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(54) **RAISABLE LEG REST**

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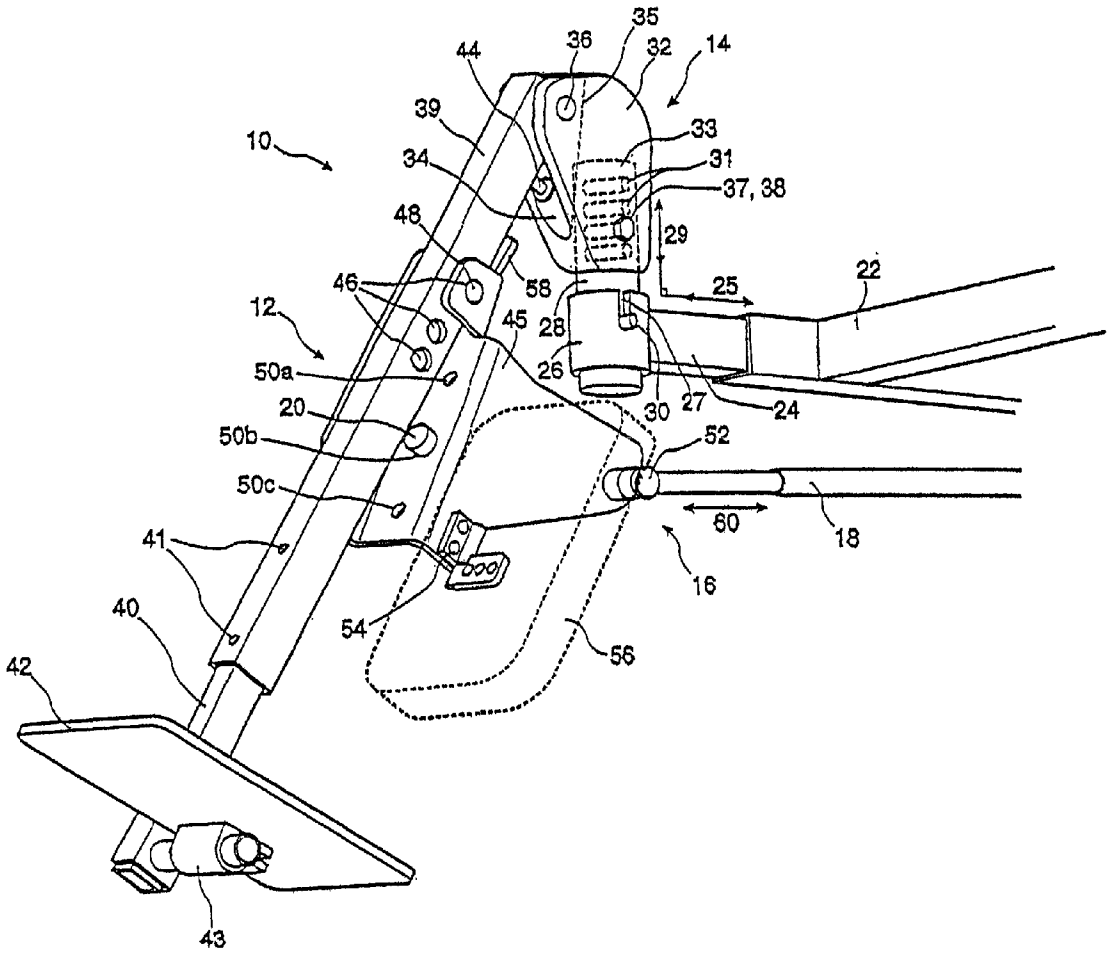
(57) **ABSTRACT**

A raisable legrest for a wheelchair, the legrest comprising: a frame, to support a user's lower leg, the frame being attachable to the wheelchair, the frame being movable between a lowered position and a raised position about a pivot point when attached to the wheelchair; and a pivot point position adjustor, located between the pivot point and the wheelchair, for adjusting the position of the pivot point in at least a vertical direction; wherein the pivot point can be positioned by the pivot point position adjustor to be coaxial with an approximate center of rotation of a knee of the user.



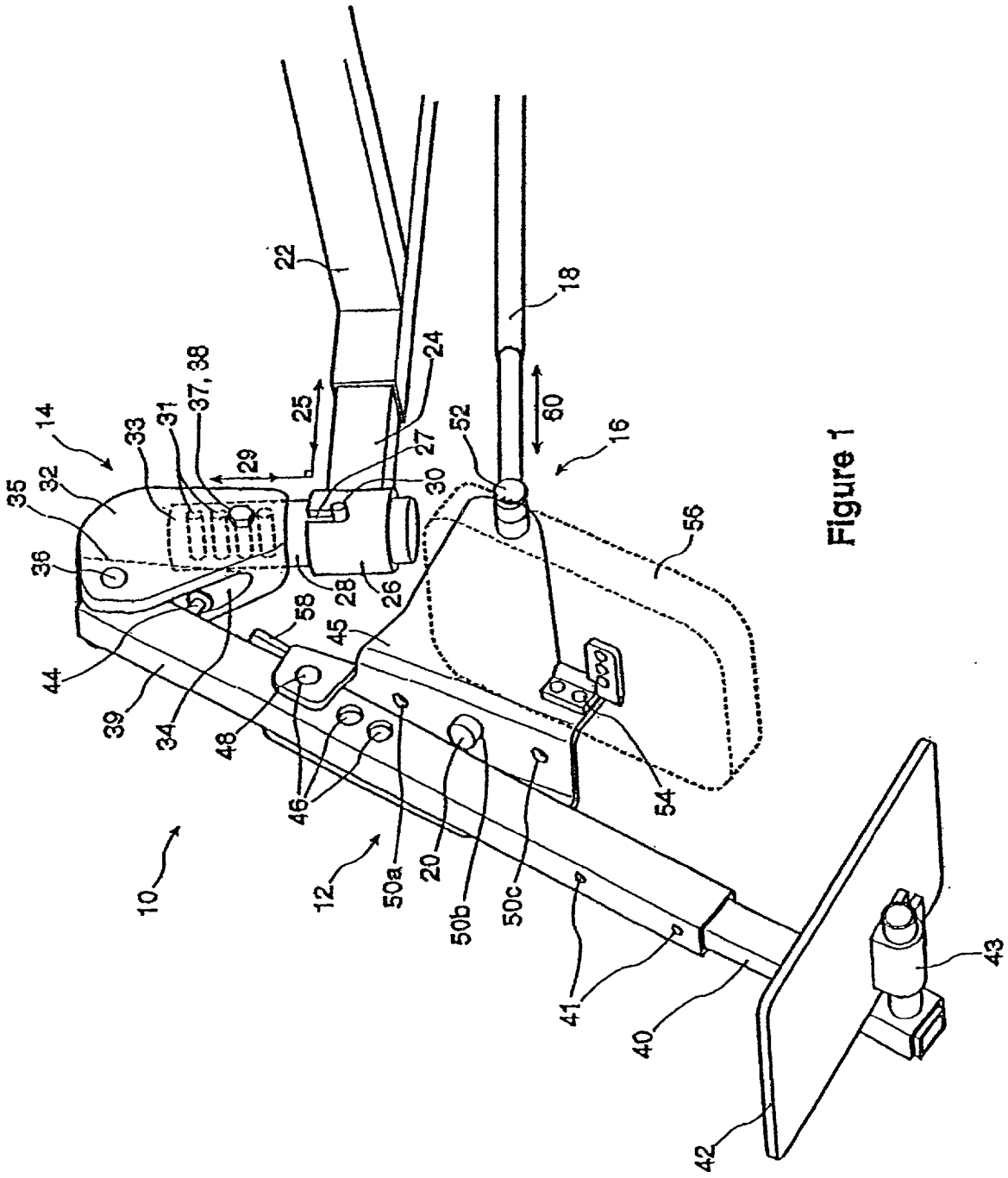

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Figure 1

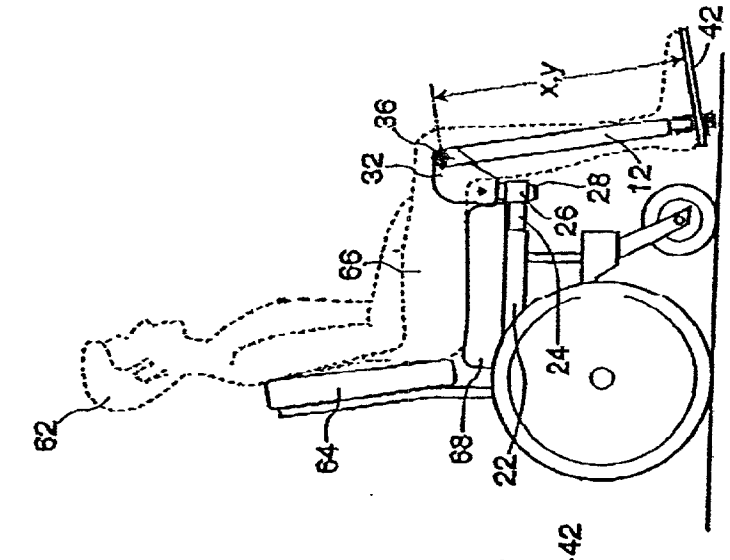

Figure 2c

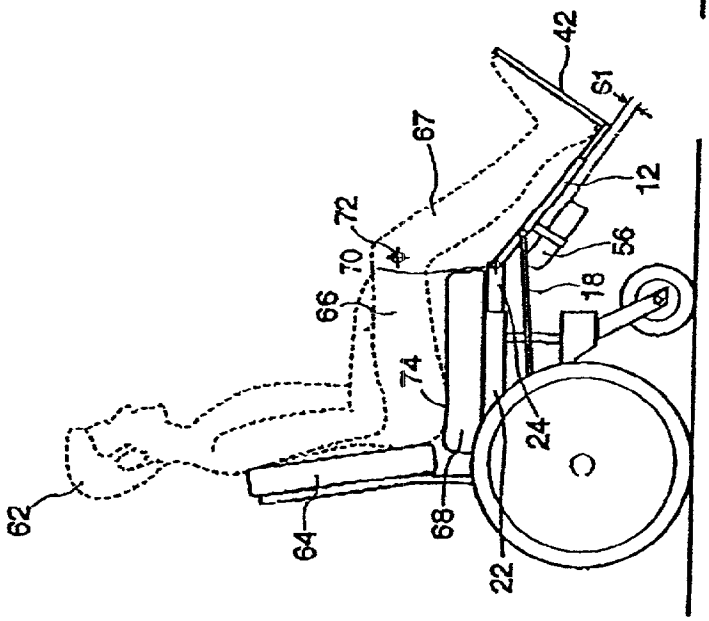

Figure 2b
Prior Art

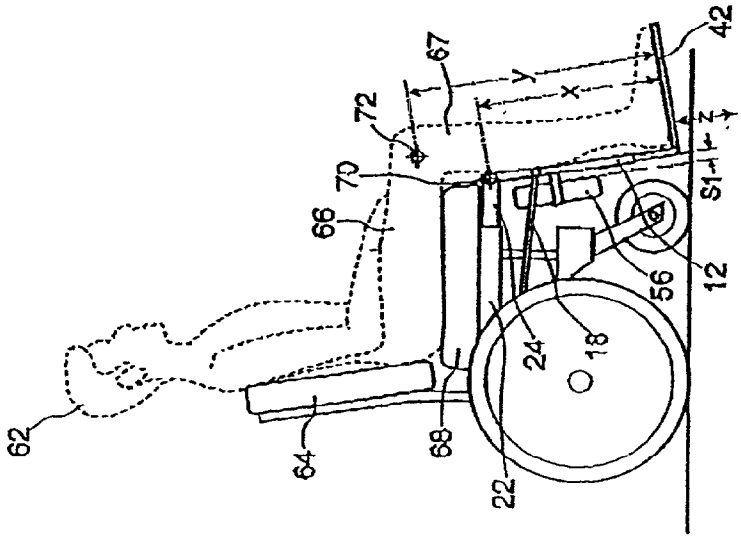

Figure 2a
Prior Art

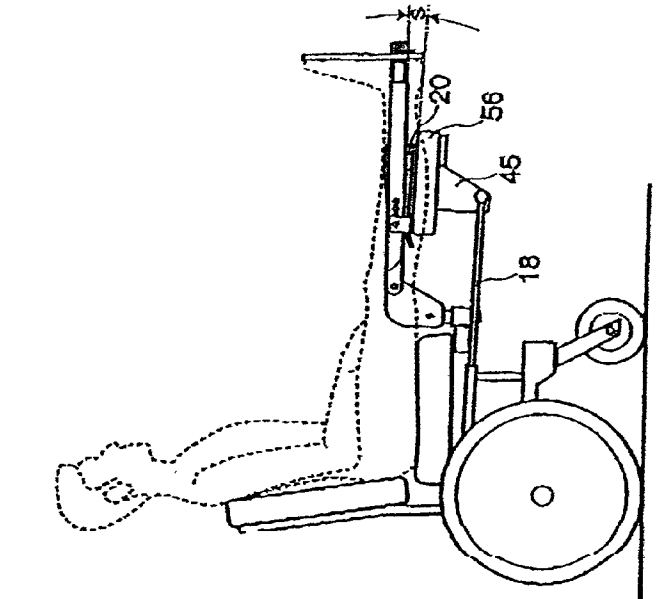

Figure 3c

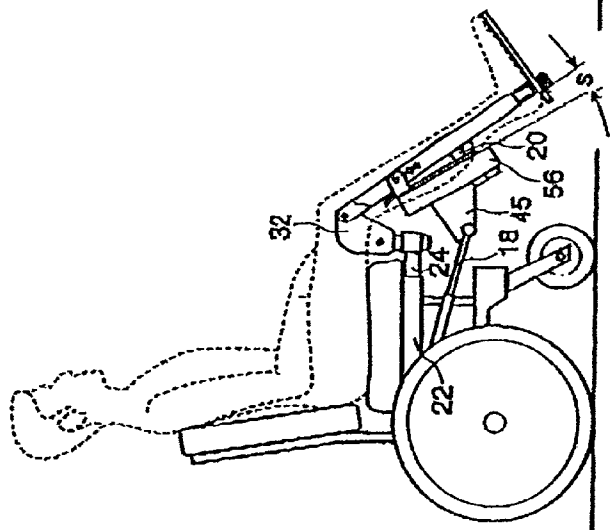

Figure 3b

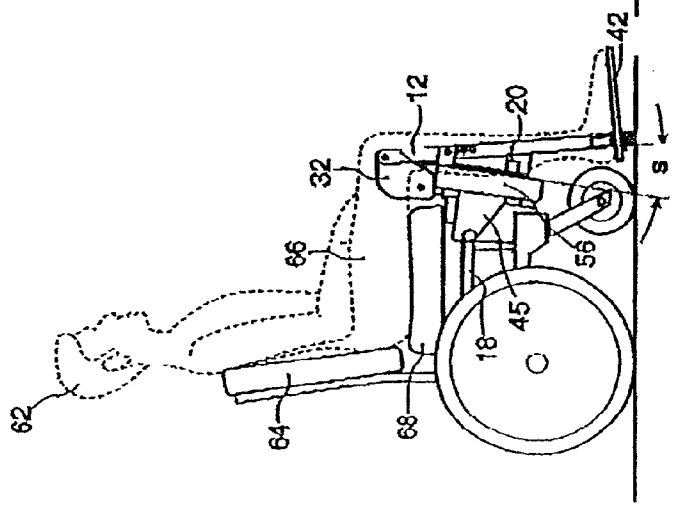

Figure 3a

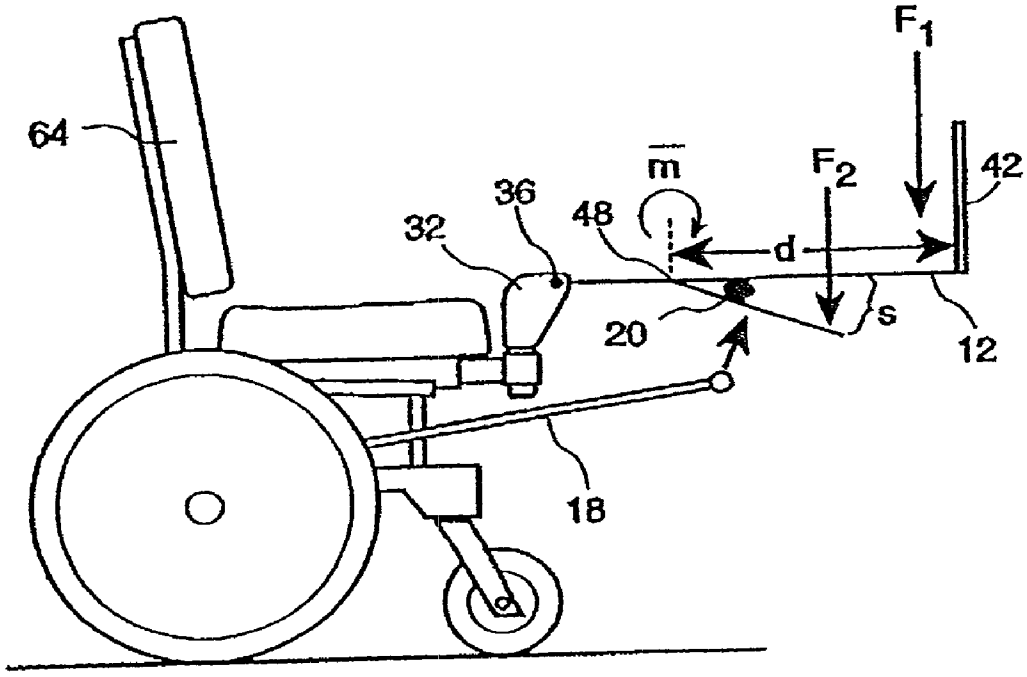

Figure 4

RAISABLE LEG REST

FIELD OF THE INVENTION

[0001] This invention relates to the general field of wheelchairs, and more particularly to wheelchairs which include leg rests to support the wheelchair user's legs.

BACKGROUND OF THE INVENTION

[0002] Wheelchairs have been known and used for many years to assist disabled people in moving about. Wheelchairs generally include a mobile platform, which includes the base and wheels, a seat mounted to the base, and legrests to comfortably secure and support the wheelchair user's legs. Since most wheelchair users are confined to their chairs for extended periods, wheelchairs are usually designed to provide a variety of sitting positions. This enhances user comfort and enables the user to relieve excessive pressure in any single area, which can cause sores. The need for variety has given rise to wheelchairs with such features as seats that tilt or recline, and raisable leg rests. Since individual wheelchair users vary greatly in size and body type, it is a challenge to construct a chair that is sufficiently versatile in providing a range of positions suitable for many people, while using mechanisms that are safe, reliable, and preferably low cost.

[0003] Raisable legrests in particular present certain problems. Legrests are designed to support a user's lower leg and move it between a lowered position and a raised position. The lower leg range of motion may be from a vertical (leg bent 90 degrees) to horizontal (leg straight, parallel to ground). Legrests typically include a pivoting down tube with a footplate, a calf pad, and an actuator to move the down tube between selected positions. Generally the weight of the lower leg will be supported in any given position by the footplate and the calf pad, with the calf pad taking on more weight as the legrest is raised.

[0004] A problem with this arrangement is that the user's lower leg is typically longer than the down tube. As the leg rest is raised there is an inward pressure created on the user's foot from the footplate. This will force the user's knee to pop up, lifting the upper leg off the seat to some extent. The upper leg will therefore lack support, and there will be localized pressure at the contact point with the seat. Attempted solutions in the prior art usually involve providing an extension mechanism to extend or retract the down tube telescopically in accordance with the raising or lowering of the legrest. These solutions however are generally complicated, prone to breakdown, and costly. It is also difficult to provide a mechanism that works effectively for users of varying size.

[0005] An example of such a structure is shown in U.S. Pat. No. 5,711,580 to Barclay, which uses two down tubes to move the footplate. The second down tube comprises two link arms connected at an unsupported, exposed joint **36**. Aside from the difficulty of making such a structure perform as intended, it can be appreciated that the exposed link arms and joint structure may be easily damaged in the course of daily use.

[0006] Other problems associated with raisable leg rests concern the support provided by the calf pad as the legrest is raised. To begin with, the legrest length problem described above may lead to the user's leg lifting off the legrest. Another issue arises from the fact that most users need increasing calf support as the legrest is raised, but minimal or no support when the legrest is in the low end of its range. In fact, contact with an unneeded calf pad can be uncomfortable when the leg rest is in a vertical position. Calf pad support is related to the distance or spacing between the calf pad and the down tube. However, most legrests require the user to select a single predetermined setting for the calf pad spacing, which then remains fixed over the whole range of motion. It can be difficult to find a single setting that is both close enough to provide adequate support while the legrest is being raised, and at the same time far enough apart to be comfortable when the legrest is in a substantially lowered position. As a result, most users are forced to tradeoff a preferred level of comfort in one position against a lesser level of comfort in another position.

[0007] A further issue, somewhat related to the above, is that users may have very different preferences regarding the support provided by the calf pad relative to the footplate. The wheelchair using population is as diverse as the general population, and people will vary greatly in size, weight, leg shape, individual areas of sensitivity or injury, as well as matters of personal comfort. For example, a person with heavy calves may be more comfortable with greater calf support relative to the footplate, while another may prefer the opposite, perhaps to relieve pressure from a skin condition at the calf.

[0008] These matters have not been adequately addressed by the prior art. An attempt to address the issue of user comfort in a wheelchair legrest is shown in U.S. Pat. No. 3,189,384 to Bliss. This patent discloses a calf pad mounted to the down tube through tubular rubber elements. As the legrest rises, the calf pad can shift into a more comfortable angular postion for the user due to the resiliency of the rubber. While Bliss may provide a marginal improvement in comfort, it does not address any of the calf pad support problems described above.

[0009] Besides reasons of comfort, having a calf pad retract as far as possible when the legrest is in a fully lowered position is generally desirable because it shortens the overall length of the wheelchair, which enhances manoeuvrability. Having a little extra space behind the calf may allow users to push their feet back, shortening the effective chair length even further. For some wheelchair users in cramped or small residential environments, even a small improvement in this aspect can result in much improved manoeuvrability and quality of life.

[0010] Yet another problem with raisable legrests is that they are susceptible to damage from banging into walls, doors, and other structures, which can occur frequently due to extensive daily use. The popular powered wheelchairs can reach speeds of 8 m.p.h., exacerbating the problem. The problem is most acute with respect to actuators, since they tend to get easily damaged by sudden shocks and are costly to replace.

[0011] Unless these and other practical problems associated with wheelchair legrests are resolved, wheelchair users will continue to experience discomfort from using legrests that are costly, ineffective, and unreliable. Such considerations may affect user behaviour, leading to avoidance of desired leg positions that have been rendered uncomfortable

due to legrest inadequacies. Some users may also become excessively cautious for fear of an accidental bump that would incur costly damage to the actuator. For people who are already compelled to spend the greater part of their lives confined to a wheelchair, such loss of enjoyment is especially unfortunate.

SUMMARY OF THE INVENTION

[0012] What is desired is a raisable legrest which overcomes the problems associated with the current devices used for raising the legs of wheelchair users.

[0013] Most particularly, the legrest device should allow the user to raise his or her lower leg over a full range of motion. Preferably, the lower leg should be raisable from a lowered, generally vertical position where the lower leg is approximately perpendicular to the ground to a raised, generally horizontal position where the lower leg is approximately parallel to the ground. Throughout the range of motion of the leg the legrest should comfortably support the lower leg, without applying inward pressure on the user's foot, which causes the knee to lift, raising the upper leg off the seat and the lower leg off the legrest. The legrest should preferably also provide adequate and comfortable support at the user's calf for any legrest elevation, while at the same time reducing or eliminating pressure on the calf when the legrest is in the vertical or down position. There would also be the added benefit of shortening the length of the chair, or providing more space behind the calf, for enhanced manoeuverability. It would be advantageous as well to provide the user with the means to adjust the legrest to suit his or her individual needs. In this way, the user would experience an improved degree of comfort and would thereby be encouraged to use the legrest without hesitation in accordance with his or her personal inclination. Preferably the device would be relatively simple in construction to help keep the cost of the device low and yet still have a high reliability. Lastly, it would be desirable if the legrest device were easy to install both on new wheelchairs and as an easily attached upgrade to existing wheelchairs.

[0014] The raisable legrest device of the present invention includes a means for adjusting the position of the legrest pivot point in at least a vertical direction, so that the pivot point can be positioned close to the axis of rotation of the user's knee. This allows the legrest down tube to match the length of the user's lower leg. In this way the legrest down tube is adequate to support the leg at any raised position, and a telescoping mechanism is not needed. Calf support is improved by pivotally connecting the calf support to the down tube, directing the actuator to act on the pivotable calf pad rather than the down tube, and by installing a compressible element such as a rubber pad between the calf pad and down tube. As the legrest is raised, the calf pad accepts an increasing portion of the leg's weight, causing the rubber pad to compress and bringing the calf pad closer to the down tube. As the legrest is lowered, the rubber pad is less compressed, and it acts to separate the calf pad from the down tube. In this way the legrest device of the present invention varies support on the calf as the legrest moves through its full range of motion. A stop on the down tube protects the actuator from impact when the legrest is in the down position, and the rubber pad provides similar protection when the legrest is in a raised position.

[0015] Accordingly, there is provided a raisable legrest for a wheelchair, the legrest comprising:

[0016] a frame, to support a user's lower leg, said frame being attachable to the wheelchair, said frame being movable between a lowered position and a raised position about a pivot point when attached to said wheelchair; and

[0017] a pivot point position adjustor, located between the pivot point and the wheelchair, for adjusting the position of the pivot point in at least a vertical direction;

[0018] wherein the pivot point can be positioned by the pivot point position adjustor to be coaxial with an approximate center of rotation of a knee of the user.

[0019] According to another aspect of the invention, there is further provided:

[0020] a calf support to further support the user's lower leg, said calf support being pivotally connected to the frame at a frame pivot point;

[0021] an actuator, to apply a force on the calf support, to move said frame between the lowered position and the raised position; and

[0022] a compressible positioning element, positioned between the calf support and the frame, for permitting the calf support position relative to said frame to be varied as a moment about said frame pivot point changes;

[0023] wherein, as said moment increases about said frame pivot point, said compressible positioning element compresses, and said calf pad support moves closer to said frame to provide support to the lower leg of the user.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024] Reference will now be made, by way of example only, to preferred embodiments of the invention as illustrated in the attached figures.

[0025] **FIG. 1** is a perspective view of the raised legrest of the present invention;

[0026] **FIG. 2***a* is a side view of a wheelchair equipped with a conventional legrest device, with the legrest device in a lowered position;

[0027] **FIG. 2***b* is a view of the wheelchair of **FIG. 2***a*, with the legrest device in a raised position;

[0028] **FIG. 2***c* is a side view of a wheelchair equipped with the legrest device of the present invention, with the legrest device in a lowered position;

[0029] **FIG. 3***a* is a side view of a wheelchair equipped with the legrest device of **FIG. 1** of the present invention, with the legrest device in a fully lowered or vertical position;

[0030] **FIG. 3***b* is a view of the wheelchair of **FIG. 3***a*, with the legrest device in a raised position;

[0031] **FIG. 3***c* is a view of the wheelchair of **FIG. 3***a*, with the legrest device in a fully raised or horizontal position; and

[0032] **FIG. 4** is a schematic view of the legrest device of the present invention, showing the forces acting on the device.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0033] The raisable legrest apparatus or device of the present invention is shown in **FIG. 1**. The apparatus is generally indicated with reference numeral **10**, and broadly comprises a frame or down tube **12**, a pivot point position adjustor **14**, a calf support **16**, an actuator **18**, and a compressible positioning element **20**.

[0034] The present invention **10** attaches to a wheelchair and provides support for a wheelchair user's lower leg as the leg is moved between a lowered and a raised position. In **FIG. 1** the device **10** is shown attached to a wheelchair frame or seat frame **22** that is part of a wheelchair (not shown). The seat frame **22** is a generally preferred point of attachment since it is secure, conveniently located, and typically constructed of a hollow but high strength material such as steel.

[0035] As shown in **FIG. 1, a** horizontal element **24** fits slidably within the seat frame **22** and is adjustable in a forward and rearward direction as indicated by arrow **25**. Instead of being constructed as a straight element, the horizontal element **24** can also be curved outwards to provide a wider space for the user's leg. Not shown in the figure is a releasable holder which can be set to hold element **24** in place at a desired horizontal position. The releasable holder may be, for example, holes in the seat frame **22** and element **24**, though which a bolt may be inserted. Thus, upon initial installation a preferred horizontal position can be selected to suit the user, and the element **24** can be held or locked in place by said releasable holder.

[0036] Returning to **FIG. 1, a** legrest receiver or holder **26** in the general form of a hollow cylinder is attached towards a forward end of horizontal element **24**. The receiver **26** has two notches **27** cut out of its upper surface. One notch **27** is visible in **FIG. 1**, with the other one positioned on the exact opposite side of the cylinder.

[0037] A vertical element **28** fits slidably within legrest receiver **26** at right angles to the movement of horizontal element **24** as indicated by arrow **29**. This connection is facilitated by having at least one of the vertical element **28** or the holder **26** be hollow, so the other element can slidably fit within the hollow element. The vertical element **28** has a discrete number of connection points or holes **31**, shown in outline in **FIG. 1**. There is also a dowel pin **30** built into the vertical element **28**. It can be seen that the dowel pin **30** is sized and shaped to slidably engage the notch **27**, so that vertical element **28** rests on and is connected to legrest receiver or holder **26**. Once inserted, vertical element **28** is prevented from rotating by the dowel pin **30** in the notch **27**.

[0038] A pivot block **32** is adjustably connected towards a top end of vertical element **28**. The pivot block **32** is preferably a solid block with a hollow section **33** sized and shaped to receive the vertical element **28**, and a carved-out section **34** having a back wall **35** and a pivot pin or pivot point **36**.

[0039] It can be seen from **FIG. 1** that the pivot block **32** can be adjustably connected to vertical element **28** by inserting a fastener or bolt **37** through a hole **38** in the hollow section **33** of the pivot block **32**, and continuing through one of holes **31** in vertical element **28**. It can be appreciated that other means of connection may also be used as long as the vertical element **28** and pivot block **32** can be adjustably and securely connected. This may include, for example, a continuous type of connection that allows for more incremental variations in vertical height.

[0040] It can now be appreciated that the pivot block **32**, which supports pivot point **36**, can be raised to a desired vertical height in a direction along arrow **29** by selecting one of the holes **31** in the vertical element **28** to insert the bolt **37**. Upon bolting, the vertical element **28** and pivot block **32** will be fixed together, and so the pivot point **36** will be located at a fixed vertical height. In this way the pivot point **36** is adjustable in at least a vertical direction. It is preferred that the range of vertical height adjustment of pivot point **36** be at least 2 inches. Moreover, setting the position of horizontal element **24** will set a horizontal position of pivot point **36**.

[0041] The pivot point position adjustor **14** according to the present invention is located between the pivot point and the wheelchair and comprehends a means of adjusting the position of the pivot point **36** in at least a vertical direction. The means of adjustment may be generally described by an extendable vertical support element which supports the pivot point.

[0042] For example, in the preferred embodiment of **FIG. 1** described above, the extendable vertical support element may include the vertical element **28**, pivot block **32**, and fastener or bolt **37** which adjust the position of the pivot point **36** in a vertical direction by means of a rack and pin connection. The fastener or bolt **37** holds the extendable vertical support element at a fixed vertical height. The extendable vertical support element may alternatively be considered to be the vertical element **28** and fastener **37** alone, without the pivot block **32**, because elements **28** and **37** are sufficient to adjust the vertical position of the pivot point **36**. The extendable vertical support element therefore may be said to engage the holder at one end and the pivot block at the other end, and is adjustably connected therebetween.

[0043] A feature of this embodiment is that the vertical adjustability function is separate from the means of attachment to the wheelchair. As noted, the extendable vertical support element or vertical element **28** and holder **26** fit together in a dowel pin and notch arrangement. This arrangement therefore has the advantage of providing a quick release coupling, since the legrest **10** can be easily and quickly attached to or removed from the wheelchair by simply placing the vertical element **28** in the holder **26** or by lifting it out.

[0044] While the above arrangement is preferred because of the quick release coupling feature, the present invention comprehends all mechanically equivalent forms, such as threaded connections, releasably clampable connections, or the like that permit a vertical adjustment of the pivot point. For example, in an alternative embodiment the extendable vertical support element may be a holder **26** in the form of a releasable clamp and a vertical element **28** having a pivot point **36**. With the clamp released, the vertical element **28** could be moved in a vertical direction. The releasable clamp

could then be clamped to set the vertical element **28**, and with it the pivot point **36**, at a fixed vertical height. The releasable clamp may also include a fastener such as a screw or bolt to hold the vertical element **28** at a fixed vertical height.

[**0045**] It can be appreciated that in this embodiment the pivot point **36** could be supported by a pivot block fixedly attached to vertical element **28**, or as noted the pivot point **36** could attach directly to the vertical element **28** and no pivot block is needed. Thus while the pivot block **32** is a convenient element to use to attach the pivot point **36**, as long as there is an extendable vertical support element present elsewhere in the pivot point position adjustor to adjust the height of the pivot point in a vertical direction, a separate pivot block **32** is not necessary. However, it can also be appreciated that since the extendable vertical support element adjusts the position of the pivot point in a vertical direction, the extendable vertical support element will preferably have a top end and a bottom end, with the pivot point being located towards the top end.

[**0046**] For additional flexibility the pivot point position adjustor **14** may include a horizontal adjustor comprising means to position the pivot point in a horizontal direction. The horizontal adjustor may include, for example, the horizontal element **24** and releasable holder described above.

[**0047**] The frame or down tube **12** is attachable to the wheelchair through the pivot point **36**. It can be seen in **FIG. 1** that the frame **12** is attached to the pivot point **36** at a top of the frame **12**. Accordingly, as the frame **12** pivots or swings about pivot point **36** in a downward direction it can be appreciated that the frame is movable into a lowered position. Similarly, as the frame **12** pivots or swings in an upward direction it can be appreciated that the frame **12** is moveable into a raised position. Therefore the frame **12** is moveable between a lowered and a raised position.

[**0048**] At a bottom of the frame **12** there is a footplate **42** provided to serve as a platform for the wheelchair user's foot. The footplate **42** is generally constructed of metal, plastic, or other durable material, and through its mounting connection through footplate fastener **43** the footplate **42** is generally free to pivot, flex, or flip up with respect to the frame **12**.

[**0049**] The frame **12** is preferably in the form of a tubular metal element and provides support for the user's lower leg. To perform this function the frame **12** has a length which is adjustable to accommodate the user's leg. Accordingly, the frame **12** is preferably constructed in two parts as an upper frame **39** slidably connected to a lower frame **40**. Upper frame **39** is attached to the pivot point **36** at the top and lower frame **40** is attached at the bottom to footplate **42**. Most conveniently at least one of the frames is hollow, so that the other frame is slidable within the hollow core. In **FIG. 1** the upper frame **39** is shown as hollow, and lower frame **40** is slidable within the hollow interior of frame **39**. The frame **12** may be set to a desired length by placing a bolt (not shown) through frame extension holes **41** in the upper frame **39** and a counterpart hole in the lower frame **40**. It can be appreciated that other means of locking the two frames together, such as a releasable clamp, may also be used.

[**0050**] The length of the frame **12** may be conveniently measured as the distance between the pivot point **36** and footplate **42**. This length can be adjusted as described above to be approximately equal to the leg-length, or length of the user's lower leg. As will be discussed below, the frame **12** remains at this adjusted length as the frame **12** moves between the lowered and raised position.

[**0051**] In the preferred embodiment of the invention shown in **FIG. 1** there is also included a frame-stop **44** to stop the frame **12** from being movable beyond a predetermined lower position. The frame-stop **44** is located towards a top of the frame **12** near the pivot point **36**. The frame-stop **44** has an adjustable position and is interposed between the frame **12** and the back wall **35** of the pivot block **32**. As shown in **FIG. 1** frame-stop **44** may be conveniently implemented as a simple screw threaded into the underside of frame **12**. It can be appreciated however that frame-stop **44** could equally be implemented as a screw threaded into the back wall **35** of the pivot point position adjustor. Therefore, frame-stop **44** is attachable to at least one of the frame **12** or the pivot point position adjustor **14**.

[**0052**] Upon retraction of frame **12** by the actuator or a rearward force against frame **12**, frame-stop **44** contacts the back wall **35** and stops any further rearward movement of frame **12**. The frame-stop position can be adjusted by threading the screw the desired distance, since this will affect where the screw hits the back wall **35**. This in turn determines the amount of rearward travel of frame **12** and the predetermined lowered position of the frame. In the event that the frame **12** is forced backward, for example, by the user banging the legrest **10** against a wall, frame-stop **44** stops the frame **12** from moving too far backward and damaging actuator **18**.

[**0053**] The calf support **16** further supports the user's lower leg and is pivotally connected to the frame **12** at a frame pivot point **48**. The calf support **16** includes a push plate **45** and a calf pad **56** adjustably connected to the push plate **45** through mounting plate **54**. The calf pad **56** is a cushion or pillow type article that supports the user's calf, and for clarity is shown in outline in **FIG. 1** so that the portion of the push plate **45** hidden by the calf pad **56** can be more clearly seen. More particularly, it can be seen in **FIG. 1** that the user's lower leg is supported by calf pad **56**, and that push plate **45** pivotally connects with the frame **12** at frame pivot point **48**. A portion of the push plate **45** extends rearwardly and attaches to the actuator **18** at pivotal connector **52**, which is preferably a quick release type connector.

[**0054**] Push plate **45** is a fabricated part sized and shaped to facilitate the interconnection of several elements. It has been found that a suitable push plate **45** may be constructed as a stamped metal plate, though it can be appreciated that other forms of the push plate **45** may also be adequate.

[**0055**] As shown in **FIG. 1**, push plate **45** is pivotally connected to the frame **12** at an adjustable length along the frame **12**. There are a plurality of holes **46** along frame **12** for connecting to the calf support **16**, and a frame pivot point or hole **48** in the push plate. The pivotal connection may be accomplished by inserting a pin (not shown) through the selected hole **46** and frame pivot point **48**.

[**0056**] It can be further seen that there are a plurality of predetermined locations or holes **50** on one of which a compressible positioning element **20** is positioned. The

holes **50** are positioned so that the compressible positioning element is between the frame **12** and the calf support **16**, or in particular the push plate **45** of calf support **16**. In **FIG. 1** the holes **50** are shown on a surface of the push plate **45** but it can be appreciated that they could equally be on the surface of the frame **12**, as long as the compressible positioning element **20** is between the frame **12** and push plate **45**. In **FIG. 1** there are a representative three holes **50**, which may be designated for convenient reference as upper hole **50***a*, middle hole **50***b*, and lower hole **50***c*. The compressible positioning element **20** is shown inserted in middle hole **50***b*.

[**0057**] The compressible positioning element **20** is preferably formed from a resilient material that can be formed in the shape of a pad or ball for insertion into a predetermined location or hole **50**. The material preferably maintains some rigidity when in an uncompressed state and should be sufficiently elastic or resilient to return to the fully uncompressed state when it is not compressed. It should also be durable, to withstand repeated compression and decompression without cracking or loss of elasticity. It has been found that a compressible positioning element **20** made of rubber provides adequate results, though it can be appreciated that other materials such as urethane, a conventional spring, or even an air or gas spring may also be used. For convenience the compressible positioning element **20** may be referred to as a rubber pad or rubber **20**.

[**0058**] The push plate also includes a stop **58**. In **FIG. 1** the stop **58** is shown positioned at the top of the push plate **45** near the calf support hole **46**, and is formed as part of push plate **45** in the shape of a tab or projecting metal piece, bent back slightly off the frame **12**. In general, the stop **58** is positioned so that as the portion of the push plate **45** attached to the actuator **18** pivots away from the frame **12** the stop **58** will contact the frame **12** and prevent further movement of the push plate **45**. In this way the stop restricts the pivot range of the calf support **16** or in particular, the push plate **45** of the calf support **16**. In the absence of stop **58** the push plate **45** would be able to pivot much farther back, perhaps as far as 90 degrees away from the frame **12**.

[**0059**] It can be appreciated that the push plate **45** is a convenient element to pivotally attach the calf pad **56** to the frame **12**, connect to the actuator **18** so the actuator **18** can apply force on the calf support **16**, and allow for the positioning of a compressible positioning element or rubber **20**. While the preferred embodiment of the push plate **45** is a stamped metal plate that can be sized and shaped to attach to the frame **12** and make the various connections shown, it can be appreciated that other means of connecting the calf pad to the frame, the actuator to the calf pad, and positioning the rubber **20** may be used. For example, the rubber **20** may be positioned in holes **50** located on the underside or part of frame **12** rather than on the push plate **45**.

[**0060**] The actuator **18** is preferably an electrically powered element that moves a shaft within a housing. The actuator **18** is shown having its shaft attached to the push plate **45** at pivotal connector **52**. The origin of the actuator **18** is whithin the attached wheelchair and is accordingly not shown in **FIG. 1**. The actuator **18** represents any element that applies a force on the calf support **16**, or more particularly the push plate **45** and calf pad **56**. The actuator **18** will most commonly be electrically powered, particularly on powered wheelchairs. However the actuator **18** could be a manual device, for example, a ratcheted device movable into successively forward positions by the user or an attendant, or a hydraulic device.

[**0061**] The movement of the actuator **18** is generally represented by arrow **60** and is generally in a forward and backward direction, where the forward direction applies a force moving the calf pad **56** forward and the reverse direction retracts the calf pad **56**. In this way the actuator **18** moves the calf support **16** and with it the frame **12** between a lowered and a raised position.

[**0062**] It can be seen that as the actuator **18** moves forward, the push plate **45** will pivot so that the calf pad **56** moves forward and the stop **58** moves rearward. The compressible positioning element or rubber **20** will engage the underside of the frame **12**, and cause the frame **12** and attached footplate **42** to rise. It can be appreciated that since the rubber **20** is between the push plate **45** and frame **12** it will compress, particularly if the legrest **10** is being used and it is occupied by a wheelchair user's leg.

[**0063**] As the actuator **18** retracts the frame **12** will move from a raised to a lowered position, and eventually to a fully lowered or down position. Several factors govern the position of the elements of the legrest **10** of the present invention in the fully lowered position. First, the frame **12** will stop retracting upon engagement of the frame-stop **44** with the back wall **35**. The frame-stop **44** is adjustable, and will preferably be adjusted to stop at a predetermined lowered position that is comfortable for the user. While this will often be 90 degrees or vertical, some users may prefer a less vertical setting such as 80 or even 70 degrees from the horizontal.

[**0064**] In order to receive the shock protection benefit of the frame-stop **44** in the fully lowered position, the actuator will continue to retract past the point where the frame-stop **44** engages. The amount of further retraction of the actuator again may be adjusted in advance. Setting the actuator to retract further has the benefit of pulling the calf pad back a greater distance, so it will be less likely to contact the user's calf. However, the actuator has a limited total range of travel. The more it is allowed to retract to reach the fully lowered position, the less it will advance when moving forward and raising the frame. In practice therefore it is often preferable to set the actuator to retract to just past the point where the frame-stop **44** engages. This ensures that the frame-stop **44** is engaged, and preserves a maximum degree of actuator range of motion for forward travel.

[**0065**] Yet another factor is that the resiliency of the compressible element or rubber pad **20** will cause the calf support **16**, or more particularly the calf pad **56** of calf support **16**, to separate from and form a predetermined pivot angle with the frame **12** when the frame **12** is in the lowered position. Depending on the setting of the frame-stop **44** and amount of actuator retraction, the rubber pad **20** may be in an uncompressed state or may still be compressed. As will be discussed below, the degree of separation or pivot angle will vary depending on the position of rubber pad **20**, and will be greater the closer the rubber pad **20** is to the frame pivot point **48**.

[**0066**] Finally, the device **10** is further designed so that the stop **58** on push plate **45** will generally not engage in the ordinary course of retraction by the actuator to the fully

lowered position. The stop **58** is available to further protect the actuator by engaging the frame **12** in the event the calf pad **56** receives a further external mechanical force or push. Preferably stop **58** will contact the frame **12** without the actuator **18** moving much further, to better protect the actuator.

[**0067**] The operation of the raisable legrest **10** can now be described. Turning to **FIG. 2***a* there is a wheelchair user **62** sitting on a wheelchair **64**. The user **62** has an upper leg **66** supported by a seat cushion **68** and a lower leg **67** supported by a conventional legrest device. For clarity, the legrest device shown in **FIGS. 2***a* and **2***b* is a representative conventional legrest device of the type well known in the prior art. It can be seen that this conventional device also includes an actuator **18**, a calf pad **56** and a footplate **42**. There is a horizontal element **24** extending from the seat frame **22**, and a frame **12** that connects with the element **24** at a representative fixed pivot point **70**.

[**0068**] In the conventional set-up the horizontal element **24** is used to extend the seat frame **22** so that it fits the length of the user's upper leg **66**. The user's lower leg **67** is supported by the legrest, and in particular the frame **12**, calf pad **56**, and footplate **42**. The user has a knee with an effective center of rotation or knee pivot point **72**. In **FIG. 2***a* it can be seen that the conventional legrest has a radius or length "x" extending from the pivot point **70** to the footplate **42**, that pivots about the pivot point **70**. It can also be seen that the user's lower leg **67** has a length "y" extending from the effective center of the knee **72** to the footplate **42**. It is clear that in the configuration shown the length "y" of the user's lower leg **67** is longer than the length "x" of the legrest frame **12**, and that pivot points **70** and **72** are not co-axial.

[**0069**] In **FIG. 2***a* the legrest device is shown in a lowered position, where the legrest is approximately vertical, or perpendicular to the ground. **FIG. 2***b* shows the legrest in a raised position as a result of extension of actuator **18**. The result of this configuration associated with the conventional legrest can now be seen. Due to the difference in length between the conventional legrest "x" and the user's lower leg "y", and the non-coincident centers of rotation **70** and **72** respectively, there is insufficient length in the frame **12** of the legrest to accommodate the user's lower leg **67**. As a result there is an inward pressure on the user's foot, which forces the knee to pop up off the seat **68**. This is unacceptable as it is uncomfortable and awkward for the user **62**. As well, it forces the weight of the user to be uncomfortably concentrated at a localized area **74** of the leg **66**. As discussed above, some prior art legrest devices use an extension mechanism (not shown) to extend the legrest in the direction shown by "z" in **FIG. 2***a* as the legrest moves from a lowered to an elevated position. However, such extension mechanism devices are invariably costly, complicated, and prone to breakdown.

[**0070**] The wheelchair **64** equipped with the raisable legrest of the present invention **10** is shown in **FIG. 2***c*. The legrest **10** includes the additional elements of the vertical element **28**, legrest receiver **26**, and pivot block **32** supporting a pivot point **36**. The down tube or frame **12** connects to the pivot block **32** at the pivot point **36**. These elements permit the user to adjust the position of the pivot point **36** in at least a vertical direction.

[**0071**] In the operation of the legrest device **10** of the present invention the user or attendant would adjust the vertical element **28**, along with the horizontal position element **24** so that the pivot point **36** of the legrest device **10** is co-axial with an effective center of rotation of a knee of the user **72**. Further, due to this arrangement it can be seen in **FIG. 2***c* that the length "x" of the frame **12** of the legrest device **10** is approximately equal to the length "y" of the user's lower leg **67**. While a complex knee joint does not have a precise center of rotation like a simple mechanical pivot, it has been found that being able to position the pivot point close to the effective center of rotation of the knee provides increased comfort for users.

[**0072**] The result of this configuration may be seen in **FIG. 3**, which shows the legrest **10** of the present invention in a lowered vertical position in **FIG. 3***a*, a raised position in **FIG. 3***b*, and at a fully raised position or approximately a horizontal position, in **FIG. 3***c*. It can be seen that as a result of the legrest **10** being co-axial and equal in length to the lower leg **67**, raising the legrest does not produce inward pressure and there is simply no need for an automatic extension mechanism to dynamically increase the length of the down tube or frame **12**. The user's lower leg **67** remains comfortably supported by the legrest at all times and as there is no inward pressure the user's knee is not forced up off the seat **68**.

[**0073**] It can now be appreciated how the legrest device **10** of the present invention achieves a full range of motion of the user's leg **67**. The device **10** of the present invention has the additional benefit of simplicity since it does not require the extension mechanism required by the devices of the prior art.

[**0074**] The operation of the adjustable calf pad feature of the present invention can now be described. With reference to **FIG. 1**, the push plate **45** of calf support **16** may be connected at frame pivot point **48** with one of the holes **46** on frame **12**. Generally, a particular hole **46** will be selected to optimize the orientation of actuator **18**. It is preferred that actuator **18** be directed close to the horizontal rather than in an upward direction where it could be obstructed by other parts of the legrest device **10**. Then, the calf pad **56** may be adjusted in position relative to the push plate **45** by adjustment of the mounting plate **54**. In this way the calf pad **56** may be positioned to line up with the user's calf.

[**0075**] It can be appreciated that, given the pivot point adjustment feature of the present invention, it can be expected that the calf pad **56** will reliably remain behind the user's calf throughout the full range of motion between the lowered and raised position, as shown in **FIG. 3**. Further, shear will not develop between the calf pad and the calf if the pivot point is properly positioned. This aspect of the present invention is a significant improvement over the prior art. Further, it can be appreciated that the adjustable calf pad feature of the present invention, to be described below, is enhanced in effectiveness due to the reliable positioning of the calf pad.

[**0076**] Returning now to **FIGS. 2***a* and **2***b*, it may be seen that in the conventional legrest the calf pad **56** is set to a fixed separation distance "**s1**" from the frame **12**. While this fixed distance **s1** may be adjustable by the user, once it is set it does not change as the legrest **10** moves from the lowered to the raised position. It may also be noted that in this

arrangement the actuator **18** can apply force to either the calf pad **56** or the frame **12**. Since the calf pad and frame are rigidly connected to maintain a fixed spacing, the frame **12** will be raised the same regardless of whether the actuator **18** connects with the frame **12** or calf pad **56**.

[**0077**] In **FIG. 2***a* the legrest is in a lowered position, close to vertical, and the calf pad **56** is not needed. In this position it would be preferable to have a large separation "s" so that the calf pad **56** does not make contact with the user's calf. However, if s**1** is set to a large value then when the legrest is raised, as shown in **FIG. 2***b*, the user's leg may be somewhat distant and not naturally be supported by the calf pad. It is possible that the user's foot may slip slightly out of the footplate **42**, to permit the calf pad **56** to take up some of the weight. The user's leg however will likely not be comfortably supported when the legrest is being raised. In practice, users will often choose to make s**1** smaller, to get the calf pad support. However in that case there will be pressure or contact from the calf pad **56** when the legrest is in the almost fully lowered vertical position of **FIG. 2***a*. Since no one position of the calf pad **56** or s**1** can satisfy the comfort settings of both lowered and raised positions the result is a tradeoff which leaves the user dissatisfied in both positions.

[**0078**] Accordingly, it can be appreciated that while the legrest **10** is rising, it is generally desired to have the calf pad close to the frame **12**, or a small "s", to provide support and take up some of the weight of the lower leg **67**. It is also generally desirable that when the legrest is in a more lowered position, particularly when vertical, that the space "s" be larger so that the calf pad ideally does not exert any pressure on the user's calf. Also as noted, a larger "s" is desirable to allow for the possibility that the user's feet may be able to be drawn back and thereby shorten the effective overall chair length.

[**0079**] **FIG. 3** shows the action of the calf pad **56** of the legrest **10** of the present invention, as the legrest **10** moves from a fully lowered or vertical position in **FIG. 3***a* to a fully raised or horizontal position in **FIG. 3***c*. The separation "s" between the calf pad **56** and the frame **12** in each position is indicated. It can be seen that the separation "s" starts out relatively large in **FIG. 3***a*, so that the calf pad is either not in contact with the user's calf, or at least exerting relatively less pressure. In the intermediate raised position of **FIG. 3***b* it can be seen that the separation "s" has narrowed, thereby providing more support for the user's calf. Finally, in the horizontal position of **FIG. 3***c* the separation "s" has shrunk even further and the calf pad **36** is directly under the user's lower leg. This profile, by contrast with the calf pad positioning "s**1**" shown from the conventional legrest of **FIGS. 2***a* and **2***b*, is closer to that desired by most users.

[**0080**] This may be better understood by noting that in **FIG. 3** the actuator **18** pushes on the push plate **45**, which in turn pushes the calf pad **56**. In the fully lowered position of **FIG. 3***a* the actuator is not active. The rubber **20** presses the push plate **45** and calf pad **56** away from the frame **12** to form the predetermined pivot angle. When the rubber **20** is in upper hole **50***a* the separation or predetermined pivot angle between the calf pad **56** and frame **12** is largest, for given settings of the frame-stop **44** and actuator **18**, and when in the lower hole **50***c* the separation is the smallest. In any event, "s" is relatively large and the calf pad **56** is relatively far from the user's calf, which is desirable when the legrest is in the fully lowered position.

[**0081**] In **FIGS. 3***b* and **3***c* the actuator is activated and exerts a force raising the push plate **45** and calf pad **56**, as well as the frame **12**. However the weight of the lower leg **67** pushes the frame **12** downwards, which squeezes the rubber **20**. This reduces the separation "s" , bringing the calf pad **56** closer to the frame **12**. The smaller "s" results in better support for the user's calf, allowing the calf pad **56** to take on more weight than it would under the conventional arrangement. Again, this resulting smaller "s" is desirable when the legrest is in a raised position.

[**0082**] Essentially, the more weight that is placed on the footplate **42**, the more compression will occur of the rubber **20**, leading the calf pad **56** to become closer and more able to provide support. Accordingly, for any position of the rubber **20**, the rubber **20** provides a position adjustment through the range of motion of the calf pad **56** by the actuator **18**. Therefore, the legrest **10** of the present invention is an improvement over the conventional legrest in that it enables the separation between the calf pad **56** and down tube **12** to vary over the range of movement of the legrest **10**. The legrests of the prior art have only a fixed separation distance, forcing the user to trade-off comfort in one position for less comfort in the other. The present invention **10** transfers weight from the footplate **42** to the calf as the footplate **42** is elevated. As well, the user can pre-select the hole **50** in which to place the rubber **20** to achieve optimum comfort across the range of movement.

[**0083**] **FIG. 4** provides a more graphical view of the operation of the present invention. The figure shows the present invention **10** with the legrest in a fully raised position, with a representation of the various forces at work. The weight of the user's lower leg **67** on the legrest **10** creates a force F**1** from the footplate **42**, and a force F**2** from the calf pad **56**. There is an equal upward counter-force F**3** provided by the actuator **18**. In this case the frame **12** may be viewed as a lever having a distance equal to the length of frame **12** and acting about the pivot point **36**. There will be a moment produced about the pivot point **36** by the downward force on the frame **12**. This is resisted by an opposite moment created by the actuator about the frame pivot point **48** equal to the product of the force F**1** and the distance "d". This moment in effect is what causes the rubber **20** to compress. As the rubber compresses the separation "s" gets smaller. This however means that the calf pad will take up more of the weight of the lower leg **67**, so F**2** increases and F**1** decreases, however slightly. The various forces continue to adjust incrementally until an equilibrium is reached.

[**0084**] Thus it can be seen that the compressible positioning element or rubber pad **20**, positioned between the calf support **16** and the frame **12**, permits the calf support position relative to the frame, i.e. the separation "s", to be varied as the moment about frame pivot point **48** changes. As the moment about frame pivot point **48** increases, the compressible positioning element or rubber pad **20** compresses, and the calf pad **56** support moves closer to the frame **12** to provide support to the lower leg **67** of the user.

[**0085**] The positioning of the rubber **20** may now be understood. **FIG. 1** shows three predetermined locations or holes **50** to receive the compressible positioning element **20**.

For illustration purposes the rubber **20** has been inserted into the middle hole **50***b*. It can be appreciated that more than 3 holes could have been used. From the figure, it can be seen that when the rubber **20** is in the upper hole **50***a*, the pivot angle of the frame **12** relative to the push plate **45** will be larger and the calf pad **56** will be spaced further from the down tube **12**. This setting accordingly results in more compression and travel by the calf pad **56**. The converse will be true as the rubber **20** is moved to positions **50***b* and **50***c*. For the lower positions there is less compression, leverage, and travel. The lowest position is closer to that of the conventional legrest having a fixed separation s**1**.

[**0086**] The advantages of the present invention may be better understood by considering certain practical issues. Many wheelchairs have items that act as barriers that prevent the legrest from reaching a fully lowered or vertical position. For example, wheelchairs often have a cowling, which is a plastic covering that covers the top of the wheelchair to enhance the chair's appearance. The cowling may block the calf pad from retracting to the fully lowered or vertical position. Other items that may act as barriers in this way include the battery or battery cover. However, many users will want to achieve a position as close to the vertical as possible, to obtain as much of a true sitting position as possible and to enhance maneuverability. Accordingly, these users of the present invention will most likely choose to insert the rubber **20** in the lowest available position. In this way they will get as close to the vertical position as possible. While there would be more calf pressure in this setting, this would probably still be considered preferable by these users since at least the footrest will be closest to the vertical. While this setting is closest to conventional legrest it can be appreciated that the present invention at least offers the user a choice which would otherwise be unavailable.

[**0087**] Another type of barrier might be castors that block the footplate. In this case while the legrest still cannot retract fully, there may well be nothing blocking the calf pad. Therefore in this case it would be reasonable to set the rubber **20** at a higher position. This would force the calf pad back while the legrest is in the lowest possible position. While the legrest would not be in a fully lowered vertical position, as before the user at least has the benefit of choice, and in addition the benefits of reduced or eliminated calf pressure and the possibility to reduce the overall chair length and enhance maneuverability.

[**0088**] In a conventional legrest, where there is a large fixed separation (s**1**) the calf pad may well be comfortably off the calf at a fully lowered legrest position. While this may be desirable to the user, due to the large separation, as the legrest rises the calf pad will be unable to receive a large weight transfer and this may well be uncomfortable to the user. Where the separation (s**1**) is small the user will likely have more comfortable calf support as the legrest rises but uncomfortable calf pad contact when the legrest is in a fully lowered position.

[**0089**] Each of the predetermined locations **50***a*, **50***b*, and **50***c* provide for a separation "s" that is larger in the lowered position than in the raised position, with the largest separation in the fully lowered or vertical position, and the smallest separation in the fully raised or horizontal position of the legrest. The higher predetermined location such as **50***a* will have a generally larger separation throughout the range of motion of the legrest. The user of the present invention **10** has the opportunity to select the setting most appropriate to his or her circumstances. This may include such considerations such as the presence or absence of a cowling and other aspects of chair configuration, and the user's personal preferences regarding calf support relative to foot support, and calf pad contact in the fully lowered position.

[**0090**] It can now be appreciated how the legrest **10** of the present invention better transfers weight from the foot to the calf, resulting in greater comfort for the user.

[**0091**] Wheelchair users commonly bump into walls, doors, and other obstacles. Since the legrest is the most forward part of the chair, it is the part most likely to be struck in a collision. While the legrest itself is fairly sturdy, it can happen that jarring of the frame **12** may cause the frame to be pushed back, which in turn could jolt and damage the actuator. This is a problem for users because the actuator is an expensive device to replace or repair.

[**0092**] However, this matter is addressed by the present invention. The rubber **20** used to affect calf pad separation also acts as a buffer or bumper to receive unexpected jostling from the front without causing the actuator to retract.

[**0093**] Yet another protection against jostling from the front is provided by the frame-stop **44**. If the legrest is jarred from the front, particularly when in the fully lowered position, the frame **12** will be driven back until the frame-stop **44** engages the back wall **35**. As noted, this is commonly set to occur prior to the actuator retracting to its bottom position.

[**0094**] Accordingly, it can now be appreciated how the present invention is more secure and less fragile than the legrests otherwise available. It can also be appreciated how the present invention may be easily manufactured or installed in pre-exising wheelchairs. All that is required is to secure the device to the wheelchair at the seat frame **22** or similar location, and connect the actuator from the wheelchair to the push plate **45**.

[**0095**] It will be appreciated by those skilled in the art that the foregoing description was in respect of preferred embodiments and that various alterations and modifications are possible within the broad scope of the appended claims without departing from the spirit of the invention. For example, while reference is made to adjusting the positioning of the compressible element or rubber by inserting the rubber into one of a plurality of positions, further variation is possible by threading the rubber into each position. An even finer adjustment of calf pad positioning may be made available by adjusting the degree of threading of the rubber into the selected position of insertion. Further, the stop could also be made adjustable so that the extent to which the push plate is allowed to pivot back could be set by the user. Also, further shock absorbtion may be achieved by adding rubber bushing to the pivot point **36** and a rubber bumper to the contact point of the frame-stop **44**. Various other modifications will be apparent to those skilled in the art but are not described in any further detail herein.

We claim:

1. A raisable legrest for a wheelchair, the leg rest comprising:

(a) a frame, to support a user's lower leg, said frame being attachable to the wheelchair, said frame being movable between a lowered position and a raised position about a pivot point when attached to said wheelchair; and

(b) a pivot point position adjustor, located between the pivot point and the wheelchair, for adjusting the position of the pivot point in at least a vertical direction;

wherein the pivot point can be positioned by the pivot point position adjustor to be coaxial with an approximate center of rotation of a knee of the user.

2. The legrest according to claim 1, wherein said pivot point position adjustor is adjustable in at least a vertical direction by means of an extendable vertical support element which supports said pivot point.

3. The legrest according to claim 2, wherein said extendable vertical support element includes a fastener to hold said extendable vertical support element at a fixed vertical height.

4. The legrest according to claim 2, wherein said pivot point position adjustor further includes a holder and one of said extendable vertical support element or said holder is hollow, and said extendable vertical support element and said holder fit together to form a quick release coupling.

5. The legrest according to claim 4, wherein one of said extendable vertical support element or said holder contains a notch, and the other of said extendable vertical support element or said holder contains a pin sized and shaped to engage said notch to form said quick release coupling.

6. The legrest according to claim 4, wherein said pivot point position adjustor includes a pivot block, and said extendable vertical support element engages said holder at one end and said pivot block at the other end and is adjustably connected therebetween.

7. The legrest according to claim 6, wherein said extendable vertical support element includes a vertical element which may be connected to said pivot block at one of a discrete number of connection points.

8. The legrest according to claim 7, wherein said connection points comprise a discrete number of holes on one of said vertical element or said pivot block, and said pivot block may be connected to said vertical element by a bolt inserted through one of said holes.

9. The legrest according to claim 2, wherein said extended vertical support element has a top end and a bottom end, and said pivot point is located towards said top end.

10. The legrest according to claim 4, wherein said holder is a hollow cylinder.

11. The legrest according to claim 1, wherein said pivot point position adjustor is adjustable in at least a vertical direction by means of a releasable clamp.

12. The legrest according to claim 11, wherein said pivot point position adjustor further includes a vertical element which supports said pivot point, and wherein said vertical element is movable in a vertical direction when said releasable clamp is released, and said vertical element is set at a fixed vertical height when said releasable clamp is clamped.

13. The legrest according to claim 1, wherein the pivot point position adjustor further includes a horizontal adjustor to adjust the position of the pivot point in a horizontal direction.

14. The legrest according to claim 13, wherein the horizontal adjustor comprises a horizontal element and a releasable holder to hold said horizontal element.

15. The legrest according to claim 1, wherein said frame has a length, said length being adjustable to accommodate the leg of the user.

16. The legrest according to claim 15, wherein said frame has a footplate to receive a foot of the user.

17. The legrest according to claim 16, wherein said frame has a top and a bottom, and said pivot point is located at the top of said frame and said footplate is located at the bottom of said frame.

18. The legrest according to claim 17, wherein said lower leg of said user has a leg-length, the length of the frame can be adjusted so that the distance between the pivot point and the footplate is approximately equal to said leg-length, and wherein the frame remains at said adjusted length as the frame moves between the lowered and raised position.

19. The legrest according to claim 15, wherein said frame comprises an upper frame attached to the pivot point and a lower frame slidably connected to the upper frame.

20. The legrest according to claim 19, wherein one of the upper frame or the lower frame is hollow, and wherein the other of said upper frame or lower frame fits into the hollow frame.

21. The legrest according to claim 1, further including a frame-stop to stop said frame from being movable beyond a predetermined lowered position.

22. The legrest according to claim 21, wherein said frame-stop has an adjustable position, and wherein said predetermined lowered position of said frame can be adjusted by adjusting said position of said frame-stop.

23. The legrest according to claim 21, wherein said frame-stop is attachable to at least one of said frame or said pivot point position adjustor.

24. The legrest according to claim 21, wherein said frame-stop is a threaded screw.

25. The legrest according to claim 1, further including:

(a) a calf support to further support the user's lower leg, said calf support being pivotally connected to the frame at a frame pivot point;

(b) an actuator, to apply a force on the calf support, to move said frame between the lowered position and the raised position; and

(c) a compressible positioning element, positioned between the calf support and the frame, for permitting the calf support position relative to said frame to be varied as a moment about said frame pivot point changes;

wherein, as said moment increases about said frame pivot point, said compressible positioning element compresses, and said calf pad support moves closer to said frame to provide support to the lower leg of the user.

26. The legrest according to claim 25, wherein the compressible positioning element defines a predetermined pivot angle between the calf support and the frame when the frame is in the lowered position.

27. The legrest according to claim 25, wherein the calf support comprises a push plate and a calf pad mounted on the push plate.

28. The legrest according to claim 27, where the calf pad is adjustably connected to the push plate.

29. The legrest according to claim 27, wherein the compressible positioning element is a resilient material and is positioned between the frame and the push plate of the calf support.

30. The legrest according to claim 27, wherein the compressible positioning element can be positioned at one of a number of predetermined locations between the frame and the push plate.

31. The legrest according to claim 29, wherein the compressible positioning element is rubber.

32. The legrest according to claim 26, further including an adjustable stop to restrict the pivot range of the calf support.

33. A raisable legrest for a wheelchair to raise a lower leg of a user, the legrest comprising:

(a) a frame, said frame being attachable to the wheelchair, said frame being movable between a lowered position and a raised position about a pivot point when attached to said wheelchair;

(b) a calf support to support the user's lower leg, said calf support being pivotally connected to the frame at a frame pivot point;

(c) an actuator, to apply a force on the calf support, to move said frame between the lowered position and the raised position; and

(d) a compressible positioning element, positioned between the calf support and the frame, for permitting the calf support position relative to said frame to be varied as a moment about said frame pivot point changes;

wherein, as said moment increases about said frame pivot point, said compressible positioning element compresses, and said calf pad support moves closer to said frame to provide support to the lower leg of the user.

34. The legrest according to claim 33, wherein the compressible positioning element defines a predetermined pivot angle between the calf support and the frame when the frame is in the lowered position.

35. The legrest according to claim 33, wherein the calf support comprises a push plate and a calf pad mounted on the push plate.

36. The legrest according to claim 35, where the calf pad is adjustably connected to the push plate.

37. The legrest according to claim 35, wherein the compressible positioning element is a resilient material and is positioned between the frame and the push plate of the calf support.

38. The legrest according to claim 35, wherein the compressible positioning element can be positioned at one of a number of predetermined locations between the frame and the push plate.

39. The legrest according to claim 37, wherein the compressible positioning element is rubber.

40. The legrest according to claim 33, further including an adjustable stop to restrict the pivot range of the calf support.

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