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(54) **ADJUSTABLE AUTOMOBILE PEDAL SYSTEM**

EINSTELLBARE FAHRZEUGPEDALANORDNUNG

SYSTEME DE PEDALE AUTOMOBILE REGLABLE

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US-A- 3 798 995 **US-A- 4 989 474**
US-A- 5 010 782

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Description

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application corresponds to a continuation-in-part application to US-A-5 351 573 (& EP-A-0 607 281, WO 93/07551).

BACKGROUND OF THE INVENTION

1. FIELD OF THE INVENTION

[0002] 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.

2. DESCRIPTION OF THE PRIOR ART

[0003] 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 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 operation which is adequately comfortable for the "average" driver. However, some adjustment of the driver relative to the control pedals is clearly desirable.

[0004] Though the driver's seat is usually mounted so as to be slidable in a fore and aft direction to accommodate drivers of 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 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 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.

[0005] Lever mechanisms, of course, are known in the prior art. The adjustment of one lever with respect

to another concentrically mounted lever can also be found in wear or slack adjuster mechanisms. For example, Tack, U.S. Patent 2,550,731 and Tack et al, U.S. Patent 2,550,732, teach a manually operated screw mechanism threaded into one lever and operatively connected to associated hangers for adjusting the slack conditions in the brake rigging by adjusting with respect to the hangers and simultaneously modifying the position of the brake lever where it is connected to the associated brake rigging.

[0006] 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, 4,683,977 to Salmon, 5,010,782 to Asano et al, and British Patent No. 952,831 to Mussell. As taught by Asano et al, the entire frame and pedal assembly rotates about a single pivot point during actuation of the pedal. A disadvantage with pedal systems such as that of Asano et al is that a spring is required to return the pedal and frame assembly to its initial position, necessitating that the driver also overcome the force generated by the spring in order to actuate the pedal.

[0007] 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 as well as 5,078,024 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.

[0008] As can be readily appreciated by those skilled in the art, the above 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.

[0009] 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.

[0010] 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.

[0011] 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 adjusting the positions of the control pedals, nor does Schroter even recognize the problem to which the above prior art is directed.

[0012] From the above discussion, it can be readily appreciated that the prior art does not disclose an automobile control pedal 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 an apparatus which entails minimal additional hardware to achieve suitable adjustment of one or more control or accelerator 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.

[0013] Accordingly, what is needed is a cost-efficient adjustment device for adjusting one or more automobile control and/or accelerator 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 physiological demands of a driver, while simultaneously requiring minimal structural reinforcements and modifications to achieve the desired results.

[0014] Lastly, in the above-mentioned EP Patent application n° 0 607 281 are disclosed an adjustment device and an adjustment method as defined in the preambles of independent claims 1, 27, 30 and 36.

SUMMARY OF THE INVENTION

[0015] According to one aspect of the present invention there is provided an adjustment device or method for one or more automobile control and/or accelerator pedals, as defined in claims 1 and 30, respectively. According to another aspect of the present invention, there is provided an adjustment device or method for one or more automobile control and/or accelerator pedals, as defined in claims 27 and 36, respectively.

[0016] The adjustment device is capable of causing pivotable adjustment, 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 preferably defined by a reaction member upon which the control pedal operates, such as the pivot eyelet of a master cylinder pushrod for a clutch or brake pedal, due to the need to leave the operation of the clutch and brake master cylinders unaltered during adjustment of the respective control pedals. For an accelerator pedal, the reaction member is typically a flexible cable by which the fuel system is operated. Because the accelerator pedal is typically pivotably mounted to the firewall for purposes of actuating the cable, the datum point may be any suitable reference point which allows conventional operation of the accelerator pedal with respect to the cable. Being adjustably pivotable in this manner, the control pedals can be optimally positioned to suit the needs of a particular driver.

[0017] 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 eyelet of the cylinder pushrod, without the need of any additional support hardware other than a device for maintaining a predetermined distance between the pushrod eyelet 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.

[0018] In one embodiment, the adjustment device includes a camming device, such as a disc-shaped cam having a predetermined camming contour. The automobile pedal arm elidably abuts the camming device such that rotation of the camming device about its axis of rotation causes pivotable movement of the automobile pedal arm relative to the pushrod eyelet. 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.

[0019] The camming device preferably has its axis of rotation substantially parallel to the control pedal arm's axis of rotation about its corresponding pivot. Furthermore, its axis of rotation is spaced from the axis of the pushrod eyelet. 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.

[0020] 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 the pushrod eyelet. Thus, the control pedal arm is rotated about its pivot point, 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 point 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.

[0021] According to a further embodiment of this invention, one end of the link is 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 addition, the cam driving device and the camming device are mounted directly to the link or 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.

[0022] 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 cyl-

inder 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. Similarly, the operation of the accelerator cable is not affected by the adjustment device of the present invention, in that, the invention as disclosed displaces the pedal arm of the accelerator with respect to the attachment point of the accelerator cable.

[0023] 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.

[0024] In a further embodiment of the invention, the functions of the cam rotation device may be obtained by a power screw which can be rotated by a manual adjuster mechanism or electrical driven actuator in order to displace the control pedal arm with respect to the cylinder pushrod without any movement of the cylinder pushrod itself.

[0025] 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 and/or accelerator pedal relative to the driver.

[0026] It is a further object of the invention that the adjustment device provide pivotable adjustment of the automobile control or accelerator pedal relative to a predetermined fixed datum, such as the pushrod eyelet of the hydraulic cylinder operated by the control pedal or an accelerator cable operated by an accelerator pedal.

[0027] It is still a further object of the invention that an embodiment of the adjustment device include a camming device which pivotably rotates the control pedal relative to the predetermined datum to achieve the desired adjustment.

[0028] 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.

[0029] It is yet another object of the invention that the camming device be electrically driven so as to allow the control pedal to be adjusted from a control device which is readily accessible to the driver.

[0030] It is also another object of the invention to utilize a power screw which may be rotated by a manual or electrically driven adjuster mechanism in order to dis-

place the control pedal arm or accelerator pedal arm with respect to the cylinder pushrod or accelerator cable without any movement of either the cylinder pushrod and/or the accelerator cable.

[0031] It is still another object of the invention that the adjustment device require minimal additional hardware so as to minimize the structural modifications required to adapt the adjustment device to a conventional automobile control pedal arm.

[0032] Other objects and 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

[0033]

Figures 1A and 1B are side and frontal views, respectively, of an automobile control pedal unit provided with an adjustment device in accordance with a first embodiment of this invention;

Figures 2A and 2B are side and frontal views, respectively, of an automobile control pedal unit provided with an adjustment device in accordance with a second embodiment useful for understanding the invention;

Figures 3A and 3B are side and cross-sectional views, respectively, of an automobile control pedal unit provided with an adjustment device in accordance with a third embodiment useful for understanding the invention;

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 fourth embodiment of this invention;

Figures 5A and 5B are side and cross-sectional views, respectively, of an automobile accelerator pedal unit provided with an adjustment device in accordance with a fifth embodiment useful for understanding the invention;

Figures 6A and 6B 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 7 and 8 are detailed cross-sectional views of the automobile control pedal units of Figures 1 and 4 and Figures 2 and 3, respectively, in accordance with this invention; and

Figures 9A and 9B are side and frontal views, respectively, of an automobile control pedal unit provided with an adjustment device in accordance with a seventh preferred embodiment of this invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0034] With reference to Figures 1A and 1B, there is

shown an automobile control pedal assembly 10 in accordance with a first embodiment of this invention. As illustrated, the automobile control pedal assembly 10 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 1A through 4B will each refer to the use of the present invention within the environment of a brake or clutch control pedal. Figures 5A through 6B illustrate the teachings of the present invention as adapted for use with an automobile's accelerator control pedal 60.

[0035] Conventionally, the control pedal assembly 10 illustrated in Figures 1A and 1B is suspended just above the compartment floor on the driver's side of the automobile. The control pedal assembly 10 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 10, or to displace the driver further from the control pedal assembly 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 assembly 10.

[0036] As illustrated in Figures 1A and 1B, the control pedal assembly 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 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.

[0037] 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.

[0038] However, as can be seen in Figures 1A and 1B, which illustrate the first 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 1A, 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.

[0039] 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.

[0040] 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.

[0041] The rotation of the cam 28 is preferably

achieved with a drive motor 44 which rotates the cam 28 through a gear box 48 and shaft 46 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 48 is on the order of about 10 to 12 rpms, though it is foreseeable that different motors could be matched with different gear boxes to produce higher or lower output speeds. As illustrated in Figure 1A, the drive motor 44 and gear box 48 are attached directly to the pivot link 40 by a pair of threaded fasteners 50. The shaft 46 extends from the gear box 48 through an aperture 32 in the pivot link 40 to the cam 28. A detailed view of this arrangement is illustrated in Figure 7, 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 46 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.

[0042] Figures 2A and 2B illustrate a control pedal assembly 110 in accordance with a second embodiment useful for understanding the invention, with the same reference numerals representing identical or similar components of Figures 1A and 1B, but interconnected in a different manner. Primarily, the embodiment of Figures 2A and 2B differs from that of Figures 1A and 1B, 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 46 and in mesh with a gear tooth form 56 provided on the cam 28. A detailed view of this arrangement is illustrated in Figure 8. otherwise, the basic characteristics of the control pedal assembly 10 of Figures 1A and 1B 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.

[0043] Figures 3A and 3B illustrate a control pedal assembly 210 in accordance with a third embodiment useful for understanding the invention, again with the same reference numerals representing the identical or similar components of Figures 1A through 2B, but interconnected in a different manner. Primarily, the embodiment of Figures 3A and 3B differs from that of Figures 1A and 1B, 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 52. Also, in a manner essentially identical to that of Figures 2A and 2E, the drive motor 44 rotates the cam 28 through the gear 58 mounted to the shaft 46, as represented by Figure 8.

[0044] A further variation of the control pedal assembly of Figures 1A and 1B is illustrated in Figures 4A and 4B, representing a control pedal assembly 310 in accordance with a fourth 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 1A and 1B 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 4A, such that the control pedal assembly 310 is more compact. In a manner essentially identical to that of Figures 1A and 1B, the cam 28 is secured to the shaft 46 as shown in Figure 7.

[0045] With reference to Figures 5A through 6B, there is shown an automobile accelerator pedal assembly 60 in accordance with fifth and sixth embodiments. 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 1A through 4B, 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.

[0046] As illustrated in Figure 5A, 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 5B, 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 5A, the pedal arm 70 is maintained in 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 1A through 4B, 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.

[0047] 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 5A and 5B, 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.

[0048] A final version of the accelerator pedal assembly 60 of this invention is illustrated in Figures 6A and 6B. 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 5A and 5B 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.

[0049] Figures 9A and 9B represent a control pedal assembly 410 in accordance with a further preferred embodiment of this invention, again with the same reference numerals representing the identical or similar components of Figures 1A through 4B. However, in this embodiment, the function of the cams 28 and shafts 46 of Figures 1A through 4B are performed by a power screw 90. As shown, the power screw 90 is threadably received in an internally threaded boss 92 formed on or secured to the pivot link 40. One end 94 of the power screw abuts the camming surface 38 provided on the forward surface of the pedal arm 20. As a result, rotation of the power screw 90 causes fore or aft pivoting of the pedal arm 20, depending upon the power screw's direction of rotation. The power screw 90 can be driven in any suitable manner, such as a drive motor (not shown) connected to the end of the power screw 90 through a coupling (not shown) or a manually actuated cable. A gear driver reduction insert is also contemplated. As is apparent from the above description, an advantage of the embodiment shown in Figures 9A and 9B is the simplification of the mechanism which pivots the pedal arm 20.

[0050] From the above, it can be seen that a significant advantage of the adjustment devices of this invention is that by selectively energizing a drive motor, a cam can be used to select an optimal fore or aft position of one or more automobile control pedal arms relative to the needs of the driver. Consequently, not only can the driver adjust the driver's seat to position himself or her-

self relative to the automobile's control pedals, but the driver can also adjust the position of the control pedals such that they are positioned to provide optimal comfort to the driver. The use of this invention may result in significant simplification of the seat adjuster mechanisms or telescoping steering wheel mechanism since the function of providing adjustment of the seat to enable reaching of the pedals need no longer be considered.

[0051] 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 can be independently adjusted with individual drive motors, or a single drive motor can be coupled with each pedal, such that all of the pedals are simultaneously adjusted according to a single command initiated by the driver. With either approach, the controls for the drive motor, and thus the adjustment of each control pedal assembly, can be located to be accessible to the driver, such as on the automobile's instrument panel.

[0052] Another advantage is that the adjustment devices of this invention require minimal additional hardware and can be readily adapted to a conventional control pedal without the need to relocate the brake cylinder pushrod or accelerator cable from its current position. Accordingly, excessive space beneath the instrument panel is not required to accommodate the adjustment devices, nor is there a significant penalty in terms of added weight.

[0053] While the invention has been described in terms of certain preferred embodiments, it is apparent that other forms could be adopted by one skilled in the art. For example, other means for rotating the cams 28 and 78 could be readily adopted by those skilled in the art to achieve the adjustment of the control pedals as described, and various other components or structures could be employed in lieu of the links 40 and 62. Accordingly, the scope of the invention is to be limited only by the following claims.

Claims

1. An adjustment device for adjusting a pedal arm (20 ; 70) with respect to a datum point on a reaction member (34 ; 84), said pedal arm being rotatable about an axis of arm rotation, said adjustment device comprising :

a link member (40 ; 62) having a first pivot axis in one end and a second pivot axis in an oppositely disposed other end, said one end of said link member (40 ; 62) being pivotably mounted substantially concentric with said axis of arm rotation ;

means (42) for mounting said datum point of said reaction member (34 ; 84) to said link member (40 ; 62);

a rotatable member (28 ; 78 ; 90) rotatably mounted about an axis of rotation such that rotation of said rotatable member (28 ; 78 ; 90) causes said pedal arm (20 ; 70) to rotate about said axis of arm rotation ; said link member (40 ; 62) coaxing with said rotatable member (28 ; 78 ; 90) to rotate said pedal arm (20 ; 70) about said axis of arm rotation ; and drive means (44, 46, 48) interconnected with said rotatable member (28 ; 78 ; 90) for rotating said rotatable member (28 ; 78 ; 90) about said axis of rotation whereby as said drive means rotates said rotatable member (28, 78; 90), said pedal arm (20 ; 70) is rotated about said axis of arm rotation ;

characterized in that said rotatable member (28 ; 78 ; 90) is rotatably mounted to one of said pedal arm (20 ; 70) and said link member (40 ; 62) while making contact with the other of said pedal arm (20 ; 70) and said link member (40 ; 62), said axis of rotation being positioned between said first pivot axis and said second pivot axis.

2. The adjustment device of claim 1, further comprising :

a frame member (14);

and wherein

said one end of said link member (40) is pivotably attached to said frame member (14) about said first pivot axis substantially aligned with said axis of arm rotation ; and said other end of said link member (40) is pivotably attached to said reaction member so as to define said second pivot axis.

3. The adjustment device of claim 1 or 2, wherein said rotatable member is a power screw (90) rotatably mounted to one of said link member (40) and said pedal arm (20).

4. The adjustment device of claim 1 or 2, wherein said rotatable member mounted about said axis of rotation comprises a camming member (28 ; 78) rotatably mounted juxtaposed said pedal arm (20 ; 70) for rotating said pedal arm about said axis of arm rotation ; said camming member (28 ; 78) having an axis of cam rotation and further wherein said drive means is interconnected with said camming member (28 ; 78) for driving said camming member (28 ; 78) about said axis of cam rotation.

5. The adjustment device of claim 4, wherein said axis of cam rotation is substantially parallel to said axis

of arm rotation.

6. The adjustment device of claim 4, wherein said camming member is a disc having a camming surface radially spaced from said axis of cam rotation, said camming surface slidably contacting said pedal arm.
7. The adjustment device of claim 4, wherein :

said camming member is rotatably mounted to said link member such that said camming member cams against said pedal arm to rotate said pedal arm about said axis of arm rotation ; and said drive means is mounted to said link member so as to rotate said camming means about said axis of cam rotation.
8. The adjustment device of claim 4, wherein :

said camming member is rotatably mounted to said pedal arm such that said camming member cams against said link member to rotate said pedal arm about said axis of arm rotation ; and said drive means is mounted to said pedal arm and interconnected with said camming member so as to rotate said camming member about said axis of cam rotation.
9. The adjustment device of claim 4, wherein :

said camming member is rotatably mounted to said link member such that said camming member cams against said pedal arm to rotate said pedal arm about said axis or arm rotation ; and said drive means is mounted remote from said link member and interconnected with said camming member so as to rotate said camming member about said axis of cam rotation.
10. The adjustment device of claim 4 or 8, wherein said drive means further comprises an extended drive shaft (46) interconnecting said drive means with said camming member for rotating said camming member about said axis of cam rotation.
11. The adjustment device of claim 10, wherein said drive means further comprises a drive motor (44) and a gear drive device (48) interconnecting said drive motor with said extended drive shaft of said drive means.
12. The adjustment device of claim 10 or 11, wherein said extended drive shaft of said drive means further comprises a pinion gear (58) secured to said extended drive shaft and wherein said camming member comprises a gear tooth form (56) in mesh

with said pinion gear for rotating said camming member about said axis of cam rotation.

13. The adjustment device of claim 4, wherein said reaction member (84) is secured to said link member (62) intermediate said one end and other end.
14. The adjustment device of claim 13, wherein said drive means is mounted remote from said camming member and wherein said camming member comprises a coupling (86) for interconnecting said camming member with said drive means.
15. The adjustment device as claimed in claim 4, wherein :

said reaction member (84) has one end secured to said link member; said link member (62) further comprises a peripheral portion connected to said reaction member; and means for securing said reaction member to said link member are provided.
16. The adjustment device as claimed in claim 7, wherein said camming member mounted to said link member further comprises :

a cam surface (30 ; 80) juxtaposed said pedal arm ; means for mounting said camming member to said link member;

and further wherein said drive means mounted to said link member further comprises :

a drive housing mounted to said link member; a drive motor (44) located in said drive housing ; and gear drive means (48) mounted in said drive housing complementary with said drive motor, said gear drive means having a projecting portion (46) extending in a direction towards said camming member and engaging said camming member to establish a driving relationship therewith, said gear drive means rotating said camming member in one direction when said drive motor is driven in a first direction and further rotating said camming member in a second opposite direction when said motor is driven in a second opposite direction such that as said camming member rotates said pedal arm is pivoted about said axis of arm rotation.
17. The adjustment device as claimed in claim 16, wherein said other end of said link member has an aperture defining said second pivot axis centrally disposed with said aperture.

18. The adjustment device as claimed in claim 8, wherein said camming member further comprises a cam surface (30) juxtaposed said link member ; means for mounting said camming member to said pedal arm being provided ; and wherein said drive means further comprises :

a drive housing mounted to said pedal arm ;
 a drive motor (44) located in said drive housing ;
 gear drive means mounted in said drive housing complementary with said drive motor, said gear drive means having a projecting portion (46) extending in a direction towards said camming member and engaging said camming member to establish a driving relationship therewith, said gear drive means rotating said camming member in one direction when said drive motor is driven in a first direction and further rotating said camming member in a second opposite direction when said drive motor is driven in a second opposite direction such that as said camming member rotates said pedal arm is pivoted about said axis of arm rotation ; and
 means for mounting said drive means to said pedal arm.

19. The adjustment device as claimed in claim 9, wherein said camming member is mounted to said link member and has a cam surface radially spaced from said axis of cam rotation, said cam surface being juxtaposed said pedal arm and means for mounting said camming member to said link member being provided ; and further wherein said drive means comprises a projecting portion extending in a direction towards said camming member and is fixedly secured thereto such that as said drive means and associated projecting portion is rotated in a first direction said camming member rotates in said first direction, said drive means and associated projecting portion rotating said camming member in a second opposite direction when said drive means rotates in a second opposite direction.

20. The adjustment device as claimed in claim 1, wherein said reaction member has one end secured to said link member ; and wherein said means for mounting further comprises :

a peripheral portion of said link member connected to said reaction member; and
 means for securing said reaction member to said peripheral portion of said link member.

21. The adjustment device as claimed in claim 20, further comprising :

a camming member (28) as said rotatable member, having a cam surface juxtaposed said pedal arm ;
 means (46) for mounting said camming 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 (44) located in said drive housing ; and
 gear drive means (48) mounted in said drive housing complementary with said drive motor, said gear drive means having a projecting portion (46) extending in a direction towards said camming member and engaging said camming member to establish a driving relationship therewith, said gear drive means rotating said camming member in one direction when said drive motor is driven in a first direction and further rotating said camming member in a second opposite direction when said drive motor is driven in a second opposite direction such that as said camming member rotates said pedal arm is pivoted about axis of arm rotation.

22. The adjustment device as claimed in claim 4, wherein said camming member further comprises a cam surface juxtaposed said link member ; means for mounting said camming member to said pedal arm being provided and said drive means comprising :

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

23. The adjustment device as claimed in claim 21, wherein said peripheral portion of said link member comprises said opposite other end of said link member having an aperture defining said second pivot axis centrally disposed with said aperture.

24. The adjustment device as claimed in claim 1, wherein said link member (40) further comprises :

a segment portion connected to said reaction member (34); and
means (42) for securing said reaction member (34) to said link member (40) at said segment portion.

25. The adjustment device as claimed in claim 24, wherein said segment portion of said link member is said opposite other end of said link member (40).

26. The adjustment device as claimed in claim 1 wherein said drive means further comprises :

a drive housing having a drive motor (44) located in said drive housing and gear box means (48) mounted in said drive housing complementary with said drive motor, said gear box means having a projecting portion (46) extending in a direction towards said rotatable member (28) and engaging said rotatable member to establish a driving relationship therewith, said gear box means rotating said rotatable member in one direction when said drive motor is driven in a first direction and further rotating said rotatable member in a second opposite direction when said drive motor is driven in a second opposite direction such that as said rotatable member rotates said pedal arm (20) is pivoted about said axis of arm rotation.

27. An adjustment device for adjusting a pedal arm (20) with respect to a datum point on a reaction member (34), said pedal arm (20) being rotatable about an axis of arm rotation, said adjustment device comprising :

a link member (40) having a first pivot axis in one end and a second pivot axis in an oppositely disposed other end, said one end of said link member being pivotably mounted substantially concentric with said axis of arm rotation ;
means (42) for mounting said datum point of said rotation member (34) to said link member (40);
thread means (90, 94) rotatably mounted about an axis of rotation spaced a predetermined distance from said axis of arm rotation, such that rotation of said thread means (90, 94) causes said pedal arm (20) to rotate about said axis of arm rotation, said link member (40) coaxing with said thread means (90, 94) to rotate said pedal arm (20) about said axis of arm rotation ;
and
drive means interconnected with said thread means (90, 94) for rotating said thread means (90, 94) about said axis of rotation whereby as said drive means rotates said thread means

(90, 94) said pedal arm is rotated about said axis of arm rotation ;

characterized in that said thread means (90, 94) is rotatably mounted to one of said pedal arm (20) and said link member (40) and has one end (94) abutted against the other of said pedal arm (20) and said link member (40).

28. The adjustment device as claimed in claim 27, wherein said thread means (90, 94) for rotating said pedal arm (20) is a power screw (90) rotatably mounted to one of said link member (40) and said pedal arm (20).

29. The adjustment device as claimed in claim 27 or 28, wherein said drive means further comprises :

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

30. A method for adjusting an automobile pedal arm adapted to rotate about an axis of pedal arm rotation with respect to a datum point on a reaction member, said method comprising the steps of:

pivotably mounting a rotatable link means having a first pivot axis in one end and a second pivot axis in an opposite end juxtaposed said pedal arm, said first pivot axis being positioned such that it is substantially aligned with said axis of pedal arm rotation ;
immobilizing said rotatable link means with respect to said reaction member by attaching said rotatable link means to said reaction member at said datum point;
rotatably mounting a rotatable member about an axis of rotation ;
rotating said rotatable member about said axis of rotation such that said automobile pedal arm is rotatively displaced relative to said axis of pedal arm rotation to provide adjustment of said pedal arm,

characterized by

positioning said axis of rotation between said first pivot axis and said second pivot axis in one of said pedal arm and said rotatable link means ; and

fixing said rotatable member to said one of said rotatable link means and said pedal arm, said rotatable member engaging the other of said pedal arm and said rotatable link means.

31. The method of claim 30, further comprising the step of maintaining a constant distance between said axis of rotation and said axis of arm rotation.

32. The adjusting method as claimed in claim 30, further comprising the step of providing a means for attachment complementary with said first pivot axis such that said rotatable link means is pivotably attached to said pedal arm about said first pivot axis.

33. The adjusting method as claimed in claim 30, further comprising the step of:
providing a means for mounting said opposite end of said rotatable link means to a frame member.

34. The adjusting method as claimed in claim 30 or 32, further comprising the step of providing a gear reduction unit and motor to rotate said rotatable member.

35. The adjusting method as claimed in claim 32, wherein said step of positioning said axis of rotation comprises providing a means for attachment complementary with said one of said rotatable link means and said pedal arm such that said rotatable member is rotatably attached to said one of said rotatable link means and said pedal arm for rotation about said axis of rotation.

36. A method of adjusting a pedal arm adapted to rotate about an axis of pedal arm rotation with respect to a datum point on a reaction member, said method comprising the steps of:

pivotably mounting a rotatable link means having a first pivot axis in one end and a second pivot axis in another end juxtaposed said pedal arm, said first pivot axis being positioned such that it is substantially aligned with said axis of pedal arm rotation ;
immobilizing said rotatable link means with respect to said reaction member by attaching said rotatable link means to said reaction member at said datum point about said second pivot axis ;

characterized by

fixing a power screw for rotatable movement to one of said rotatable link means and said pedal arm such that said power screw rotates with respect to said one of said rotatable link means and said pedal arm and engages with one end

the other of said rotatable link means and said pedal arm ;

whereby rotation of said power screw moves said pedal arm and rotatively displaces said pedal arm about said axis of pedal arm rotation to provide adjustment of said pedal arm.

37. The adjusting method as claimed in claim 36, further comprising the step of providing a means for attachment complementary with said first pivot axis such that said rotatable link means is pivotably attached to said pedal arm about said axis first pivot axis.

38. The adjusting method as claimed in claim 36 or 37, further comprising the step of providing a gear reduction unit and motor to rotate said power screw.

20 Patentansprüche

1. Eine Einstelleinrichtung zum Einstellen eines Pedalarms (20; 70) bezüglich einem Bezugspunkt auf einem Reaktionselement (34; 84), wobei der Pedalarm um eine Armdrehachse dreh- bzw. schwenkbar ist, wobei die Einstelleinrichtung umfaßt:

ein Verbindungselement (40; 62) mit einer ersten Schwenkachse in einem Ende und einer zweiten Schwenkachse in einem gegenüberliegenden anderen Ende, wobei das eine Ende des Verbindungselements (40; 62) im wesentlichen konzentrisch zu der Armdrehachse schwenkbar angebracht ist;

Mittel (42) zum Anbringen des Bezugspunkts des Reaktionselements (34; 84) an dem Verbindungselement (40; 62);

ein drehbares Element (28; 78; 90), das derart um eine Dreh- bzw. Schwenkachse drehbar angebracht ist, daß die Drehung des drehbaren Elements (28; 78; 90) den Pedalarm (20; 70) zur Drehung um die Armdrehachse veranlaßt, wobei das Verbindungselement (40; 62) mit dem drehbaren Element (28; 78; 90) zusammenwirkt, um den Pedalarm (20; 70) um die Armdrehachse zu drehen;

und

ein Antriebsmittel (44, 46, 48), das mit dem drehbaren Element (28; 78; 90) verbunden ist, um das drehbare Element (28; 78; 90) um die Drehachse zu drehen, wobei der Pedalarm (20; 70) um die Armdrehachse gedreht wird, wenn das Antriebsmittel

das drehbare Element (28; 78; 90) dreht;

dadurch gekennzeichnet, daß das drehbare Element (28; 78; 90) drehbar an dem Pedalarm (20; 70) oder dem Verbindungselement (40; 62) ange-

bracht ist während es in Kontakt mit dem jeweils anderen, Pedalarm (20; 70) oder Verbindungselement (40; 62), steht und die Drehachse zwischen der ersten Schwenkachse und der zweiten Schwenkachse positioniert ist.

2. Die Einstelleinrichtung gemäß Anspruch 1, ferner mit:

einem Rahmenelement (14);

und wobei

das eine Ende des Verbindungselements (40) um die erste Schwenkachse im wesentlichen in Ausrichtung mit der Armdrehachse schwenkbar an dem Rahmenelement (14) angebracht ist; und

das andere Ende des Verbindungselements (40) schwenkbar an dem Reaktionselement so angebracht ist, daß die zweite Schwenkachse festgelegt wird.

3. Die Einstelleinrichtung gemäß Anspruch 1 oder 2, wobei das drehbare Element eine Bewegungsschraube (90) ist, die drehbar an dem Verbindungselement (40) oder dem Pedalarm (20) angebracht ist.

4. Die Einstelleinrichtung gemäß Anspruch 1 oder 2, wobei das um die bzw. an der Drehachse angebrachte drehbare Element ein Kurvensteuerelement (28; 78), welches neben dem Pedalarm (20; 70) zum Drehen des Pedalarms um die Armdrehachse drehbar angebracht ist, umfaßt, wobei das Kurvensteuerelement (28; 78) eine Steuerkurvendrehachse besitzt und das Antriebsmittel ferner mit dem Kurvensteuerelement (28; 78) verbunden ist, um das Kurvensteuerelement (28; 78) um die Steuerkurvendrehachse anzutreiben.

5. Die Einstelleinrichtung gemäß Anspruch 4, wobei die Steuerkurvendrehachse im wesentlichen parallel zu der Armdrehachse ist.

6. Die Einstelleinrichtung gemäß Anspruch 4, wobei das Kurvensteuerelement eine Scheibe mit einer Steuerkurvenoberfläche ist, welche radial von der Steuerkurvendrehachse beabstandet ist, wobei die Steuerkurvenoberfläche den Pedalarm gleitend berührt.

7. Die Einstelleinrichtung gemäß Anspruch 4, wobei:

das Kurvensteuerelement so drehbar an dem Verbindungselement angebracht ist, daß sich das Kurvensteuerelement mit der Steuerkurve gegen den Pedalarm bewegt, um den Pedalarm um die Armdrehachse zu drehen; und das Antriebsmittel an dem Verbindungs-

ment so angebracht ist, daß es das Kurvensteuerelement um die Steuerkurvendrehachse dreht.

8. Die Einstelleinrichtung gemäß Anspruch 4, wobei:

das Kurvensteuerelement so drehbar an dem Pedalarm angebracht ist, daß sich das Kurvensteuerelement mit der Steuerkurve gegen das Verbindungselement bewegt, um den Pedalarm um die Armdrehachse zu drehen; und das Antriebsmittel so an dem Pedalarm angebracht und mit dem Kurvensteuerelement verbunden ist, dass es das Kurvensteuerelement um die Steuerkurvendrehachse dreht.

9. Die Einstelleinrichtung gemäß Anspruch 4, wobei:

das Kurvensteuerelement so drehbar an dem Verbindungselement angebracht ist, daß sich das Kurvensteuerelement mit der Steuerkurve gegen den Pedalarm bewegt, um den Pedalarm um die Armdrehachse zu drehen; und das Antriebsmittel so entfernt von dem Verbindungselement angebracht und mit dem Kurvensteuerelement verbunden ist, dass es das Kurvensteuerelement um die Steuerkurvendrehachse dreht.

10. Die Einstelleinrichtung gemäß Anspruch 4 oder 8, wobei das Antriebsmittel ferner eine verlängerte Antriebsachse bzw. -welle (46) umfaßt, welche das Antriebsmittel mit dem Kurvensteuerelement zum Drehen des Kurvensteuerelements um die Steuerkurvendrehachse verbindet.

11. Die Einstelleinrichtung gemäß Anspruch 10, wobei das Antriebsmittel ferner einen Antriebsmotor (44) und eine Zahnradantriebsvorrichtung (48), welche den Antriebsmotor mit der verlängerten Antriebsachse des Antriebsmittels verbindet, umfaßt.

12. Die Einstelleinrichtung gemäß Anspruch 10 oder 11 wobei die verlängerte Antriebsachse des Antriebsmittels ferner ein Antriebsritzel (58) umfaßt, das an der verlängerten Antriebsachse festgelegt ist, und wobei das Kurvensteuerelement eine Verzahnung (56) umfaßt, die zum Drehen des Kurvensteuerelements um die Steuerkurvendrehachse mit dem Antriebsritzel kämmt.

13. Die Einstelleinrichtung gemäß Anspruch 4, wobei das Reaktionselement (84) an dem Verbindungselement (62) zwischen dem einen Ende und dem anderen Ende festgelegt ist.

14. Die Einstelleinrichtung gemäß Anspruch 13, wobei das Antriebsmittel entfernt von dem Kurvensteuer-

element angebracht ist und wobei das Kurvensteuerelement eine Kupplung (86) zum Verbinden des Kurvensteuerelements mit dem Antriebsmittel umfaßt.

15. Die Einstelleinrichtung gemäß Anspruch 4, wobei:

das Reaktionselement (84) mit einem Ende an dem Verbindungselement festgelegt ist;
das Verbindungselement (62) ferner einen Umfangsabschnitt aufweist, der mit dem Reaktionselement verbunden ist; und
Mittel zum Festlegen des Reaktionselements an dem Verbindungselement vorgesehen sind.

16. Die Einstelleinrichtung gemäß Anspruch 7, wobei das an dem Verbindungselement angebrachte Kurvensteuerelement ferner umfaßt:

eine Steuerkurvenoberfläche (30; 80) neben dem Pedalarm;
Mittel zum Anbringen des Kurvensteuerelements an dem Verbindungselement;
und wobei das an dem Verbindungselement angebrachte Antriebsmittel ferner umfaßt:

ein an dem Verbindungselement angebrachtes Antriebsgehäuse;
einen in dem Antriebsgehäuse angeordneten Antriebsmotor (44); und
ein in dem Antriebsgehäuse komplementär zu dem Antriebsmotor angebrachtes Zahnradantriebsmittel (48), wobei das Zahnradantriebsmittel einen vorstehenden Abschnitt (46) besitzt, der sich in einer Richtung zum Kurvensteuerelement hin erstreckt und mit dem Kurvensteuerelement in Eingriff steht, um eine Antriebsbeziehung mit diesem herzustellen, wobei das Zahnradantriebsmittel das Kurvensteuerelement in einer Richtung dreht, wenn der Antriebsmotor in einer ersten Richtung angetrieben wird und ferner das Kurvensteuerelement in einer zweiten, entgegengesetzten Richtung dreht, wenn der Motor in einer zweiten, entgegengesetzten Richtung angetrieben wird, derart, daß der Pedalarm um die Armdrehachse geschwenkt wird, wenn sich das Kurvensteuerelement dreht.

17. Die Einstelleinrichtung gemäß Anspruch 16, wobei das andere Ende des Verbindungselements eine Öffnung aufweist, die die zweite Schwenkachse festlegt, welche mittig in der Öffnung angeordnet ist.

18. Die Einstelleinrichtung gemäß Anspruch 8, wobei

das Kurvensteuerelement ferner eine Steuerkurvenoberfläche (30) umfaßt, die neben dem Verbindungselement gelegen ist, sowie Mittel zum Anbringen des Kurvensteuerelements an dem Pedalarm vorgesehen sind, und wobei das Antriebsmittel ferner umfaßt:

ein an dem Pedalarm angebrachtes Antriebsgehäuse;
einen in dem Antriebsgehäuse angeordneten Antriebsmotor (44); ein in dem Antriebsgehäuse komplementär zu dem Antriebsmotor angebrachtes Zahnradantriebsmittel, wobei das Zahnradantriebsmittel einen Vorsprungsabschnitt (46) aufweist, der sich in einer Richtung zu dem Kurvensteuerelement hin erstreckt und mit dem Kurvensteuerelement in Eingriff steht, um eine Antriebsbeziehung mit diesem herzustellen, wobei das Zahnradantriebsmittel das Kurvensteuerelement in einer Richtung dreht, wenn der Antriebsmotor in einer ersten Richtung angetrieben wird und ferner das Kurvensteuerelement in einer zweiten, entgegengesetzten Richtung dreht, wenn der Antriebsmotor in einer zweiten, entgegengesetzten Richtung angetrieben wird, derart, daß der Pedalarm um die Armdrehachse geschwenkt wird, wenn sich das Kurvensteuerelement dreht; und
Mittel zum Anbringen des Antriebsmittels an dem Pedalarm.

19. Die Einstelleinrichtung gemäß Anspruch 9, wobei das Kurvensteuerelement an dem Verbindungselement angebracht ist und eine Steuerkurvenoberfläche aufweist, die radial von der Steuerkurvendrehachse beabstandet ist, wobei die Steuerkurvenoberfläche neben dem Pedalarm gelegen ist, und Mittel zum Anbringen des Kurvensteuerelements an dem Verbindungselement vorgesehen sind, und wobei ferner das Antriebsmittel einen Vorsprungsabschnitt umfaßt, der sich in einer Richtung zu dem Kurvensteuerelement hin erstreckt und fest an diesem festgelegt ist, derart, daß sich das Kurvensteuerelement in der ersten Richtung dreht, wenn das Antriebsmittel und der zugeordnete Vorsprungsabschnitt in einer ersten Richtung gedreht wird, und das Antriebsmittel und der zugeordnete Vorsprungsabschnitt das Kurvensteuerelement in einer zweiten, entgegengesetzten Richtung drehen, wenn sich das Antriebsmittel in einer zweiten, entgegengesetzten Richtung dreht.

20. Die Einstelleinrichtung gemäß Anspruch 1, wobei das Reaktionselement mit einem Ende an dem Verbindungselement festgelegt ist, und wobei das Mittel zum Anbringen ferner umfaßt:

einen mit dem Reaktionselement verbundenen Umfangsabschnitt des Verbindungselements, und

Mittel zum Festlegen des Reaktionselements an dem Umfangsabschnitt des Verbindungselements. 5

21. Die Einstelleinrichtung gemäß Anspruch 20, ferner mit:

einem Kurvensteuerelement (28) als das drehbare Element, welches eine Steuerkurvenoberfläche neben dem Pedalarm aufweist; Mittel (46) zum Anbringen des Kurvensteuerelements an dem Verbindungselement; und wobei das Antriebsmittel an dem Verbindungselement angebracht ist und das Antriebsmittel ferner umfaßt: 10

ein an dem Verbindungselement angebrachtes Antriebsgehäuse; einen in dem Antriebsgehäuse angeordneten Antriebsmotor (44) und ein in dem Antriebsgehäuse komplementär zu dem Antriebsmotor angebrachtes Zahnradantriebsmittel (48), wobei das Zahnradantriebsmittel einen Vorsprungsabschnitt (46) besitzt, der sich in einer Richtung zu dem Kurvensteuerelement hin erstreckt und mit dem Kurvensteuerelement zum Herstellen einer Antriebsbeziehung mit diesem in Eingriff steht, wobei das Zahnradantriebsmittel das Kurvensteuerelement in einer Richtung dreht, wenn der Antriebsmotor in einer ersten Richtung angetrieben wird, und das Kurvensteuerelement ferner in einer zweiten, entgegengesetzten Richtung dreht, wenn der Antriebsmotor in einer zweiten, entgegengesetzten Richtung angetrieben wird, derart, daß der Pedalarm um die Armdrehachse geschwenkt wird, wenn sich das Kurvensteuerelement dreht. 15 20 25 30 35 40

22. Die Einstelleinrichtung gemäß Anspruch 4, wobei das Kurvensteuerelement ferner eine Steuerkurvenoberfläche neben dem Verbindungselement aufweist, Mittel zum Anbringen des Kurvensteuerelements an dem Pedalarm vorgesehen sind und das Antriebsmittel umfaßt: 45 50

ein an dem Pedalarm angebrachtes Antriebsgehäuse; einen in dem Antriebsgehäuse angeordneten Antriebsmotor; ein in dem Antriebsgehäuse komplementär zu dem Antriebsmotor angebrachtes Zahnradantriebsmittel, wobei das Zahnradantriebsmittel 55

einen Vorsprungsabschnitt besitzt, der sich in einer Richtung zu dem Kurvensteuerelement hin erstreckt und mit dem Kurvensteuerelement zum Herstellen einer Antriebsbeziehung mit diesem in Eingriff steht, wobei das Zahnradantriebsmittel das Kurvensteuerelement in einer Richtung dreht, wenn der Antriebsmotor in einer ersten Richtung angetrieben wird, und das Kurvensteuerelement ferner in einer zweiten, entgegengesetzten Richtung dreht, derart, daß der Pedalarm um die Armdrehachse geschwenkt wird, wenn sich das Kurvensteuerelement dreht; und Mittel zum Anbringen des Antriebsmittels an dem Pedalarm.

23. Die Einstelleinrichtung gemäß Anspruch 21, wobei der Umfangsabschnitt des Verbindungselements das gegenüberliegende andere Ende des Verbindungselements aufweist, das eine Öffnung besitzt, welche die mittig in der Öffnung angeordnete zweite Schwenkachse festlegt.

24. Die Einstelleinrichtung gemäß Anspruch 1, wobei das Verbindungselement (40) ferner umfaßt:

einen Segmentabschnitt, der mit dem Reaktionselement (34) verbunden ist; und Mittel (42) zum Festlegen des Reaktionselements (34) an dem Verbindungselement (40) an dem Segmentabschnitt.

25. Die Einstelleinrichtung gemäß Anspruch 24, wobei der Segmentabschnitt des Verbindungselements das gegenüberliegende andere Ende des Verbindungselements (40) ist.

26. Die Einstelleinrichtung gemäß Anspruch 1, wobei das Antriebsmittel ferner umfaßt:

ein Antriebsgehäuse, das einen in dem Antriebsgehäuse angeordneten Antriebsmotor (44) und ein in dem Antriebsgehäuse komplementär zu dem Antriebsmotor angebrachtes Getriebemittel (48) besitzt, wobei das Getriebemittel einen Vorsprungsabschnitt (46) aufweist, der sich in einer Richtung zu dem drehbaren Element (28) hin erstreckt und mit dem drehbaren Element zum Herstellen einer Antriebsbeziehung mit diesem in Eingriff steht, wobei das Getriebemittel das drehbare Element in einer Richtung dreht, wenn der Antriebsmotor in einer ersten Richtung angetrieben wird, und ferner das drehbare Element in einer zweiten, entgegengesetzten Richtung dreht, wenn der Antriebsmotor in einer zweiten, entgegengesetzten Richtung angetrieben wird, derart, daß der Pedalarm (20) um die Armdrehachse geschwenkt wird, wenn sich das drehbare Element dreht.

27. Eine Einstelleinrichtung zum Einstellen eines Ped-

alarms (20) bezüglich einem Bezugspunkt auf einem Reaktionselement (34), wobei der Pedalarm (20) um eine Armdrehachse dreh- bzw. schwenkbar ist, wobei die Einstelleinrichtung umfaßt:

ein Verbindungselement (40) mit einer ersten Schwenkachse in einem Ende und einer zweiten Schwenkachse in einem gegenüberliegend angeordneten anderen Ende, wobei das eine Ende des Verbindungselements im wesentlichen konzentrisch zu der Armdrehachse schwenkbar angebracht ist;

Mittel (42) zum Anbringen des Bezugspunkts des Drehelements (34) an dem Verbindungselement (40);

ein Gewindemittel (90, 94), das um eine um einen vorbestimmten Abstand von der Armdrehachse beabstandete Drehachse drehbar angebracht ist, derart, daß die Drehung des Gewindemittels (90, 94) den Pedalarm (20) zur Drehung um die Armdrehachse veranlaßt, wobei das Verbindungselement (40) mit dem Gewindemittel (90, 94) zusammenwirkt, um den Pedalarm (20) um die Armdrehachse zu drehen; und

ein mit dem Gewindemittel (90, 94) zum Drehen des Gewindemittels (90, 94) um die Drehachse verbundenes Antriebsmittel, wobei der Pedalarm um die Armdrehachse gedreht wird, wenn das Antriebsmittel das Gewindemittel (90, 94) dreht;

dadurch gekennzeichnet, daß das Gewindemittel (90, 94) drehbar an dem Pedalarm (20) oder dem Verbindungselement (40) angebracht ist und mit einem Ende (94) an dem jeweils anderen, Pedalarm (20) oder Verbindungselement (40), anliegt.

28. Die Einstelleinrichtung gemäß Anspruch 27, wobei das Gewindemittel (90, 94) zum Drehen des Pedalarms (20) eine Bewegungsschraube (90) ist, die drehbar an dem Verbindungselement (40) oder dem Pedalarm (20) angebracht ist.

29. Die Einstelleinrichtung gemäß Anspruch 27 oder 28, wobei das Antriebsmittel ferner umfaßt:

ein Antriebsgehäuse mit einem in dem Antriebsgehäuse angeordneten Antriebsmotor und einem in dem Antriebsgehäuse komplementär zu dem Antriebsmotor angebrachten Zahnradmittel bzw. -getriebe, wobei das Getriebemittel mit dem Gewindemittel in Eingriff steht, um eine Antriebsbeziehung mit diesem herzustellen, wobei das Getriebemittel das Gewindemittel in einer Richtung dreht, wenn der Antriebsmotor in einer ersten Richtung angetrieben wird, und ferner das Gewindemittel in einer zweiten, entgegengesetzten Richtung dreht, derart, daß der Pedalarm um die Armdrehachse ge-

schwenkt wird, wenn sich das Gewindemittel dreht.

30. Ein Verfahren zum Einstellen eines Automobil-Pedalarms, welcher zur Drehung um eine Pedalarmdrehachse eingerichtet ist, bezüglich einem Bezugspunkt auf einem Reaktionselement, wobei das Verfahren folgende Schritte umfaßt:

schwenkbares Anbringen eines drehbaren Verbindungsmittels mit einer ersten Schwenkachse in einem Ende und einer zweiten Schwenkachse in einem entgegengesetzten Ende neben dem Pedalarm, wobei die erste Schwenkachse so positioniert ist bzw. wird, daß sie im wesentlichen mit der Pedalarmdrehachse ausgerichtet ist;

Festlegen des drehbaren Verbindungsmittels bezüglich dem Reaktionselement durch Anbringen des drehbaren Verbindungsmittels an dem Reaktionselement an dem Bezugspunkt; drehbares Anbringen eines drehbaren Elements um eine Drehachse;

Drehen des drehbaren Elements um die Drehachse derart, daß der Automobil-Pedalarm drehend relativ zu der Pedalarmdrehachse versetzt wird, um eine Einstellung des Pedalarms zu erreichen,

gekennzeichnet durch

Positionieren der Drehachse zwischen der ersten Schwenkachse und der zweiten Schwenkachse in dem Pedalarm oder dem drehbaren Verbindungsmittel; und

Befestigen des drehbaren Elements an dem drehbaren Verbindungsmittel oder dem Pedalarm, wobei das drehbare Element mit dem jeweils anderen, dem Pedalarm oder dem drehbaren Verbindungsmittel, in Eingriff steht.

31. Das Verfahren gemäß Anspruch 30, ferner mit dem Schritt des Einhaltens eines konstanten Abstands zwischen der Drehachse und der Armdrehachse.

32. Das Einstellverfahren gemäß Anspruch 30, ferner mit dem Schritt des Vorsehens eines Mittels zur komplementären Anbringung zu der ersten Schwenkachse derart, daß das drehbare Verbindungsmittel um die erste Schwenkachse schwenkbar an dem Pedalarm angebracht ist.

33. Das Einstellverfahren gemäß Anspruch 30, ferner mit dem Schritt:
Vorsehen eines Mittels zum Anbringen des gegenüberliegenden Endes des drehbaren Verbindungsmittels an einem Rahmenelement.

34. Das Einstellverfahren gemäß Anspruch 30 oder 32,

ferner mit dem Schritt des Vorsehens einer Zahnrad-Untersetzungseinheit und eines Motors zum Drehen des drehbaren Elements.

35. Das Einstellverfahren gemäß Anspruch 32, wobei der Schritt des Positionierens der Drehachse das Vorsehen eines Mittels zur komplementären Anbringung zu dem drehbaren Verbindungsmittel oder dem Pedalarm, derart, daß das drehbare Element drehbar an dem drehbaren Verbindungsmittel bzw. dem Pedalarm zur Drehung um die Drehachse angebracht ist, umfaßt.

36. Ein Verfahren zum Einstellen eines Pedalarms, der zur Drehung um eine Pedalarmdrehachse eingerichtet ist, bezüglich einem Bezugspunkt auf einem Reaktionselement, wobei das Verfahren folgende Schritte umfaßt:

schwenkbares Anbringen eines drehbaren Verbindungsmittels mit einer ersten Schwenkachse in einem Ende und einer zweiten Schwenkachse in einem anderen Ende neben dem Pedalarm, wobei die erste Schwenkachse so positioniert ist, daß sie im wesentlichen mit der Pedalarmdrehachse ausgerichtet ist; Festlegen des drehbaren Verbindungsmittels bezüglich dem Reaktionselement durch Anbringen des drehbaren Verbindungsmittels an dem Reaktionselement an dem Bezugspunkt um die zweite Schwenkachse;

gekennzeichnet durch

Befestigen einer Bewegungsschraube für eine drehbare Bewegung an dem drehbaren Verbindungsmittel oder dem Pedalarm derart, daß sich die Bewegungsschraube bezüglich dem drehbaren Verbindungsmittel bzw. dem Pedalarm dreht und mit einem Ende mit dem jeweils anderen, dem drehbaren Verbindungsmittel bzw. dem Pedalarm, in Eingriff steht; wobei die Drehung der Bewegungsschraube den Pedalarm bewegt und den Pedalarm um die Pedalarmdrehachse drehend versetzt, um eine Einstellung des Pedalarms zu erreichen.

37. Das Einstellverfahren gemäß Anspruch 36, ferner mit dem Schritt des Vorsehens eines Mittels zur komplementären Anbringung zu der ersten Schwenkachse derart, daß das drehbare Verbindungsmittel schwenkbar an dem Pedalarm um die Achse der ersten Schwenkachse angebracht ist.

38. Das Einstellverfahren gemäß Anspruch 36 oder 37, ferner mit dem Schritt des Vorsehens einer Zahnraduntersetzungseinheit und eines Motors zum Drehen der Bewegungsschraube.

Revendications

1. Dispositif de réglage pour régler un bras de pédale (20 ; 70) par rapport à un point de référence sur un élément de réaction (34 ; 84), ledit bras de pédale pouvant tourner autour d'un axe de rotation du bras, ledit dispositif de réglage comportant :

un élément à biellette (40 ; 62) ayant un premier axe de pivotement dans une première extrémité et un second axe de pivotement dans une autre extrémité disposée de façon opposée, ladite première extrémité dudit élément à biellette (40 ; 62) étant montée de façon pivotante sensiblement concentriquement avec ledit axe de rotation du bras ;

un moyen (42) pour le montage dudit point de référence dudit élément de réaction (34 ; 84) sur ledit élément à biellette (40 ; 62) ;

un élément tournant (28 ; 78 ; 90) monté de façon à pouvoir tourner autour d'un axe de rotation tel qu'une rotation dudit élément tournant (28 ; 78 ; 90) fait tourner ledit bras de pédale (20 ; 70) autour dudit axe de rotation du bras ; ledit élément à biellette (40 ; 62) coopérant avec ledit élément tournant (28 ; 78 ; 90) pour faire tourner ledit bras de pédale (20 ; 70) autour dudit axe de rotation du bras ; et

un moyen d'entraînement (44, 46, 48) relié audit élément tournant (28 ; 78 ; 90) pour faire tourner ledit élément tournant (28 ; 78 ; 90) autour dudit axe de rotation grâce à quoi, lorsque ledit moyen d'entraînement fait tourner ledit élément tournant (28, 78 ; 90), ledit bras de pédale (20 ; 70) tourne autour dudit axe de rotation du bras ;

caractérisé en ce que ledit élément tournant (28 ; 78 ; 90) est monté de façon à pouvoir tourner sur un dudit bras de pédale (20 ; 70) et dudit élément à biellette (40 ; 62) tout en entrant en contact avec l'autre dudit bras de pédale (20 ; 70) et dudit élément à biellette (40 ; 62),

ledit axe de rotation étant positionné entre ledit premier axe de pivotement et ledit second axe de pivotement.

2. Dispositif de réglage selon la revendication 1, comportant en outre :

un élément de bâti (14) ;

et dans lequel ladite première extrémité dudit élément à biellette (40) est relié de façon pivotante audit élément de bâti (14) autour dudit premier axe de pivotement sensiblement en alignement avec ledit axe de rotation du bras ; et ladite autre extrémité dudit élément à biellette (40) est reliée de façon pivotante audit élément de réaction afin de définir ledit second axe de pivotement.

3. Dispositif de réglage selon la revendication 1 ou 2, dans lequel ledit élément tournant est une vis motrice (90) montée de façon à pouvoir tourner sur l'un dudit élément à biellette (40) et dudit bras de pédale (20). 5
4. Dispositif de réglage selon la revendication 1 ou 2, dans lequel ledit élément tournant monté autour dudit axe de rotation comprend un élément (28 ; 78) à effet de came monté de façon à pouvoir tourner en juxtaposition audit bras de pédale (20 ; 70) pour faire tourner ledit bras de pédale autour dudit axe de rotation du bras ; ledit élément (28 ; 78) à effet de came ayant un axe de rotation de came et dans lequel en outre ledit moyen d'entraînement est relié audit élément (28 ; 78) à effet de came pour entraîner ledit élément (28 ; 78) à effet de came autour dudit axe de rotation de came. 10 15
5. Dispositif de réglage selon la revendication 4, dans lequel ledit axe de rotation de came est sensiblement parallèle audit axe de rotation du bras. 20
6. Dispositif de réglage selon la revendication 4, dans lequel ledit élément à effet de came est un disque ayant une surface de came espacée radialement dudit axe de rotation de came, ladite surface de came étant en contact de glissement avec ledit bras de pédale. 25
7. Dispositif de réglage selon la revendication 4, dans lequel : 30
 ledit élément à effet de came est monté de façon à pouvoir tourner sur ledit élément à biellette afin que ledit élément à effet de came exerce une action de came contre ledit bras de pédale pour faire tourner ledit bras de pédale autour dudit axe de rotation du bras ; et
 ledit moyen d'entraînement est monté sur ledit élément à biellette afin de faire tourner ledit moyen à effet de came autour dudit axe de rotation de came. 35 40
8. Dispositif de réglage selon la revendication 4, dans lequel : 45
 ledit élément à effet de came est monté de façon à pouvoir tourner sur ledit bras de pédale afin que ledit élément à effet de came exerce une action de came contre ledit élément à biellette pour faire tourner ledit bras de pédale autour dudit axe de rotation du bras ; et
 ledit moyen d'entraînement est monté sur ledit bras de pédale et est relié audit élément à effet de came afin de faire tourner ledit élément à effet de came autour dudit axe de rotation de came. 50 55
9. Dispositif de réglage selon la revendication 4, dans lequel :
 ledit élément à effet de came est monté de façon à pouvoir tourner sur ledit élément à biellette afin que ledit élément à effet de came exerce une action de came contre ledit bras de pédale pour faire tourner ledit bras de pédale autour dudit axe de rotation du bras ; et
 ledit moyen d'entraînement est monté à distance dudit élément à biellette et est relié audit élément à effet de came afin de faire tourner ledit élément à effet de came autour dudit axe de rotation de came.
10. Dispositif de réglage selon la revendication 4 ou 8, dans lequel ledit moyen d'entraînement comporte en outre un arbre d'entraînement prolongé (46) reliant ledit moyen d'entraînement audit élément à effet de came pour faire tourner ledit élément à effet de came autour dudit axe de rotation de came.
11. Dispositif de réglage selon la revendication 10, dans lequel ledit moyen d'entraînement comporte en outre un moteur d'entraînement (44) et un dispositif d'entraînement à engrenage (48) reliant ledit moteur d'entraînement audit arbre d'entraînement prolongé dudit moyen d'entraînement.
12. Dispositif de réglage selon la revendication 10 ou 11, dans lequel ledit arbre d'entraînement prolongé dudit moyen d'entraînement comporte en outre un pignon d'engrenage (58) fixé audit arbre d'entraînement prolongé, et dans lequel ledit élément à effet de came comporte une configuration de dents d'engrenage (56) en prise avec ledit pignon d'engrenage pour faire tourner ledit élément à effet de came autour dudit axe de rotation de came.
13. Dispositif de réglage selon la revendication 4, dans lequel ledit élément de réaction (84) est relié audit élément à biellette (62) entre ladite première extrémité et ladite autre extrémité.
14. Dispositif de réglage selon la revendication 13, dans lequel ledit moyen d'entraînement est monté à distance dudit élément à effet de came et dans lequel ledit élément à effet de came comporte un accouplement (86) pour relier ledit élément à effet de came audit moyen d'entraînement.
15. Dispositif de réglage selon la revendication 4, dans lequel :
 ledit élément de réaction (84) comporte une extrémité fixée audit élément à biellette ;
 ledit élément à biellette (62) comporte en outre une partie périphérique reliée audit élément de

réaction; et
des moyens destinés à relier ledit élément de
réaction audit élément à biellette sont prévus.

16. Dispositif de réglage selon la revendication 7, dans lequel ledit élément à effet de came monté sur ledit élément à biellette comporte en outre :

une surface de came (30 ; 80) juxtaposée audit bras de pédale ;
un moyen pour le montage dudit élément à effet de came sur ledit élément à biellette ;
et dans lequel en outre ledit moyen d'entraînement monté sur ledit élément à biellette comporte en outre :

un boîtier d'entraînement monté sur ledit élément à biellette ;
un moteur d'entraînement (44) logé dans ledit boîtier d'entraînement ; et
un moyen d'entraînement à engrenage (48) monté dans ledit boîtier d'entraînement, complémentaire dudit moteur d'entraînement, ledit moyen d'entraînement à engrenage ayant une partie en saillie (46) s'étendant dans une direction orientée vers ledit élément à effet de came et engageant ledit élément à effet de came pour établir avec lui une relation d'entraînement, ledit moyen d'entraînement à engrenage faisant tourner ledit élément à effet de came dans un sens lorsque ledit moteur d'entraînement est attaqué dans un premier sens et faisant en outre tourner ledit élément à effet de came dans un second sens, opposé, lorsque ledit moteur est attaqué dans un second sens, opposé, afin que, lorsque ledit élément à effet de came tourne, ledit bras de pédale pivote autour dudit axe de rotation du bras.

17. Dispositif de réglage selon la revendication 16, dans lequel ladite autre extrémité dudit élément à biellette présente une ouverture définissant ledit second axe de pivotement disposé centralement avec ladite ouverture.

18. Dispositif de réglage selon la revendication 8, dans lequel ledit élément à effet de came présente en outre une surface de came (30) juxtaposée audit élément à biellette ; un moyen pour le montage dudit élément à effet de came sur ledit bras de pédale étant prévu ; et dans lequel ledit moyen d'entraînement comporte en outre :

un boîtier d'entraînement monté sur ledit bras de pédale ;
un moteur d'entraînement (44) logé dans ledit

boîtier d'entraînement ;
un moyen d'entraînement à engrenage monté dans ledit boîtier d'entraînement, complémentaire dudit moteur d'entraînement, ledit moyen d'entraînement à engrenage ayant une partie en saillie (46) s'étendant dans une direction orientée vers ledit élément à effet de came et engageant ledit élément à effet de came afin d'établir avec lui une relation d'entraînement, ledit moyen d'entraînement à engrenage faisant tourner ledit élément à effet de came dans un sens lorsque ledit moteur d'attaque est attaqué dans un premier sens et faisant en outre tourner ledit élément à effet de came dans un second sens, opposé, lorsque ledit moteur d'entraînement est attaqué dans un second sens, opposé, afin que, lorsque ledit élément à effet de came tourne, ledit bras de pédale pivote autour dudit axe de rotation du bras ; et
un moyen pour le montage dudit moyen d'entraînement sur ledit bras de pédale.

19. Dispositif de réglage selon la revendication 9, dans lequel ledit élément à effet de came est monté sur ledit élément à biellette et présente une surface de came espacée radialement dudit axe de rotation de came, ladite surface de came étant juxtaposée audit bras de pédale et un moyen pour le montage dudit élément à effet de came sur ledit élément à biellette étant prévu ; et dans lequel en outre ledit moyen d'entraînement comporte une partie en saillie s'étendant dans une direction orientée vers ledit élément à effet de came et est relié fixement à celui-ci afin que, lorsque ledit moyen d'entraînement et la partie en saillie associée sont en rotation dans un premier sens, ledit élément à effet de came tourne dans ledit premier sens, ledit moyen d'entraînement et la partie en saillie associée faisant tourner ledit élément à effet de came dans un second sens, opposé, lorsque ledit moyen d'entraînement tourne dans un second sens, opposé.

20. Dispositif de réglage selon la revendication 1, dans lequel ledit élément de réaction est relié par une extrémité audit élément à biellette ; et dans lequel ledit moyen de montage comporte en outre :

une partie périphérique dudit élément à biellette reliée audit élément de réaction ; et
un moyen pour fixer ledit élément de réaction à ladite partie périphérique dudit élément à biellette.

21. Dispositif de réglage selon la revendication 20, comportant en outre :

un élément à effet de came (28) constituant ledit élément tournant, ayant une surface de ca-

me juxtaposée audit bras de pédale ;
un moyen (46) pour le montage dudit élément
à effet de came sur ledit élément à biellette ;
et dans lequel ledit moyen d'entraînement est
monté sur ledit élément à biellette, ledit moyen
d'entraînement comportant en outre :

un boîtier d'entraînement monté sur ledit
élément à biellette ;
un moteur d'entraînement (44) logé dans
ledit boîtier d'entraînement ; et
un moyen d'entraînement à engrenage
(48) monté dans ledit boîtier d'entraîne-
ment, complémentaire dudit moteur d'en-
traînement, ledit moyen d'entraînement à
engrenage ayant une partie en saillie (46)
s'étendant dans une direction orientée vers
ledit élément à effet de came et engageant
ledit élément à effet de came pour établir
avec lui une relation d'entraînement, ledit
moyen d'entraînement à engrenage fai-
sant tourner ledit élément à effet de came
dans un sens lorsque ledit moteur d'entraî-
nement est attaqué dans un premier sens
et faisant en outre tourner ledit élément à
effet de came dans un second sens, oppo-
sé, lorsque ledit moteur d'entraînement est
attaqué dans un second sens, opposé, afin
que, lorsque ledit élément à effet de came
tourne, ledit bras de pédale pivote autour
dudit axe de rotation du bras.

- 22.** Dispositif de réglage selon la revendication 4, dans lequel ledit élément à effet de came présente en outre une surface de came juxtaposée audit élément à biellette; un moyen pour le montage dudit élément à effet de came sur ledit bras de pédale étant prévu et ledit moyen d'entraînement comportant :

un boîtier d'entraînement monté sur ledit bras de pédale ;
un moteur d'entraînement logé dans ledit boîtier d'entraînement ;
un moyen d'entraînement à engrenage monté dans ledit boîtier d'entraînement, complémentaire dudit moteur d'entraînement, ledit moyen d'entraînement à engrenage ayant une partie en saillie s'étendant dans une direction orientée vers ledit élément à effet de came et engageant ledit élément à effet de came afin d'établir avec lui une relation d'entraînement, ledit moyen d'entraînement à engrenage faisant tourner ledit élément à effet de came dans un sens lorsque ledit moteur d'entraînement est attaqué dans un premier sens et faisant en outre tourner ledit élément à effet de came dans un second sens, opposé, afin que, lorsque ledit

élément à effet de came tourne, ledit bras de pédale pivote autour dudit axe de rotation du bras; et un moyen pour le montage dudit moyen d'entraînement sur ledit bras de pédale.

- 23.** Dispositif de réglage selon la revendication 21, dans lequel ladite partie périphérique dudit élément à biellette comporte ladite autre extrémité, opposée, dudit élément à biellette ayant une ouverture définissant ledit second axe de pivotement disposé centralement avec ladite ouverture.

- 24.** Dispositif de réglage selon la revendication 1, dans lequel ledit élément à biellette (40) comporte en outre :

une partie à segment reliée audit élément de réaction (34) ; et
un moyen (42) pour fixer ledit élément de réaction (34) audit élément à biellette (40) au niveau de ladite partie à segment.

- 25.** Dispositif de réglage selon la revendication 24, dans lequel ladite partie à segment dudit élément à biellette est ladite autre extrémité, opposée dudit élément à biellette (40).

- 26.** Dispositif de réglage selon la revendication 1, dans lequel ledit moyen d'entraînement comporte en outre :

un boîtier d'entraînement ayant un moteur d'entraînement (44) logé dans ledit boîtier d'entraînement et un moyen à boîte d'engrenage (48) monté dans ledit boîtier d'entraînement complémentaire dudit moteur d'entraînement, ledit moyen à boîte d'engrenage ayant une partie en saillie (46) s'étendant dans une direction orientée vers ledit élément tournant (28) et engageant ledit élément tournant afin d'établir avec lui une relation d'entraînement, ledit moyen à boîte d'engrenage faisant tourner ledit élément tournant dans un sens lorsque ledit moteur d'entraînement est attaqué dans un premier sens et faisant en outre tourner ledit élément tournant dans un second sens, opposé, lorsque ledit moteur d'entraînement est attaqué dans un second sens, opposé, afin que, lorsque ledit élément tournant tourne, ledit bras de pédale (20) pivote autour dudit axe de rotation du bras.

- 27.** Dispositif de réglage pour régler un bras de pédale (20) par rapport à un point de référence sur un élément de réaction (34), ledit bras de pédale (20) pouvant tourner autour d'un axe de rotation du bras, ledit dispositif de réglage comportant :

un élément à biellette (40) ayant un premier axe de pivotement dans une première extrémité et un second axe de pivotement dans une autre

extrémité, disposée de façon à être opposée, ladite première extrémité dudit élément à biellette étant montée de façon pivotante sensiblement concentriquement avec ledit axe de rotation du bras ;

un moyen (42) pour le montage dudit point de référence dudit élément de rotation (34) sur ledit élément à biellette (40) ;

un moyen fileté (90, 94) monté de façon à pouvoir tourner autour d'un axe de rotation espacé d'une distance prédéterminée dudit axe de rotation du bras, de façon qu'une rotation dudit moyen fileté (90, 94) provoque une rotation dudit bras de pédale (20) autour dudit axe de rotation du bras, ledit élément à biellette (40) coopérant avec ledit moyen fileté (90, 94) pour faire tourner ledit bras de pédale (20) autour dudit axe de rotation du bras ; et

un moyen d'entraînement relié audit moyen fileté (90, 94) pour faire tourner ledit moyen fileté (90, 94) autour dudit axe de rotation de manière que, lorsque ledit moyen d'entraînement fait tourner ledit moyen fileté (90, 94), ledit bras de pédale tourne autour dudit axe de rotation du bras ;

caractérisé en ce que ledit moyen fileté (90, 94) est monté de façon à pouvoir tourner sur l'un dudit bras de pédale (20) et dudit élément à biellette (40) et comporte une extrémité (94) en appui contre l'autre dudit bras de pédale (20) et dudit élément à biellette (40).

28. Dispositif de réglage selon la revendication 27, dans lequel ledit moyen fileté (90, 94) destiné à faire tourner ledit bras de pédale (20) est une vis motrice (90) montée de façon à pouvoir tourner sur l'un dudit élément à biellette (40) et dudit bras de pédale (20).

29. Dispositif de réglage selon la revendication 27 ou 28, dans lequel ledit moyen d'entraînement comporte en outre :

un boîtier d'entraînement ayant un moteur d'entraînement logé dans ledit boîtier d'entraînement, et un moyen à engrenage monté dans ledit boîtier d'entraînement complémentaire dudit moteur d'entraînement, ledit moyen à boîte d'engrenage engageant ledit moyen fileté pour établir avec lui une relation d'entraînement, ledit moyen à boîte d'engrenage faisant tourner ledit moyen fileté dans un sens lorsque ledit moteur d'entraînement est attaqué dans un premier sens et faisant en outre tourner ledit moyen fileté dans un second sens, opposé, de manière que, lorsque ledit moyen fileté tourne, ledit bras de pédale pivote autour dudit axe de rotation du bras.

30. Procédé pour régler un bras de pédale d'automobile

conçu pour tourner autour d'un axe de rotation du bras de pédale par rapport à un point de référence sur un élément de réaction, ledit procédé comprenant les étapes dans lesquelles :

on monte de façon pivotante un moyen à biellette pouvant tourner, ayant un premier axe de pivotement dans une première extrémité et un second axe de pivotement dans une extrémité opposée juxtaposée audit bras de pédale, ledit premier axe de pivotement étant positionné de façon à être sensiblement aligné avec ledit axe de rotation du bras de pédale ;

on immobilise ledit moyen à biellette pouvant tourner par rapport audit élément de réaction en reliant ledit moyen à biellette pouvant tourner audit élément de réaction au niveau dudit point de référence ;

on monte de façon à lui permettre de tourner un élément pouvant tourner autour d'un axe de rotation ;

on fait tourner ledit élément pouvant tourner autour dudit axe de rotation afin que ledit bras de pédale d'automobile soit déplacé en tournant par rapport audit axe de rotation du bras de pédale pour réaliser un réglage dudit bras de pédale,

caractérisé par

le positionnement dudit axe de rotation entre ledit premier axe de pivotement et ledit second axe de pivotement dans une première des pièces constituées dudit bras de pédale et dudit moyen à biellette pouvant tourner ; et

la fixation dudit élément pouvant tourner à ladite première des pièces constituées dudit moyen à biellette pouvant tourner et dudit bras de pédale, ledit élément pouvant tourner engageant l'autre des pièces constituées dudit bras de pédale et dudit moyen à biellette pouvant tourner.

31. Procédé selon la revendication 30, comprenant en outre l'étape consistant à maintenir une distance constante entre ledit axe de rotation et ledit axe de rotation du bras.

32. Procédé de réglage selon la revendication 30, comprenant en outre l'étape consistant à utiliser un moyen de liaison complémentaire avec ledit premier axe de pivotement afin que ledit moyen à biellette pouvant tourner soit relié de façon pivotante audit bras de pédale autour dudit premier axe de pivotement.

33. Procédé de réglage selon la revendication 30, comprenant en outre l'étape dans laquelle :

on utilise un moyen pour le montage de ladite extrémité opposée dudit moyen à biellette pouvant tourner sur un élément de bâti.

34. Procédé de réglage selon la revendication 30 ou 32, comprenant en outre l'étape consistant à utiliser une unité de réduction à engrenage et un moteur pour faire tourner ledit élément pouvant tourner. 5

35. Procédé de réglage selon la revendication 32, dans lequel ladite étape de positionnement dudit axe de rotation comprend l'utilisation d'un moyen de liaison complémentaire avec ladite première des pièces constituées dudit moyen à biellette pouvant tourner et dudit bras de pédale afin que ledit élément pouvant tourner soit relié de façon à pouvoir tourner à ladite première des pièces constituées dudit moyen à biellette pouvant tourner et dudit bras de pédale pour tourner autour dudit axe de rotation. 10 15 20

36. Procédé de réglage d'un bras de pédale conçu pour tourner autour d'un axe de rotation de bras de pédale par rapport à un point de référence sur un élément de réaction, ledit procédé comprenant les étapes dans lesquelles : 25

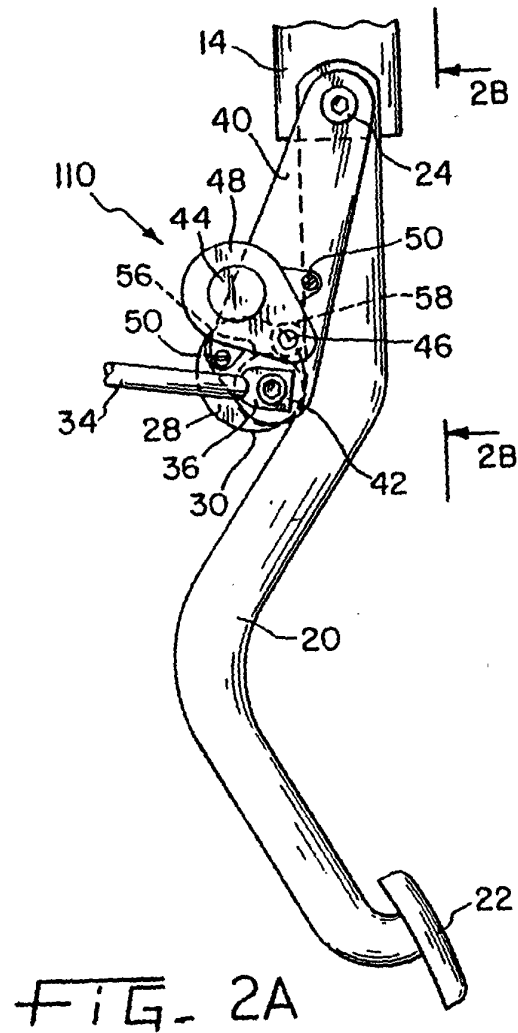
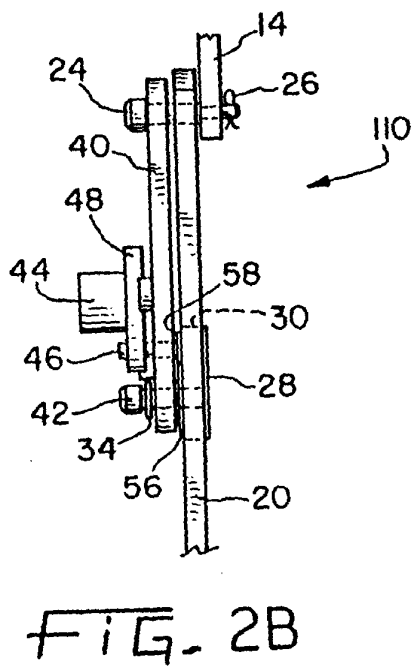
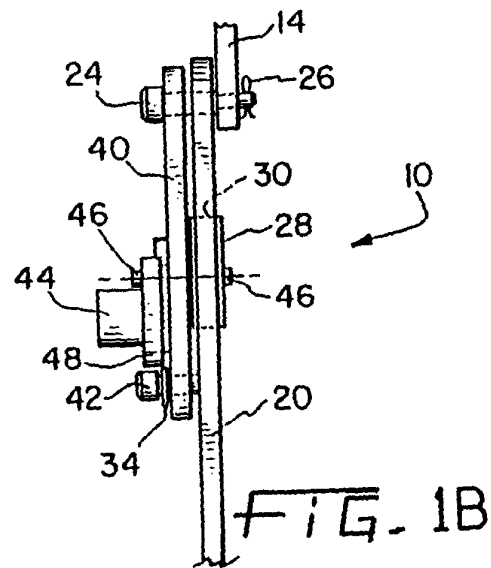
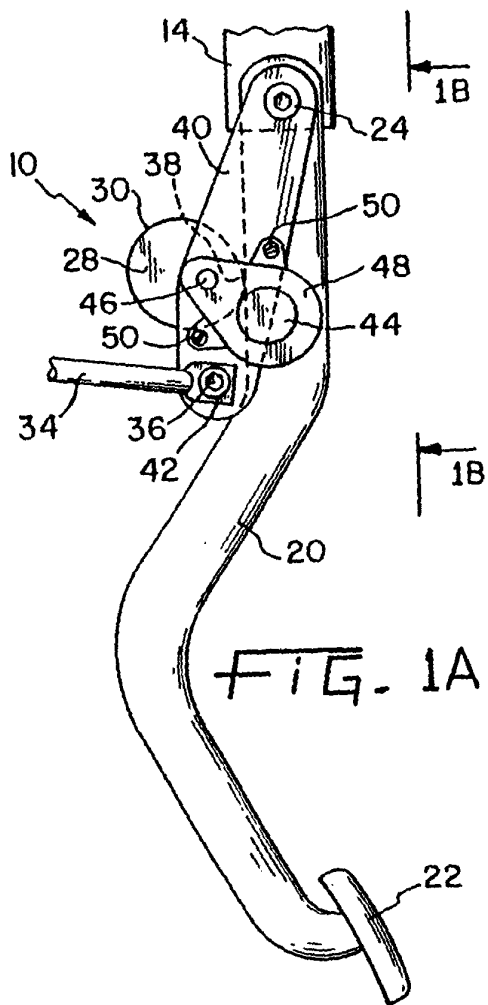
on monte de façon pivotante un moyen à biellette pouvant tourner ayant un premier axe de pivotement dans une première extrémité et un second axe de pivotement dans une autre extrémité, juxtaposée audit bras de pédale, ledit premier axe de pivotement étant positionné de façon à être sensiblement aligné avec ledit axe de rotation du bras de pédale ; 30
on immobilise ledit moyen à biellette pouvant tourner par rapport audit élément de réaction en reliant ledit moyen à biellette pouvant tourner audit élément de réaction au niveau dudit point de référence autour dudit second axe de pivotement ; 35 40

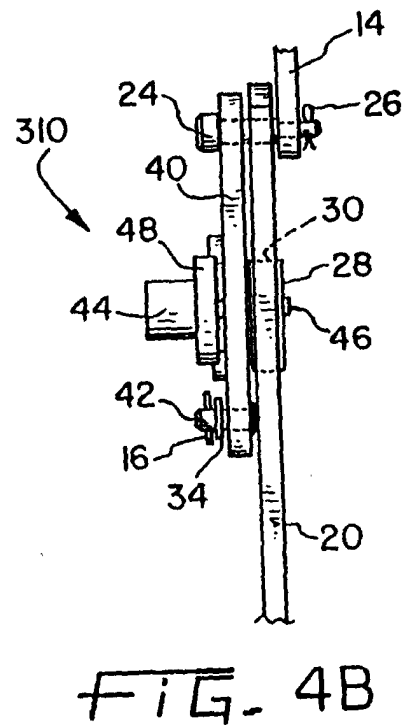
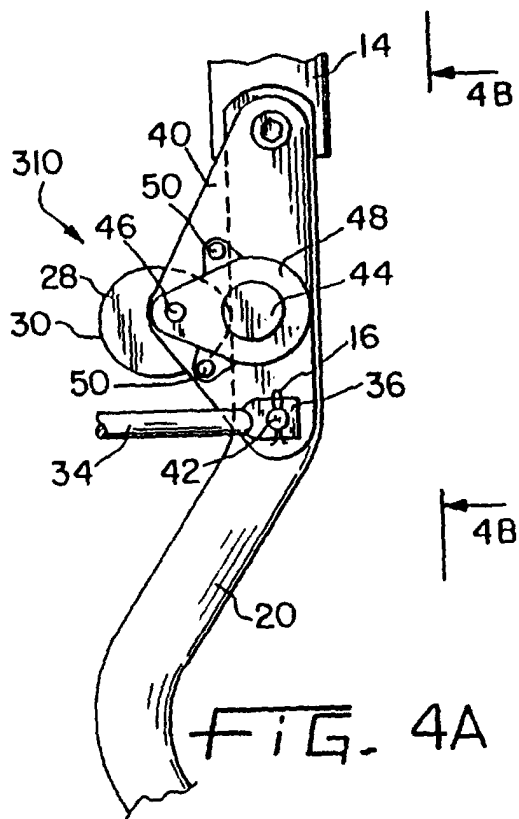
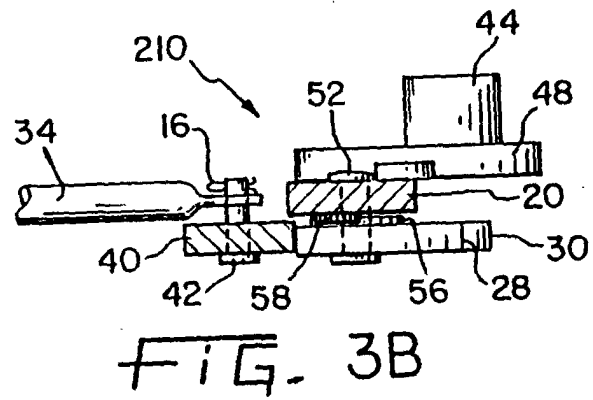
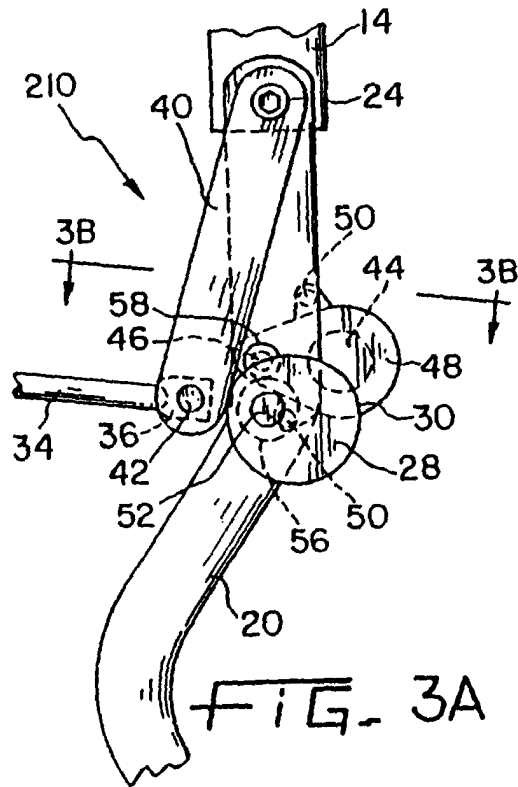
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la fixation d'une vis motrice pouvant effectuer un mouvement de rotation à une première des pièces constituées dudit moyen à biellette pouvant tourner et dudit bras de pédale de façon que ladite vis motrice tourne par rapport à ladite première des pièces constituées dudit moyen à biellette pouvant tourner et dudit bras de pédale et engage par une extrémité l'autre desdites pièces constituées dudit moyen à biellette pouvant tourner et dudit bras de pédale ; 45 50
grâce à quoi une rotation de ladite vis motrice déplace ledit bras de pédale et déplace en rotation ledit bras de pédale autour dudit axe de rotation du bras de pédale pour réaliser un réglage dudit bras de pédale. 55

37. Procédé de réglage selon la revendication 36, comprenant en outre l'étape d'utilisation d'un moyen de liaison complémentaire avec ledit premier axe de pivotement de façon que ledit moyen à biellette pouvant tourner soit relié de façon pivotante audit bras de pédale autour dudit premier axe de pivotement.

38. Procédé de réglage selon la revendication 36 ou 37, comprenant en outre l'étape d'utilisation d'une unité de réduction à engrenage et d'un moteur pour faire tourner ladite vis motrice.





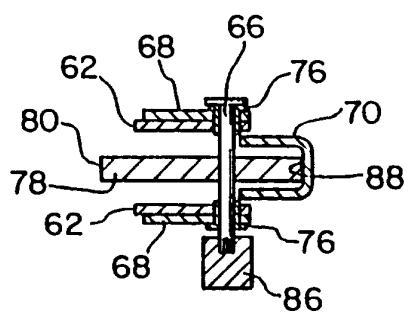


FIG. 5B

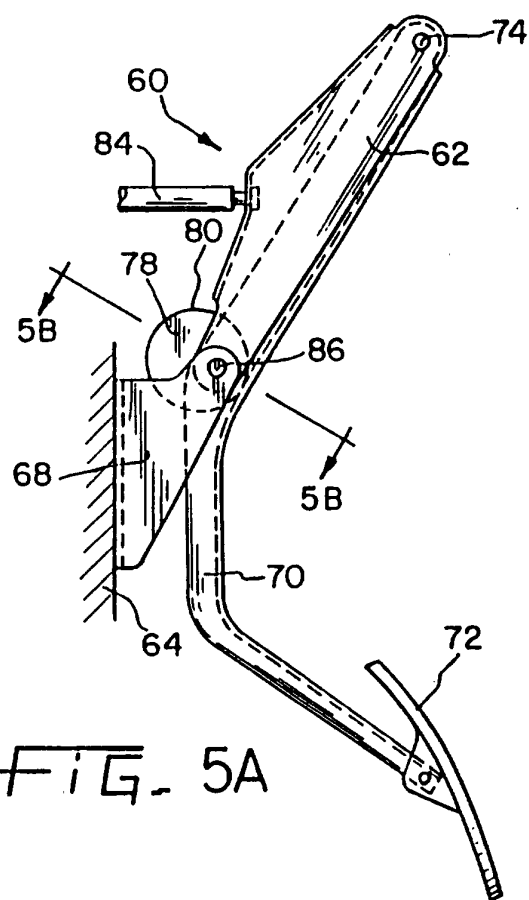


FIG. 5A

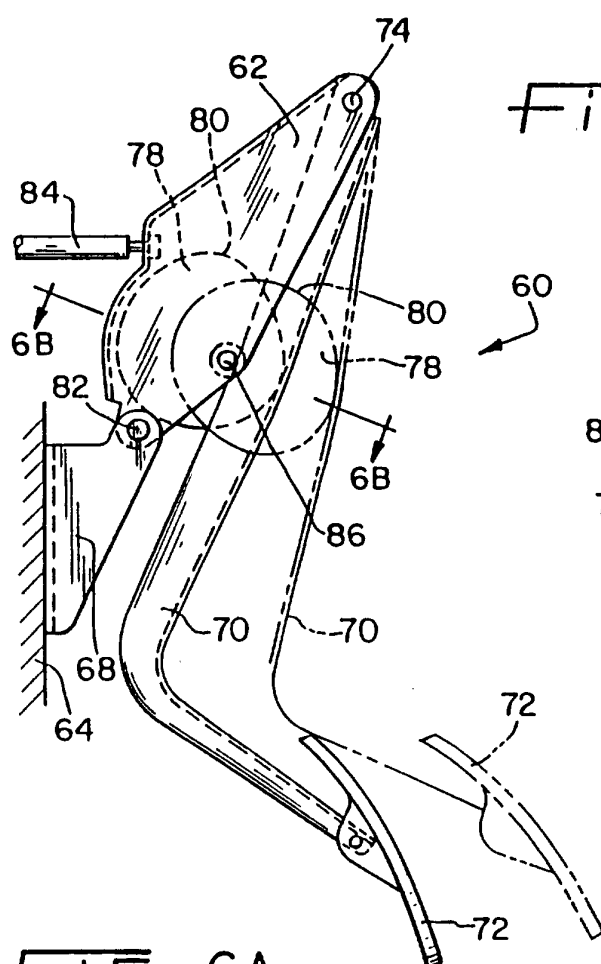


FIG. 6A

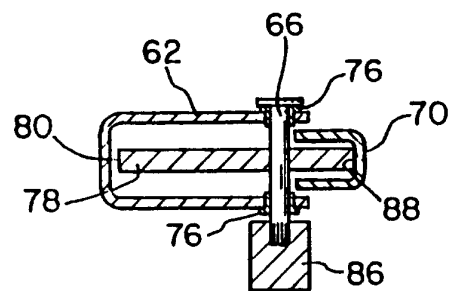


FIG. 6B

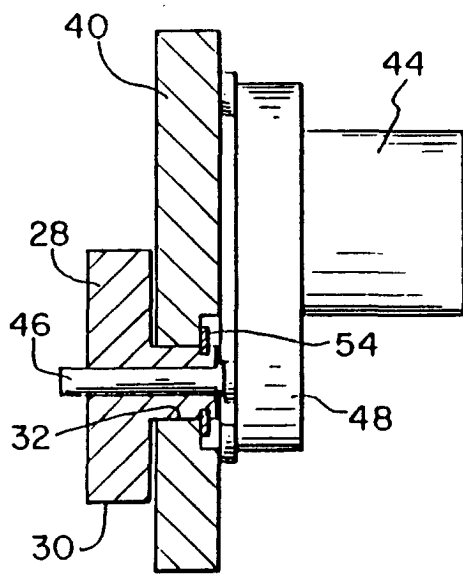


FIG. 7

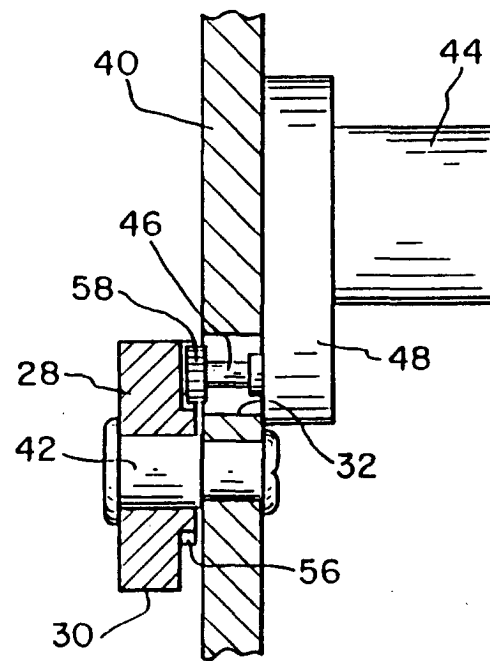


FIG. 8

