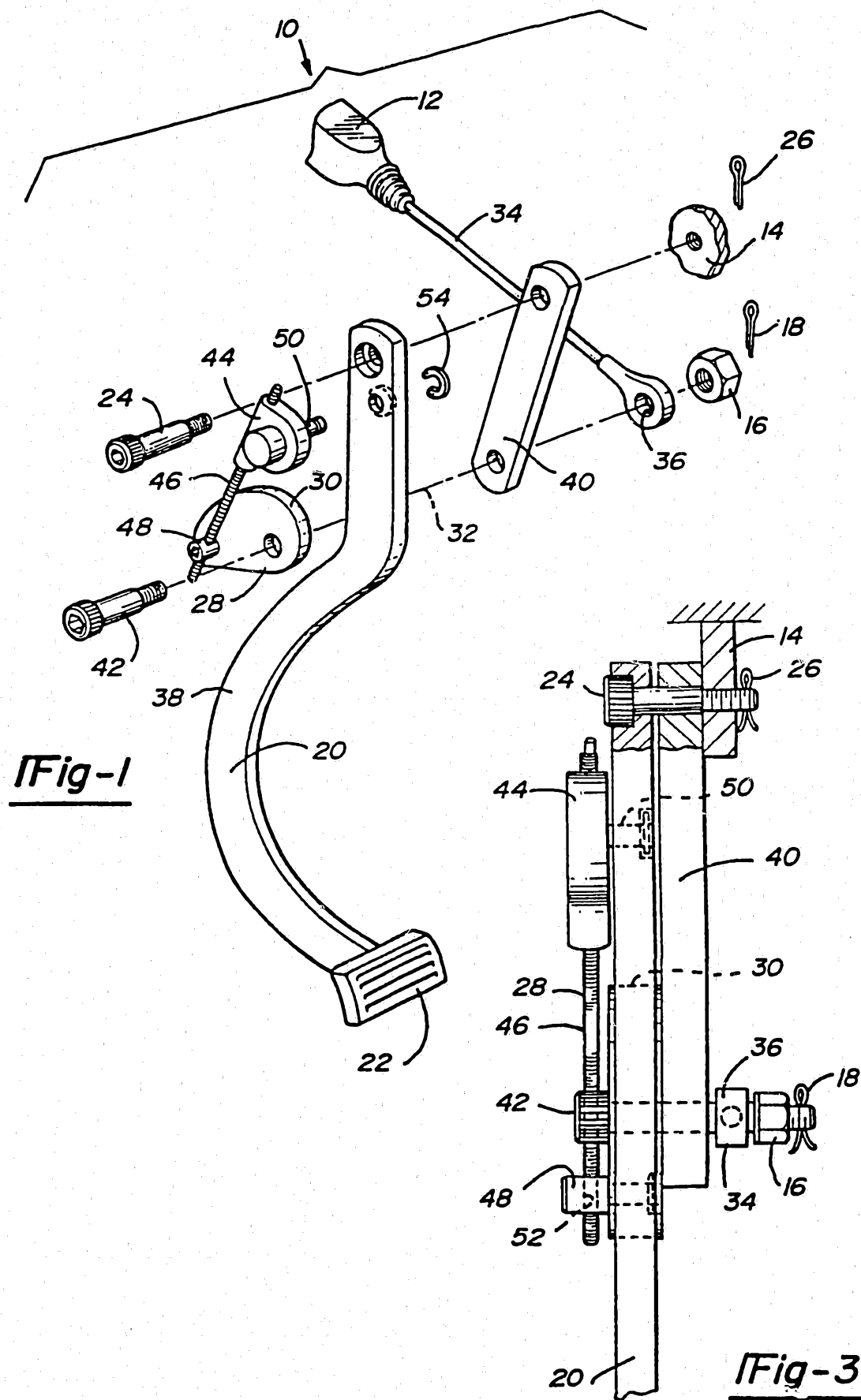
substantially as described with reference to the
accompanying drawings.

DATED this 1st day of May 1995

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Applicant:

F.B. RICE & CO.





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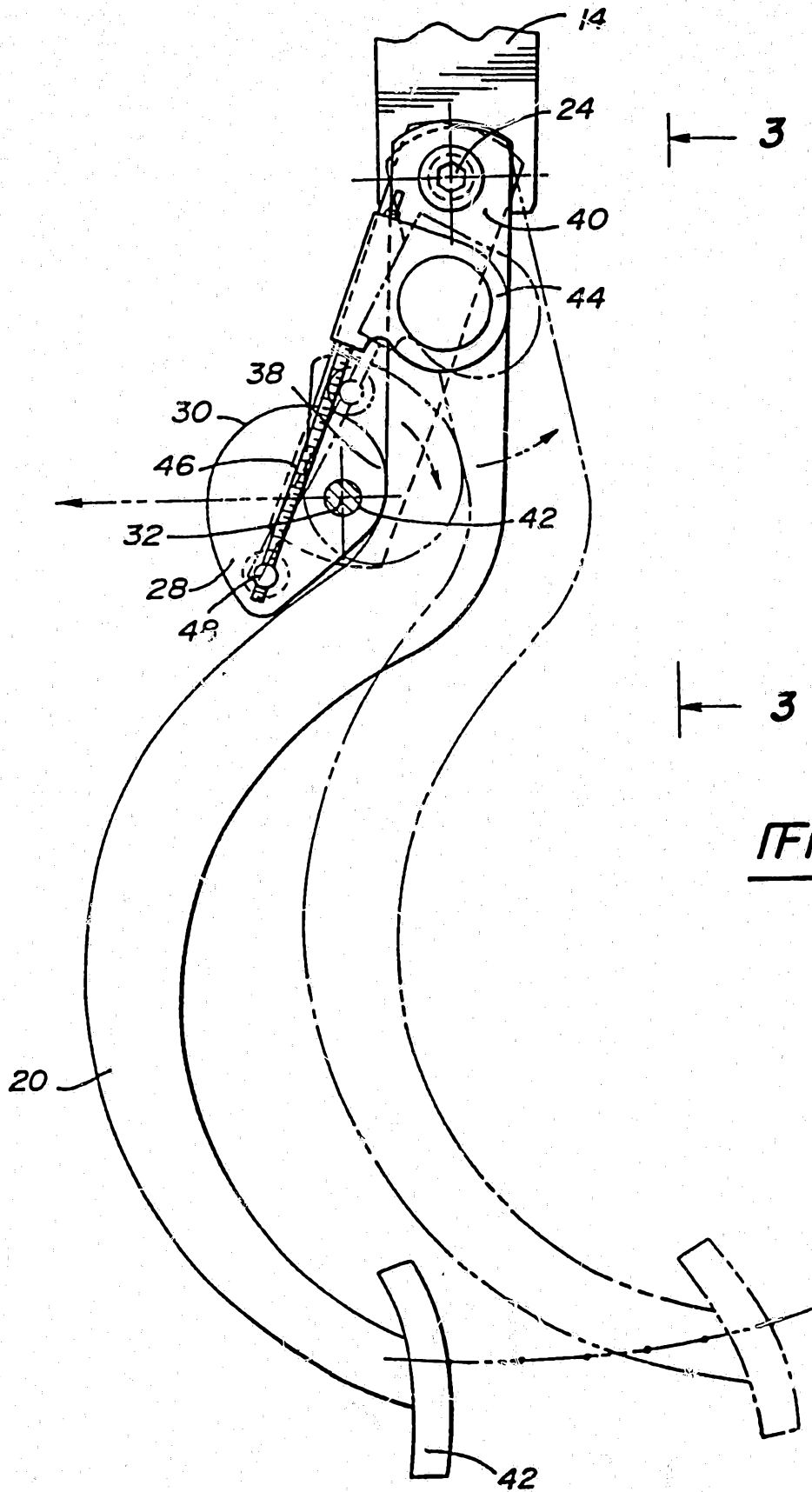


Fig-2

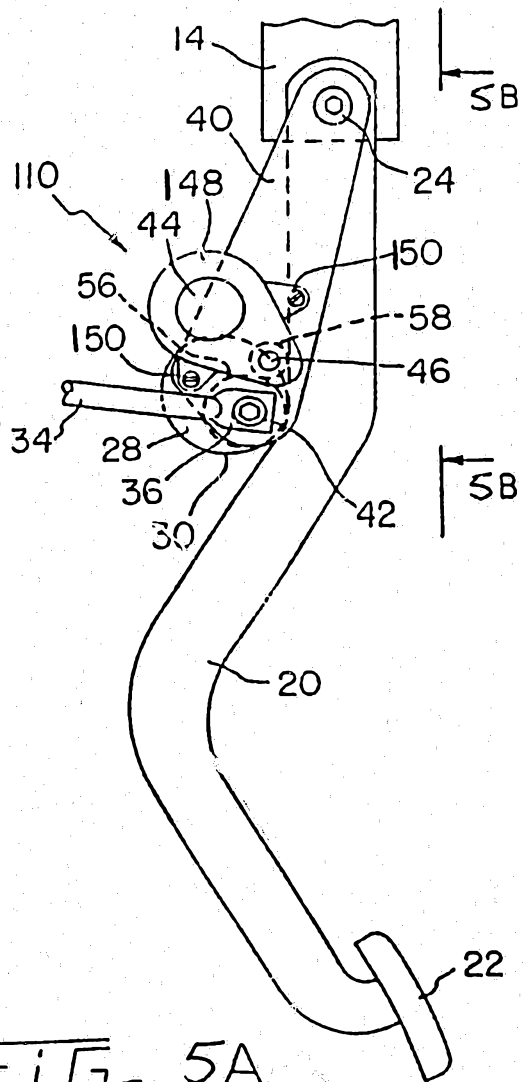
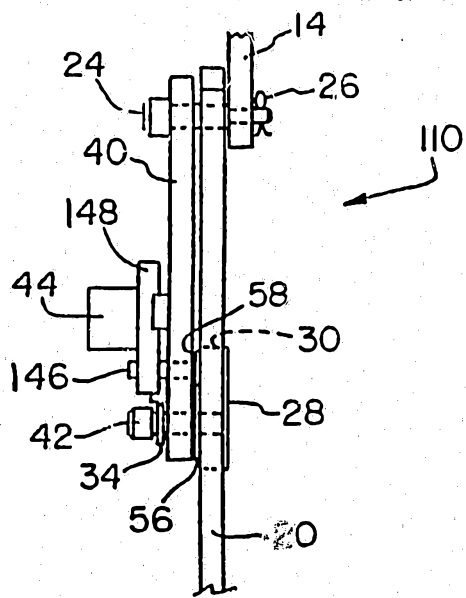
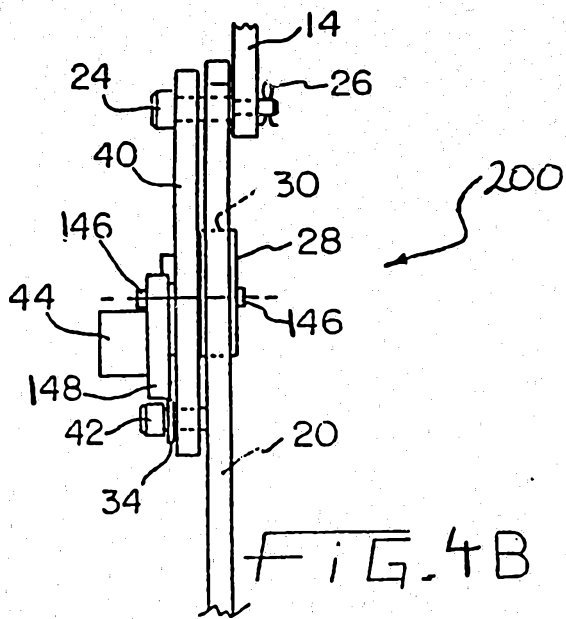
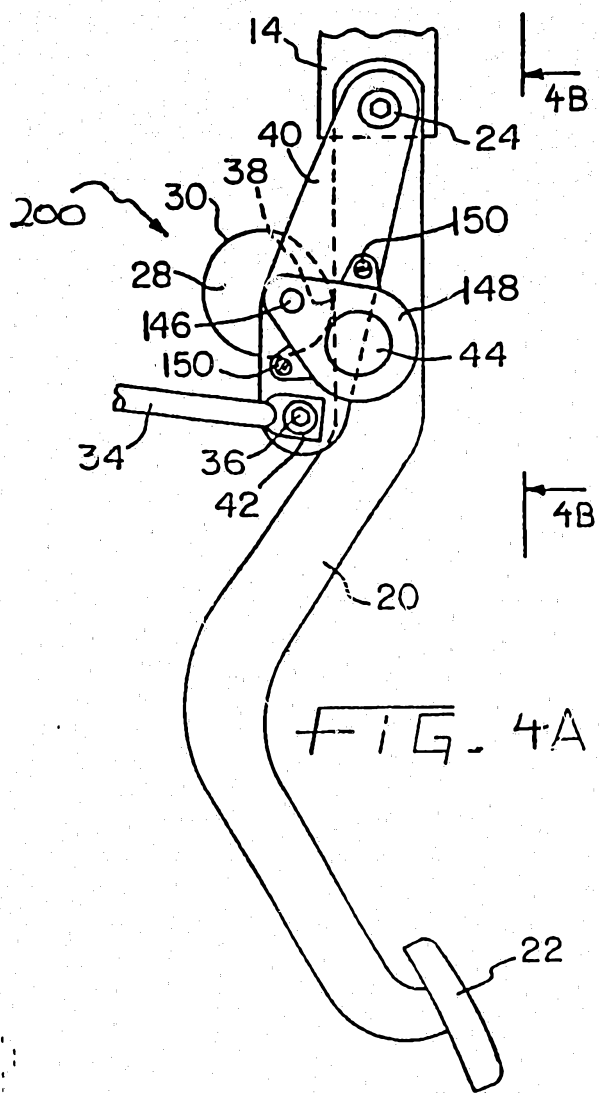
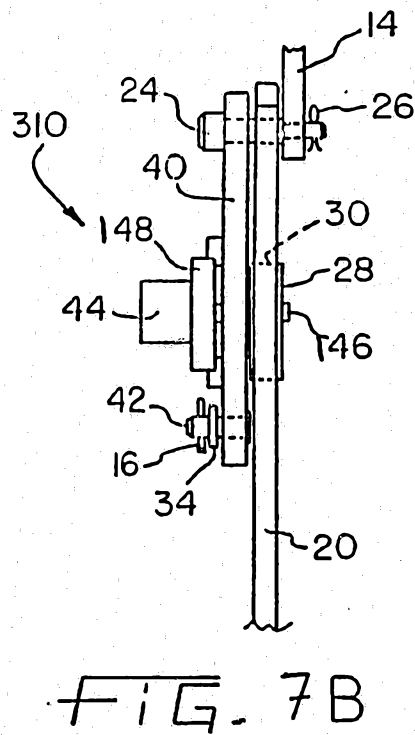
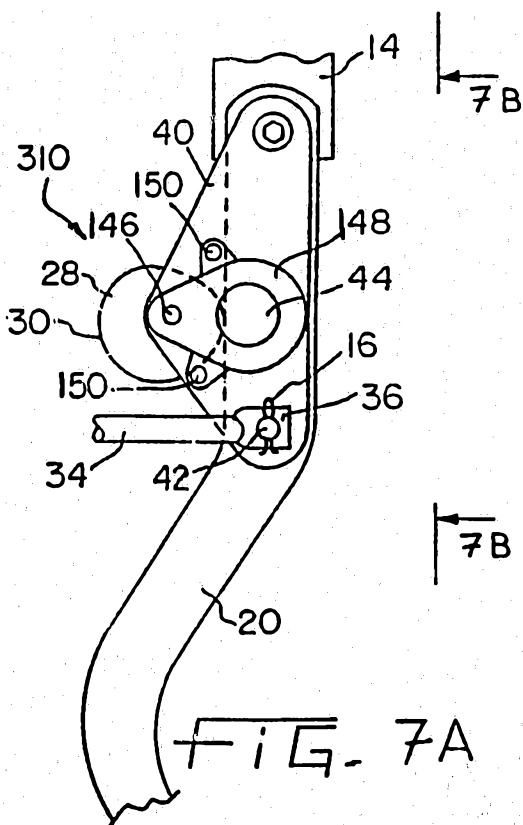
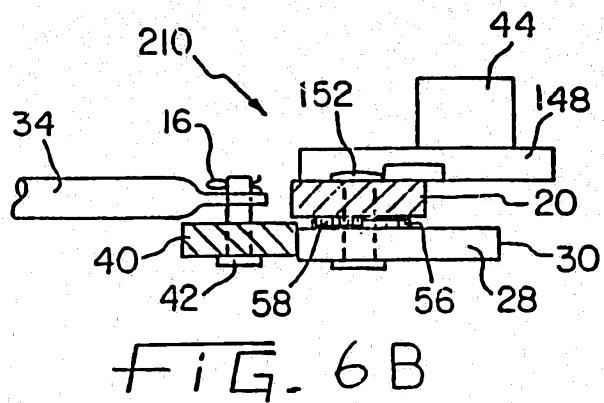
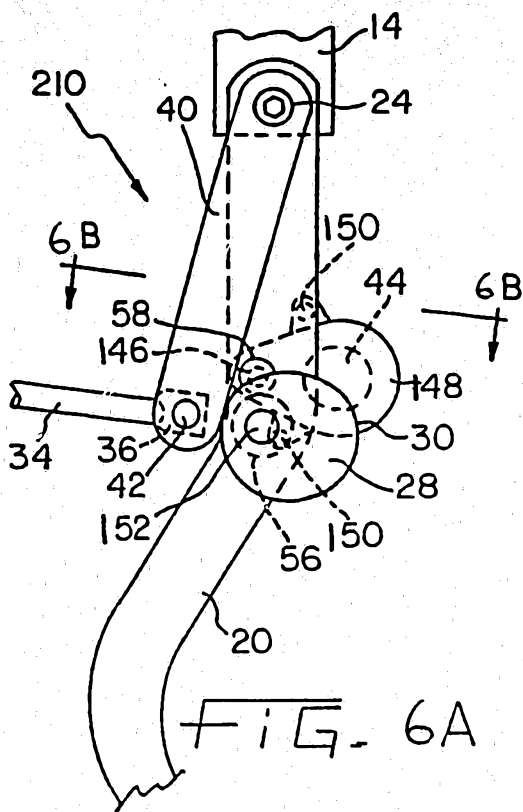


FIG. 5B

FIG. 5A

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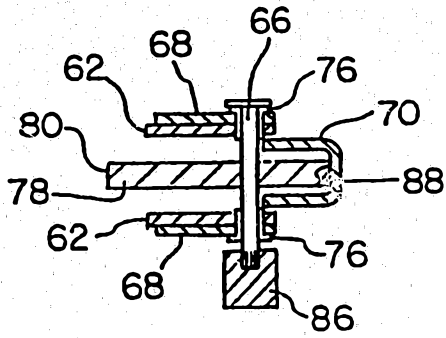


FIG. 8B

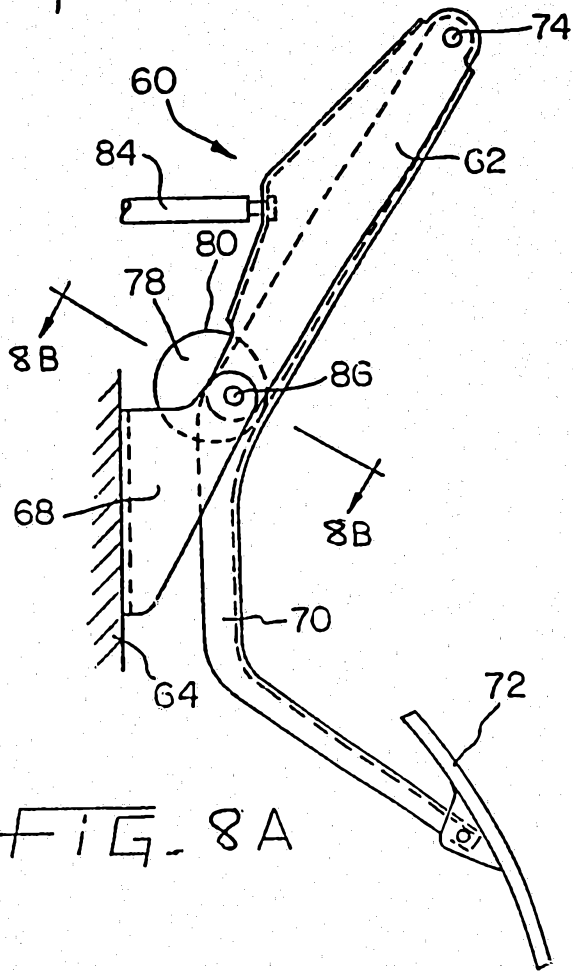


FIG. 8A

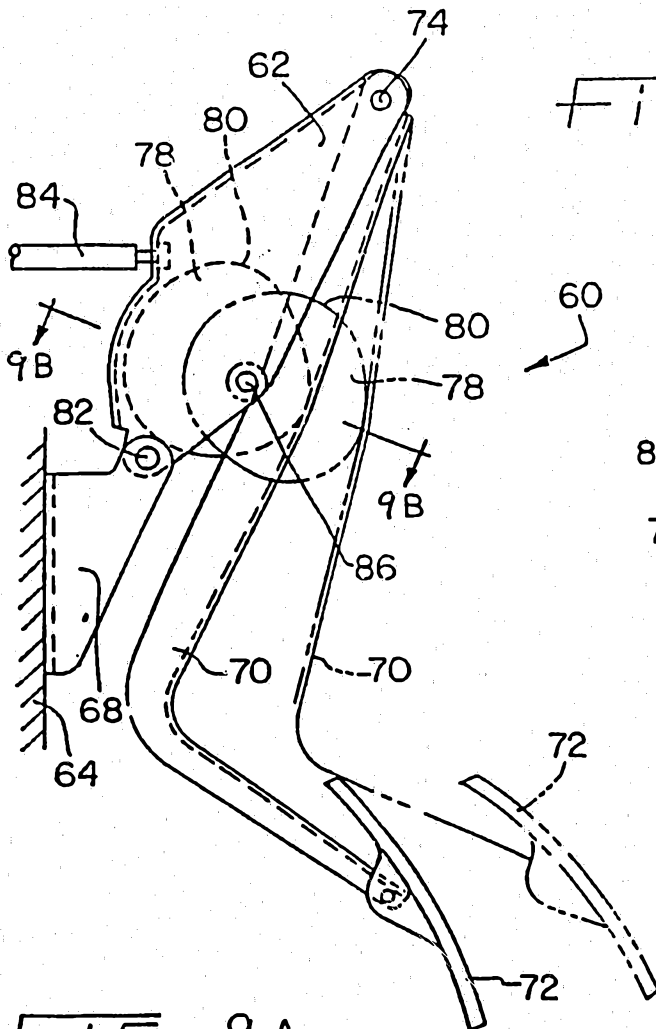


FIG. 9A

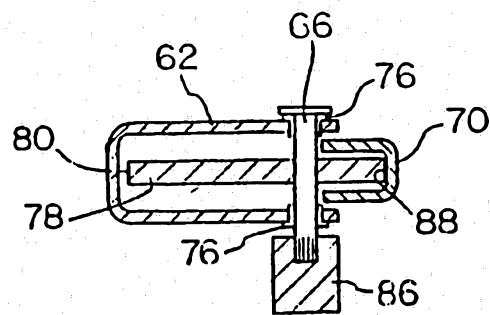


FIG. 9B

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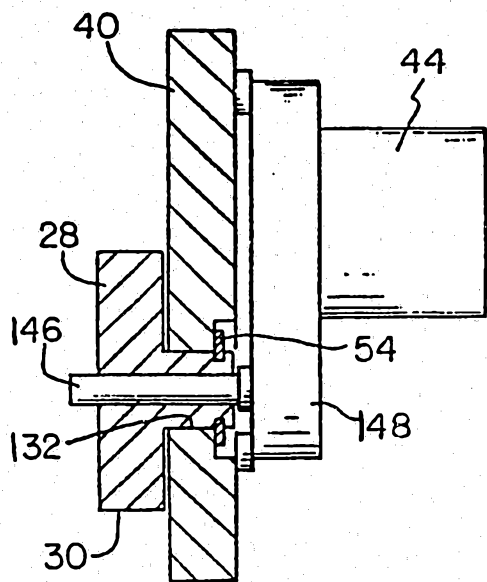


FIG. 10

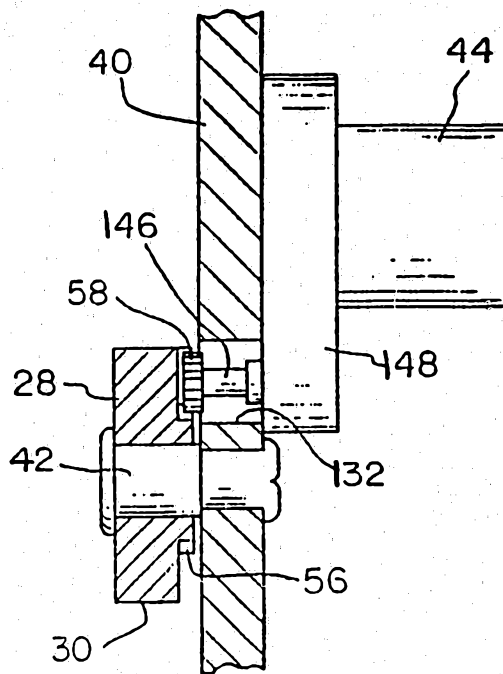


FIG. 11

INTERNATIONAL SEARCH REPORT

PCT/US92/08183

A. CLASSIFICATION OF SUBJECT MATTER

IPC(5) : G05G 1/14

US CL : 074/512

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 074/512, 560, 561, 562

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US,A, 5,010,782 (Asano et al.) 30 April 1991. See col. 4, line 55, <u>et seq.</u>	1-3,7,11-12 and 16-19
X	US,A, 4,989,474 (Cicotte et al.) 05 February 1991. See col. 4, lines 18-41.	1-3,7,11-12, and 16-19
X	US,A, 4,875,385 (Sitrin) 24 October 1989. See col. 4, lines 32-58.	1,7,12 and 16

☐ Further documents are listed in the continuation of Box C.
 ☐ See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be part of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E" earlier document published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Z" document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

12 NOVEMBER 1992

Date of mailing of the international search report

4 JAN 1993

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