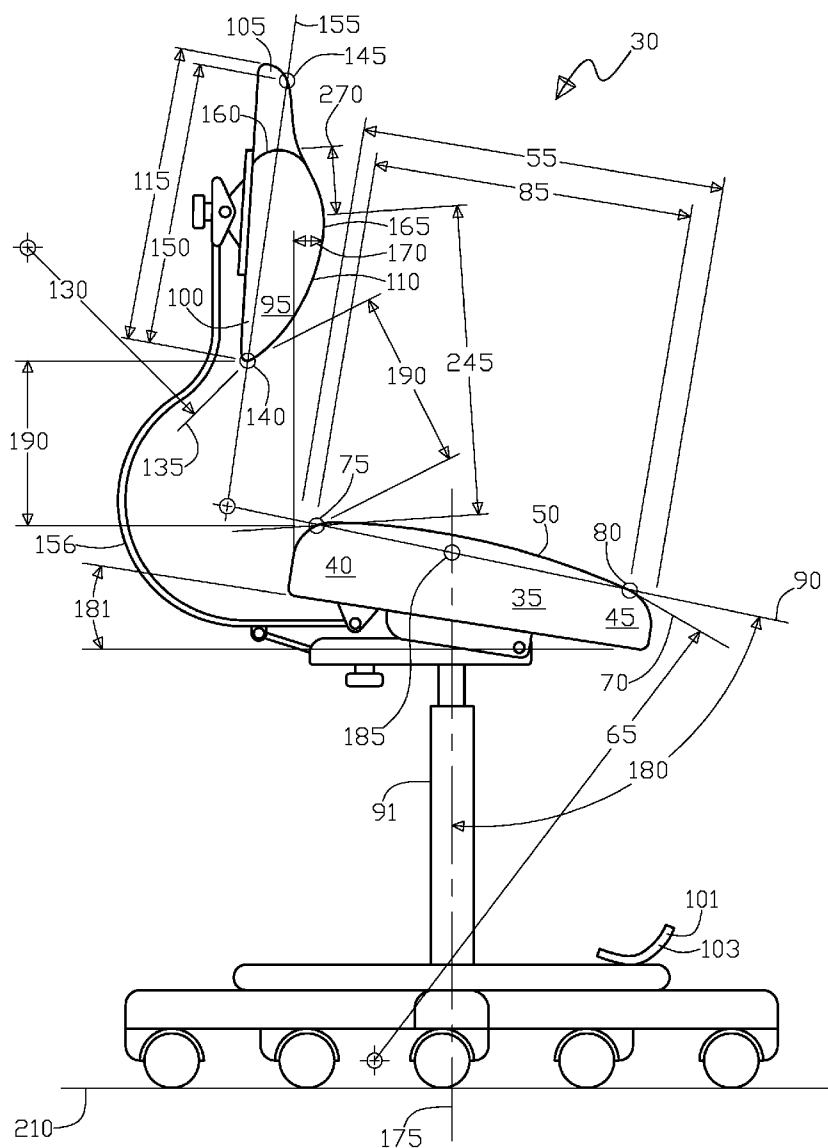




US 20110304192A1

(19) **United States**(12) **Patent Application Publication**  
**Augustat**(10) **Pub. No.: US 2011/0304192 A1**(43) **Pub. Date: Dec. 15, 2011**(54) **ERGOMETRIC CHAIR APPARATUS**(52) **U.S. Cl. .... 297/452.23**(57) **ABSTRACT**(76) **Inventor: Betty A. Augustat, Broomfield, CO (US)**(21) **Appl. No.: 12/816,226**(22) **Filed: Jun. 15, 2010****Publication Classification**(51) **Int. Cl.**  
**A47C 7/00 (2006.01)**

The present invention and method is for a chair disposed upon a surface that is designed for a female anatomy; the chair includes a seat having proximate and distal end portions forming a first convex surface with a chord plane intersecting, the having a length shorter than its width. The chair also includes a back having first and second end portions that form a second convex surface, wherein, a second lateral measure on the second end is less than a first lateral measure on the first end. The seat plane and an extension axis that is perpendicular to the surface are relatively positioned to one another to form an acute angle to one another, such that a user's femur bone lengthwise angles downward from hip to knee toward the surface while the user's shoulders arch rearward thus aligning the user's hip joint and shoulder joint vertically for better posture.



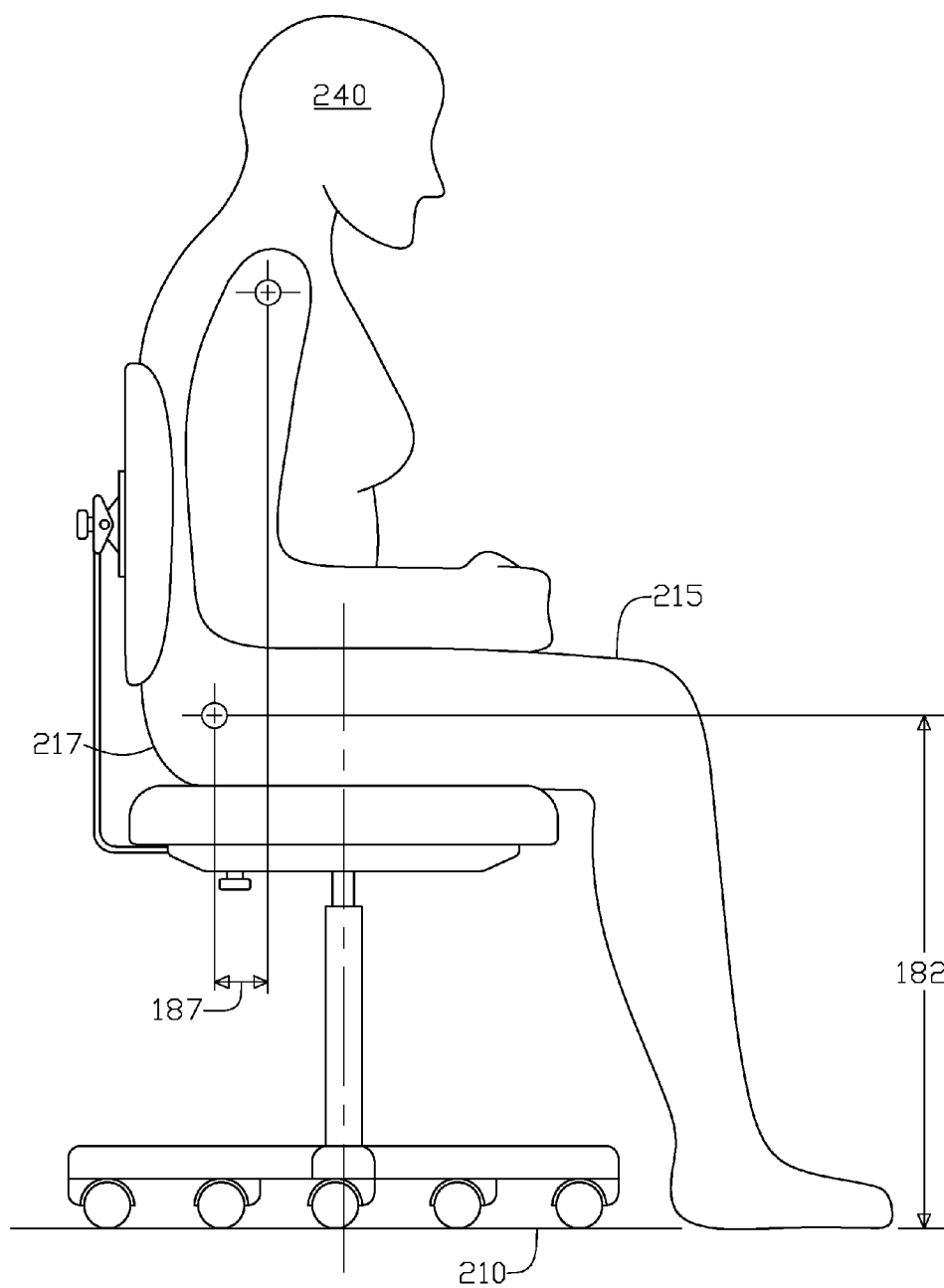
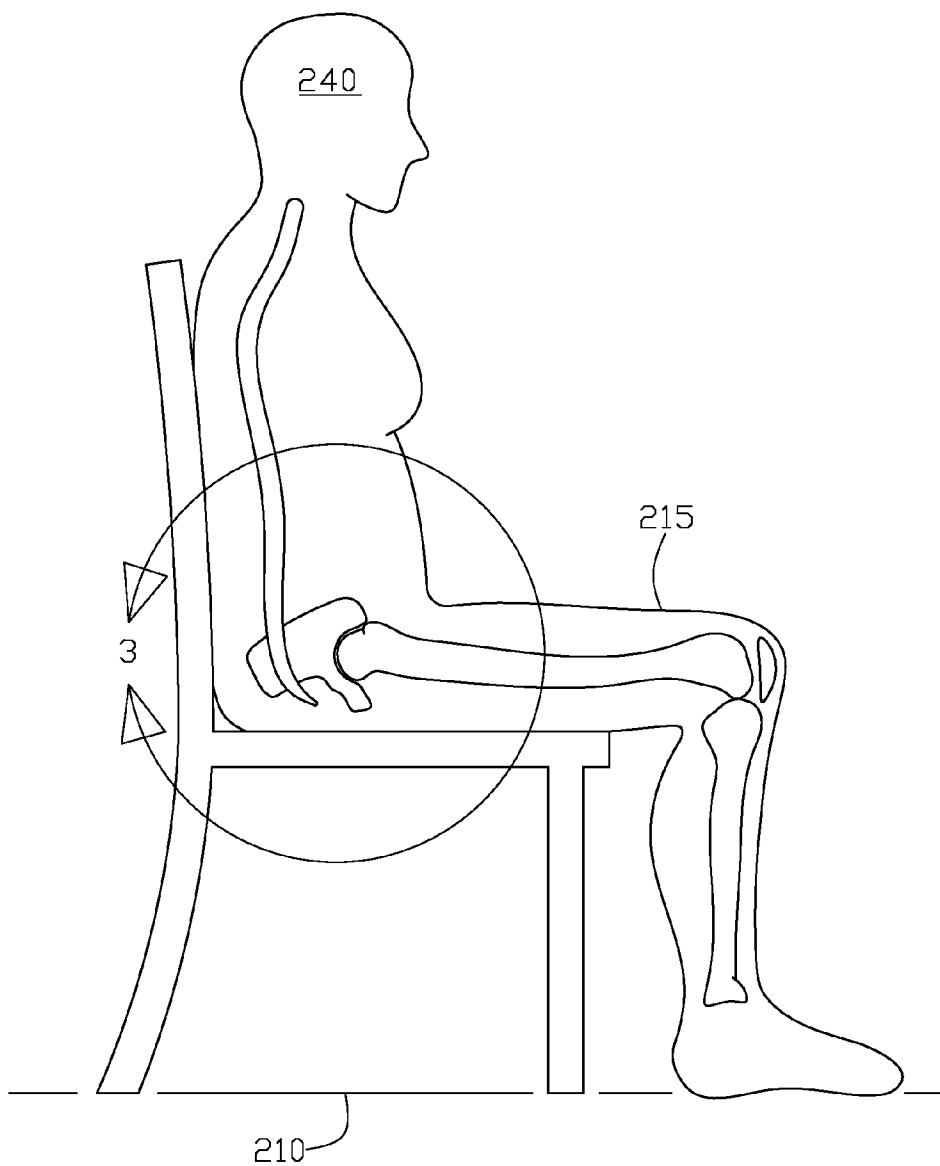
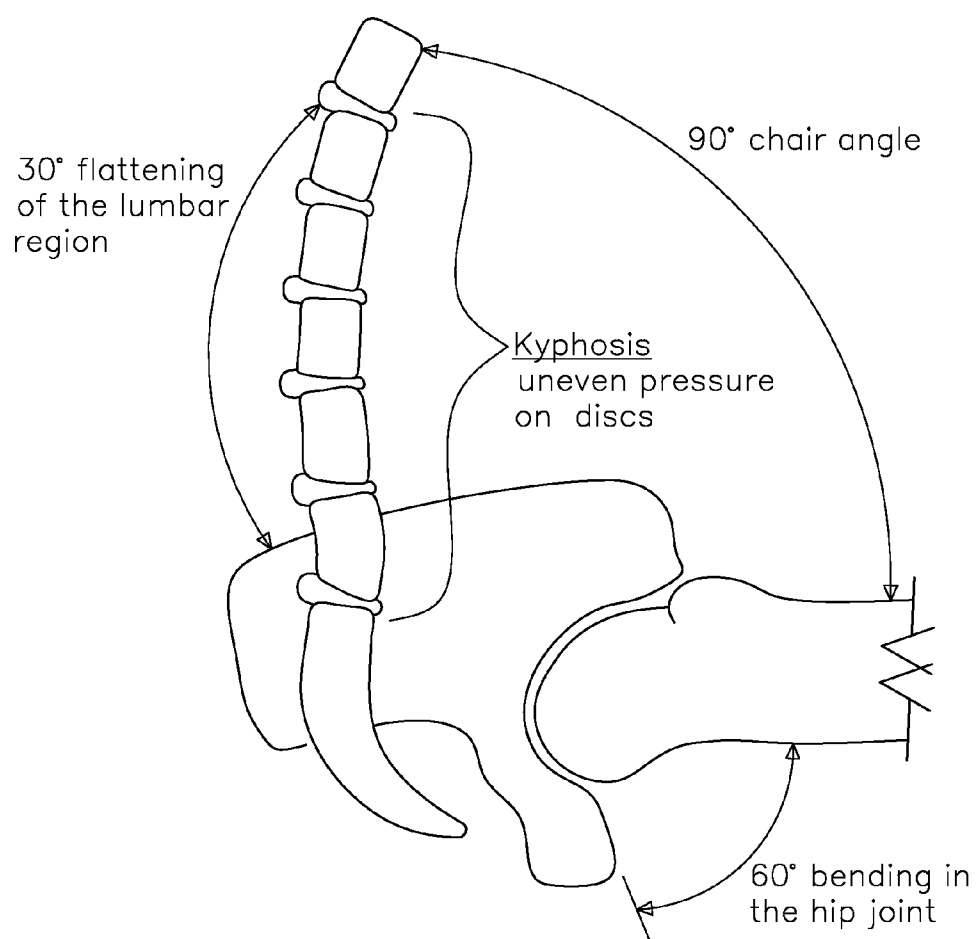


Fig.1 (Prior Art)

Sitting in a conventional chair**Fig.2 (Prior Art)**

Sitting in a conventional chair



**Fig.3 (Prior Art)**

Standing

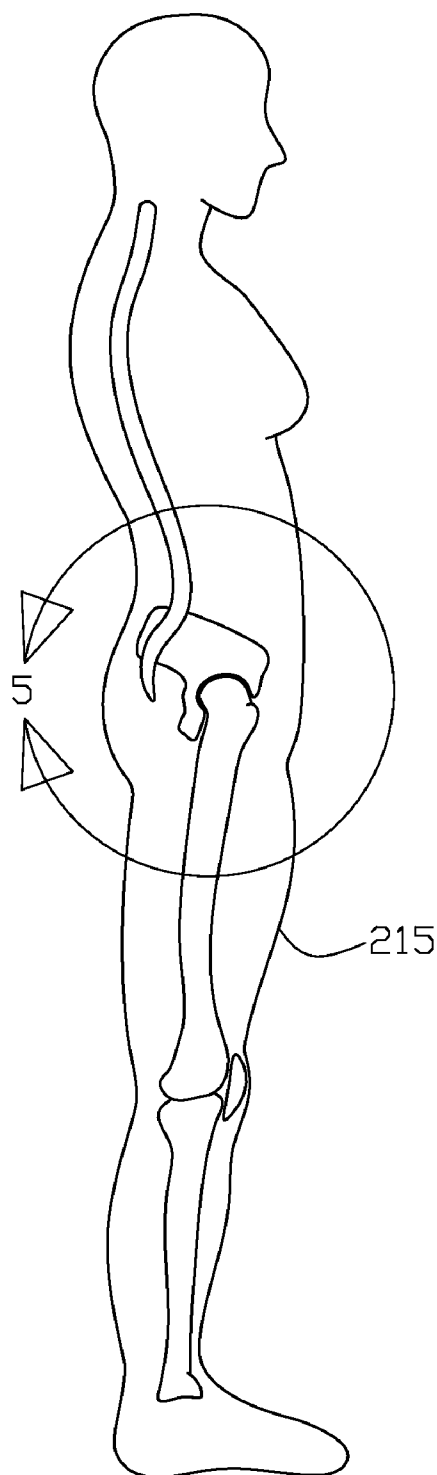


Fig.4

Standing

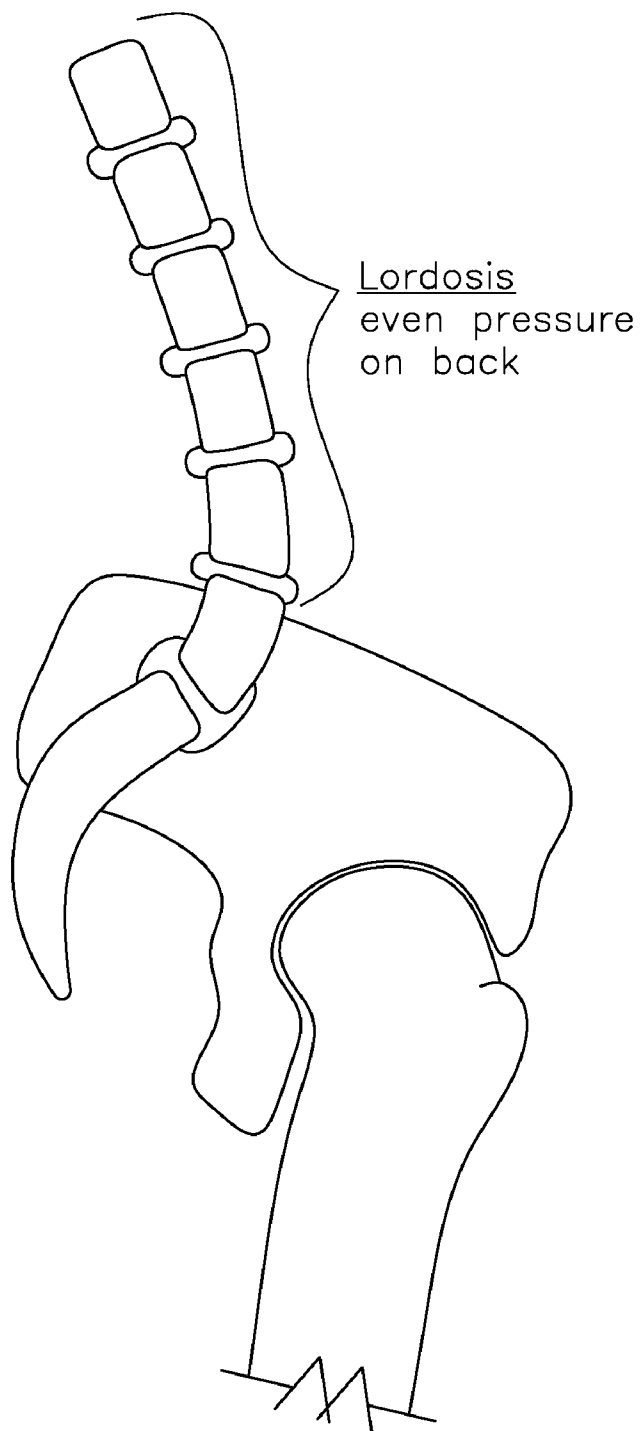


Fig.5

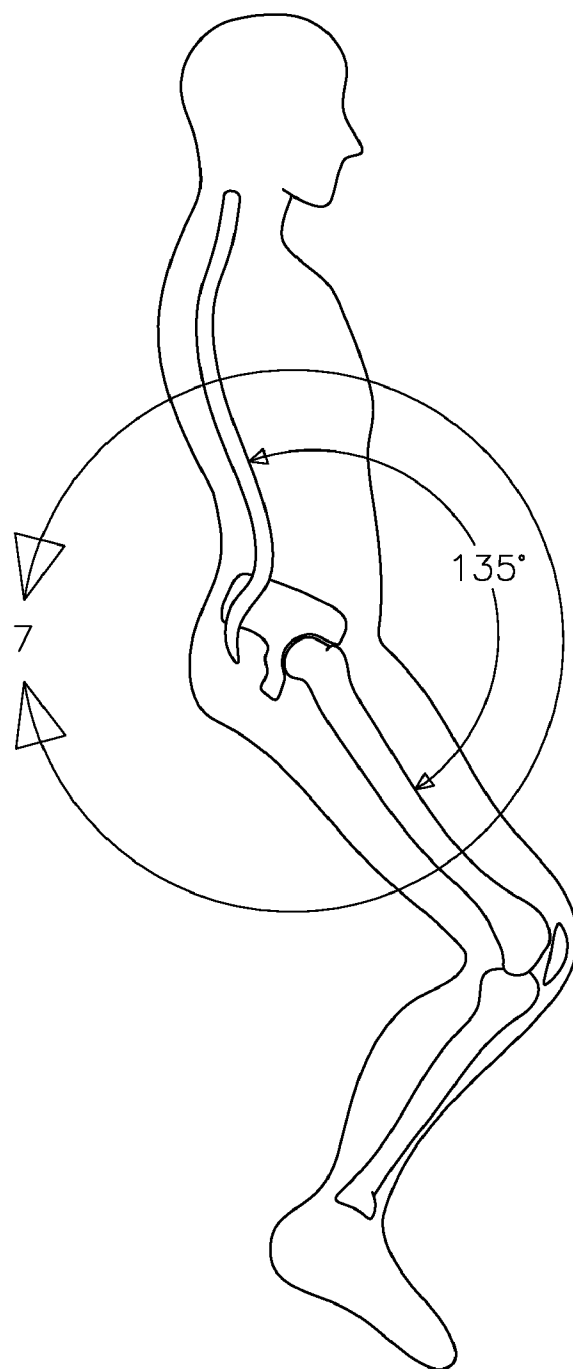
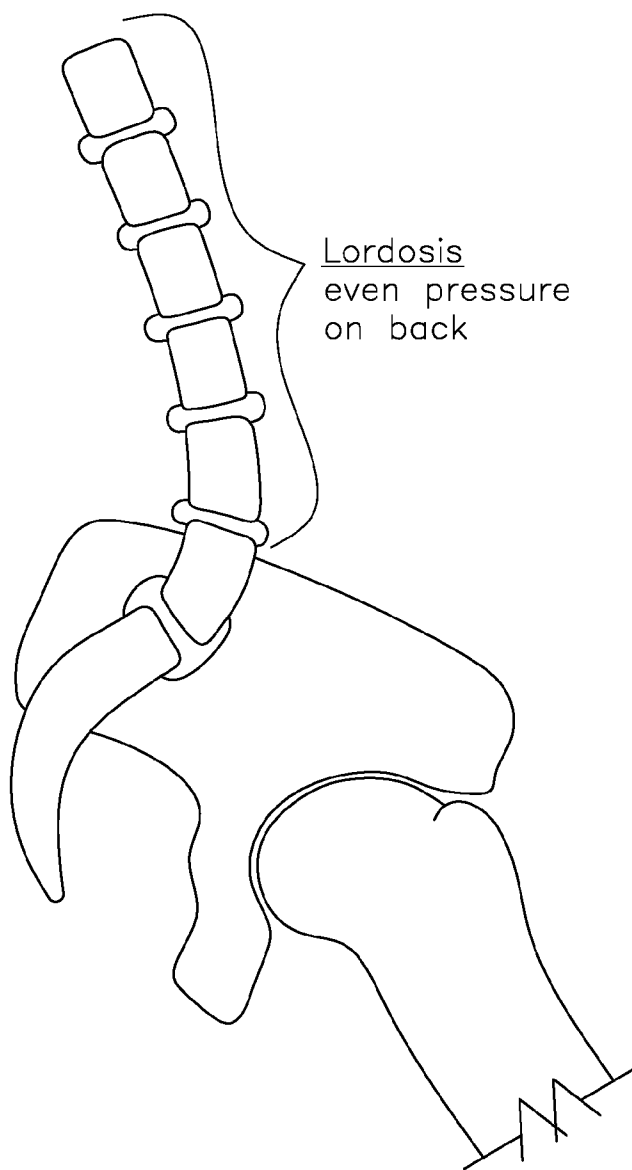
Relaxed Side Bed Resting Position

Fig.6

# Relaxed Side Bed Resting Position



**Fig.7**



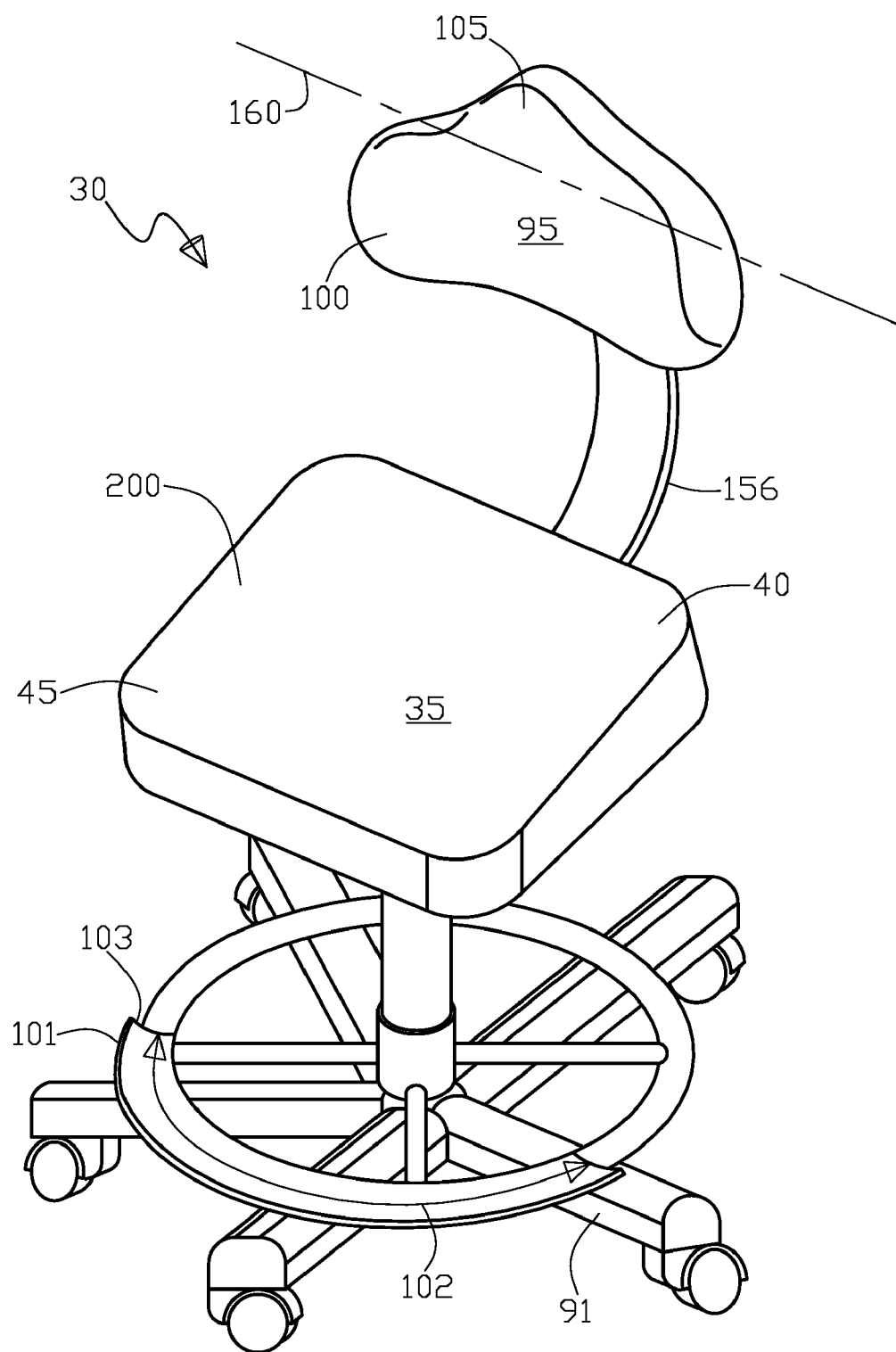


Fig.8

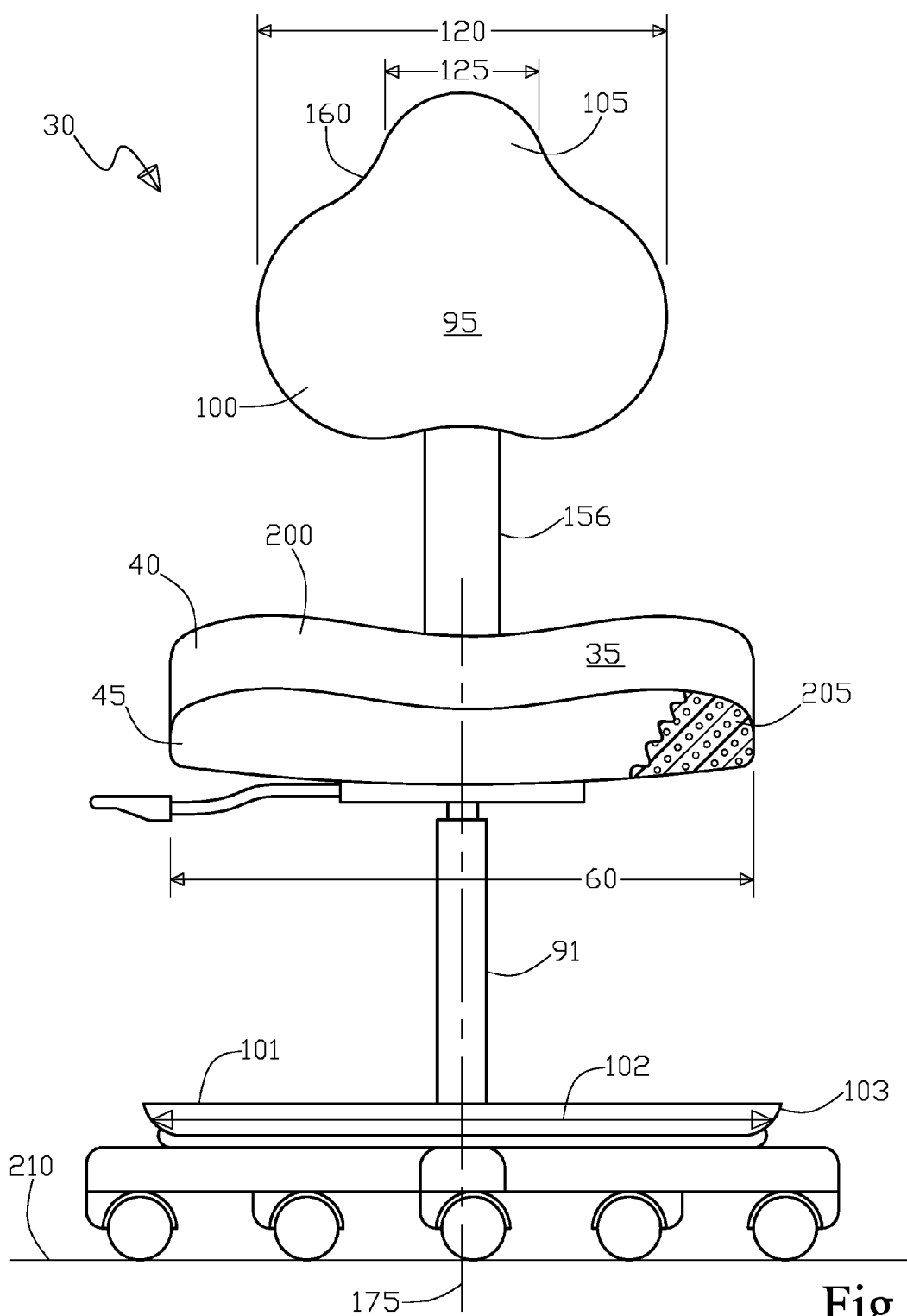
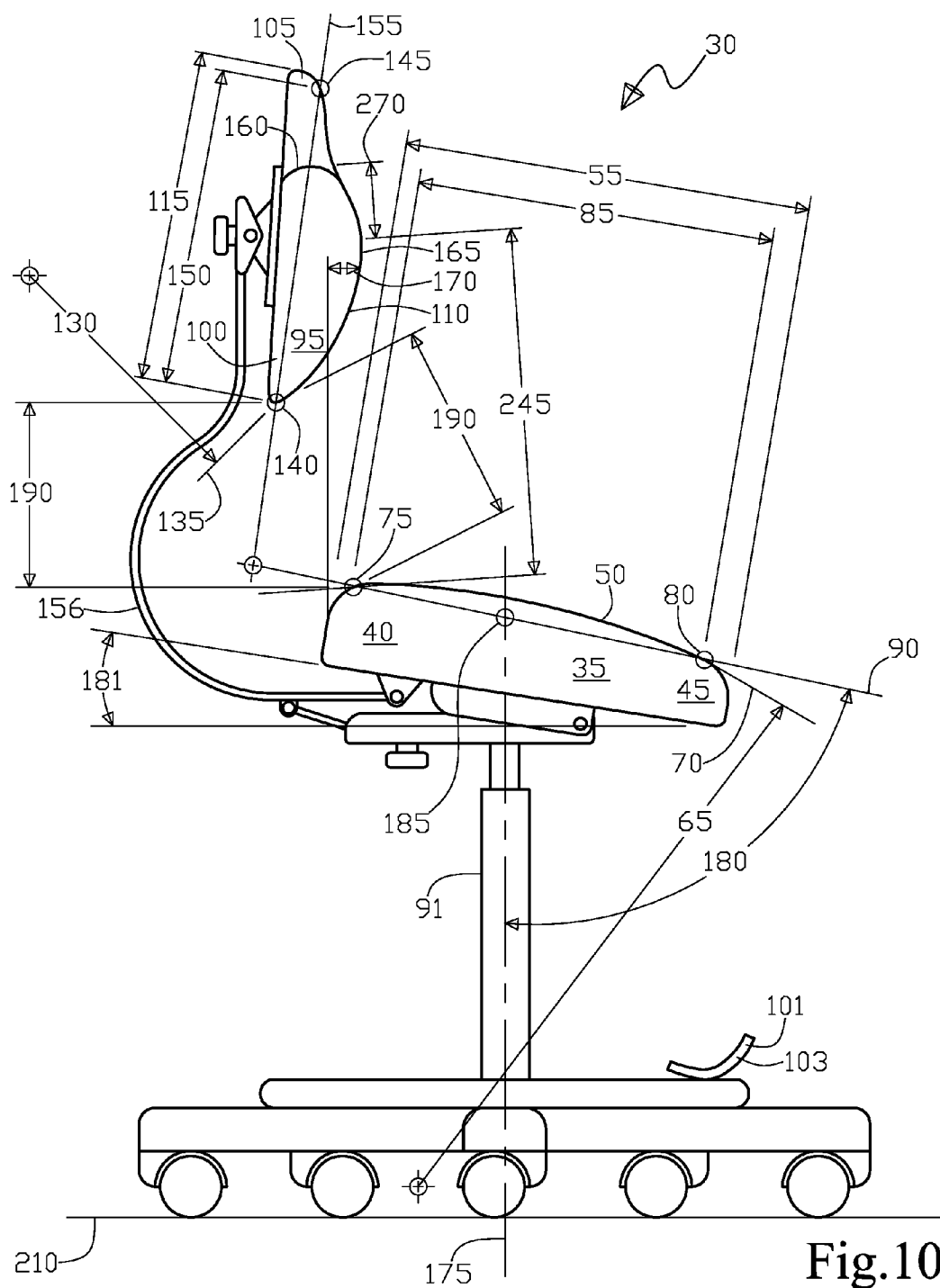
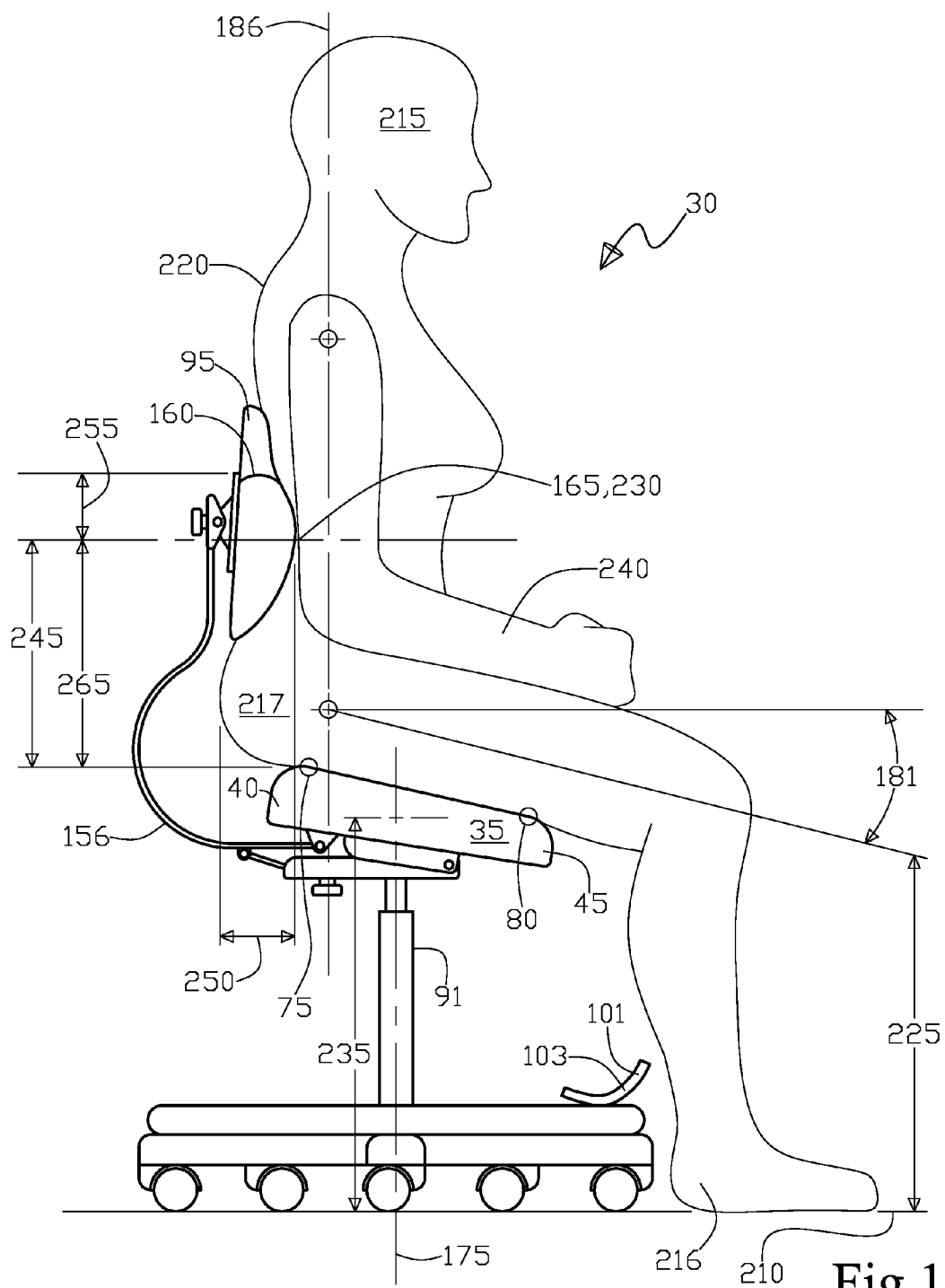


Fig.9





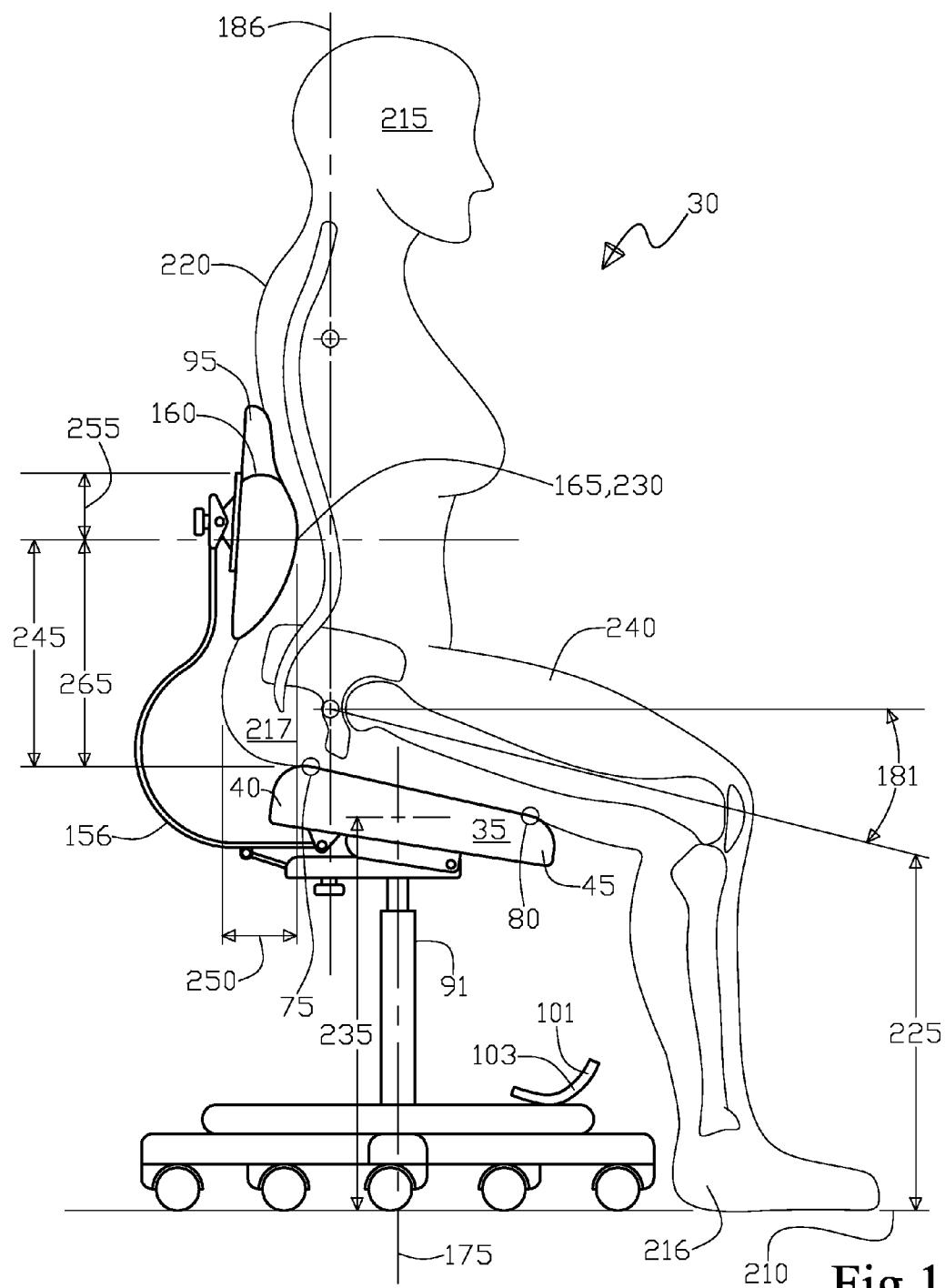


Fig.12

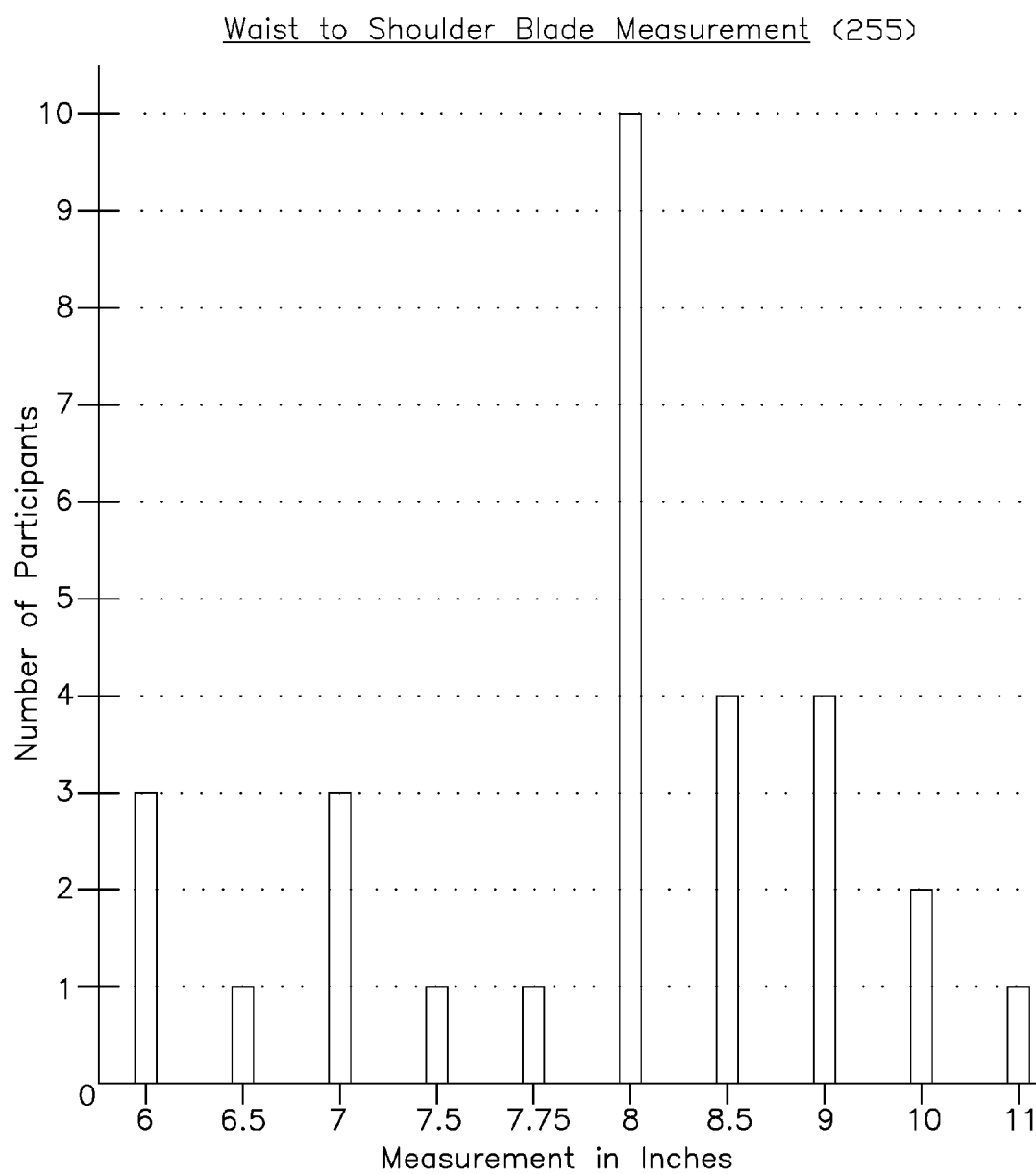


Fig.13

Horizontal Measurements of Buttocks to Waist Curve or small  
of back

(250)

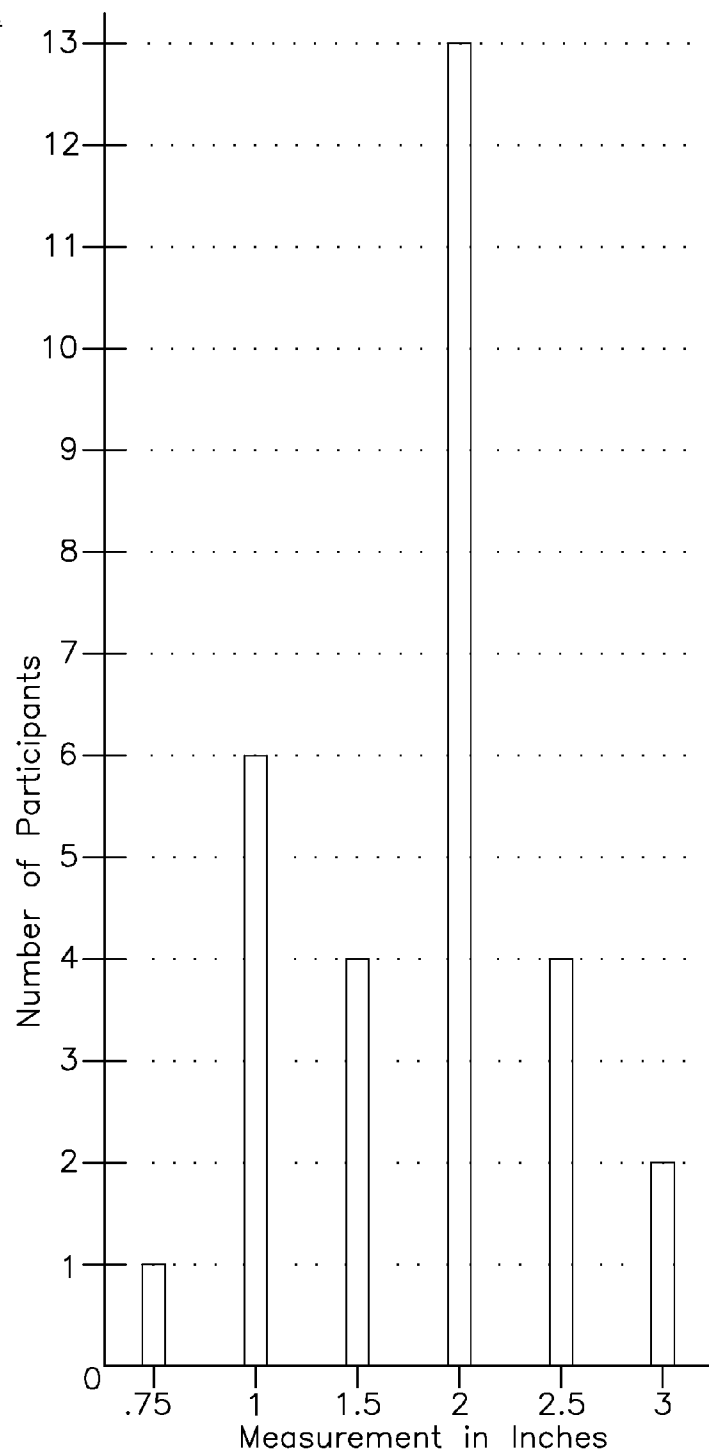


Fig.14

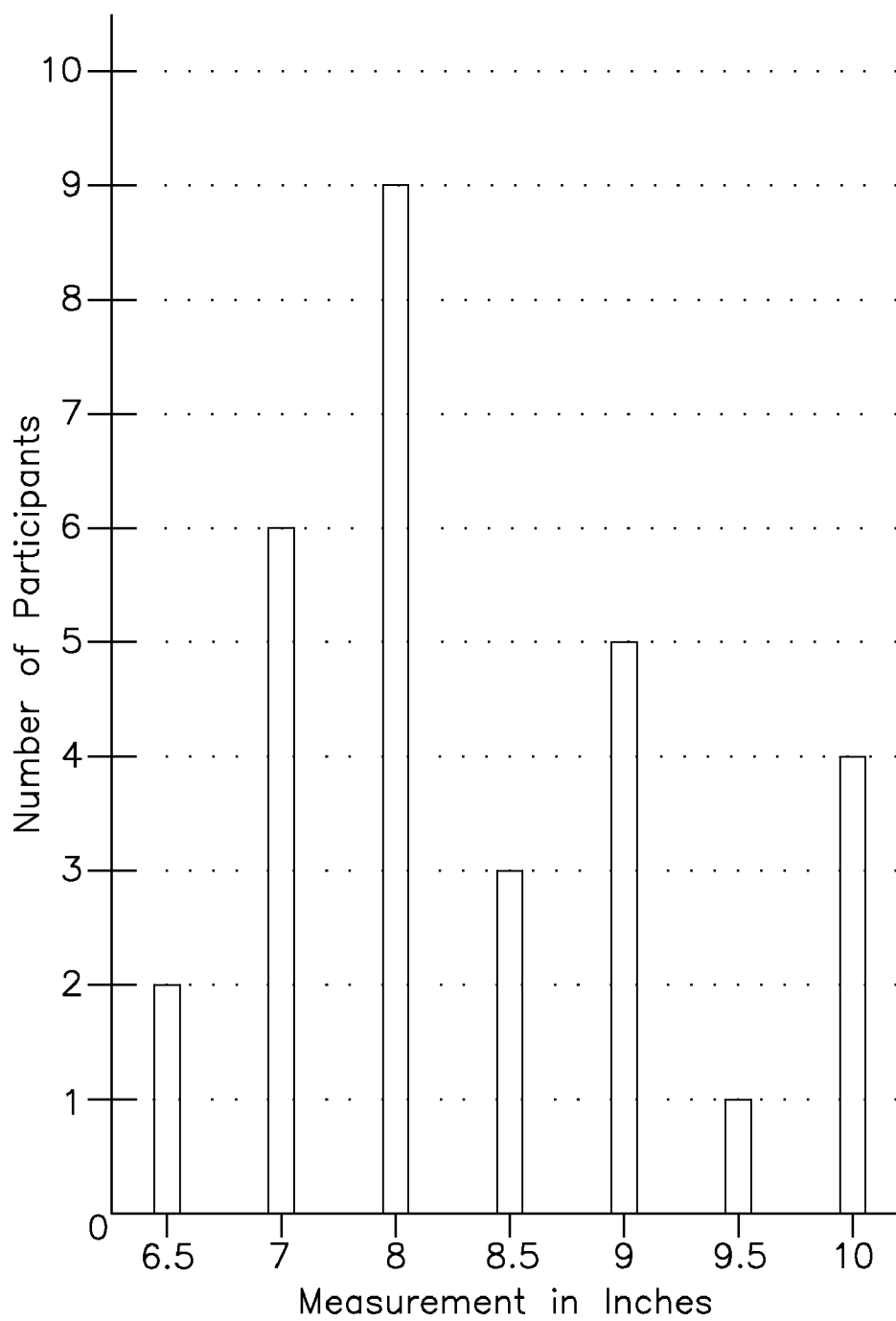
Bottom of Chair to Waist Measurements (265)

Fig.15



## ERGOMETRIC CHAIR APPARATUS

### FIELD OF INVENTION

**[0001]** The present invention relates to ergonomic seats or chairs, and more particularly to chairs that help support workers to reduce fatigue when performing tasks while seated for prolonged durations of time.

### BACKGROUND OF THE INVENTION

**[0002]** There exists a need to provide ergonomic support to workers using chairs to assist in decreasing fatigue, helping in the prevention of musculoskeletal disorders (MSDs), and related issues that result from prolonged durations of time spent in a seated position. In the increasing sedentary environment of the modern workplace, recent trends emerged showing an increase in chronic medical problems, such as musculoskeletal disorders (MSDs) and an increase in worker fatigue arising when workers sit for prolonged durations of time performing tasks that require the worker to sit. These problems are, in part, due to the growing dependence on computers to perform tasks in offices and increasing levels of automation in the work place that reduce the amount of manual labor in the workplace. Over time, chair design has remained largely unchanged, by not providing for the differing needs of office workers.

**[0003]** The negative impact of inadequate ergonomic support provided to workers during extended time periods of seating manifests primarily in two ways. The first is an increased load on the health care system, typically due to an increase in MSDs and similar ailments. The second significant impact is a loss of worker productivity through lowered worker efficiency related to loss of concentration and absenteeism in connection with the treatment of MSDs or related ailments. Additionally, extended time periods of sitting without beneficial ergonomic support leads to a decrease in efficiency once a worker becomes fatigued. Fatigue due to extended time periods of sitting can cause the worker to take more frequent breaks effectively spending less time performing work, a higher incidence of work errors, and decline in worker attitude, all combining to drive up the cost of labor to the employer. Additionally, with an aging work force, employers will likely experience additional health benefit costs as older workers become more prone to MSDs and other ailments. These relatively large costs can be circumvented through preventative steps taken by the employer to help reduce the number of MSDs and other ailments in the workplace due to inadequate ergonomic support of workers, as well as increasing the productivity of workers. These preventive measures may include proactive steps such as stretching and other therapeutic activities in the workplace. However, reliance on such proactive steps alone is insufficient. It is difficult to ensure employees participate in such proactive measures, and it may prove difficult to encourage such behavior. As a result, providing workers with ergonomic chairs capable of passively assisting the workers from becoming prone to MSDs, other related ailments, and fatigue is preferable. The relatively small investment of properly designed chairs will allow passive assistance to the worker to combat the aforementioned emerging health problems of the modern office environment.

**[0004]** The prior art recognizes the problems of workplace fatigue and chronic injury related to prolonged time periods of sitting. The prior art employs a variety of techniques in an

attempt to assist in alleviating seating fatigue and helping to prevent the onset of MSDs and other related ailments. The use of a contoured back structure combined with an adjustment mechanism is a common attempted solution in the prior art. However, the use of a back pad in conjunction with a means of adjustment presents difficulty in assisting workers in overcoming undesirable ergonomic conditions associated with extended time periods of sitting. First, the adjustment mechanism can be complicated to operate. Moreover, the adjustment mechanism presents a potential failure point in that the adjustment mechanism may break preventing adjustments from being made. Also, the range of adjustment may allow the worker to adjust the back into a position that may be comfortable temporarily, but after continuous use lead to fatigue. This requires the worker to either continually adjust the back, or alternatively, adjust the back to a comfortable starting position and continue to work despite the onset of fatigue, precursors to MSDs, or other related ailments. Adjustable back designs may also lead to an impediment of the full range of motion of the seated worker while performing job tasks. Furthermore, chairs are commonly too big or too small for the worker using them, leading to inappropriate sitting positions that can cause fatigue also.

**[0005]** An example of a prior art solution employing an adjustable seat back is in U.S. Pat. No. 6,394,547 B1 to Vik, that discloses a seat back support that is positioned between the 2nd lumbar and the 11th thoracic vertebrae of the worker. The seat back in Vik provides a horizontal and vertical component of force normal to the workers' back that acts upon the worker's back. Vik attempts to provide a simple and inexpensive ergonomic chair that provides adequate support to a worker even when the worker leans back in the chair. Vik accomplishes this end by employing an adjustable back affixed in a cantilever fashion to a seat that is positioned between the 2nd lumbar and the 11th thoracic vertebrae of the worker. While Vik accomplishes providing the worker with back support, Vik fails to teach a dimensional relationship between the back, hips, and legs of the worker. Moreover, Vik does not address any problems related to the seat of the chair, nor does Vik provide any assistance in alleviating MSDs or other ailments related to the soft tissue of the worker's legs and posterior. Also, because Vik targets a specific region of the back, and the design explicitly requires that the back pad contact the worker at a specific location, workers may either be unfamiliar with where to position the back pad, or find the position uncomfortable and fail to use the pad correctly.

**[0006]** Further, a prior art example that includes an adjustable backrest is U.S. Pat. No. 5,624,158 to Adat et. al., that discloses a seat backrest that is adjustable in vertical height and contour in both the curvature of upper and lower portions of the backrest. Additionally, Adat et. al. provides adjustable lateral support to the worker. Adat et. al. does recognize the need to provide freedom of movement in the worker's upper body; however, the adjustment mechanisms in Adat et. al. are complicated and involves several adjustment points, as well as several mechanisms for adjustment. The various mechanical adjustment structure in Adat et. al. are all prone to unreliability issues after repeated use. While Adat et. al. provides a plurality of adjustments to the worker, Adat et. al. also presents difficulty in that the worker must spend time fine tuning the adjustment at various points to achieve a comfortable backrest position. Note that Adat et al., has no criterion disclosed as to set the various backrest adjustments for specific issues related to extended sitting fatigue and discomfort.

[0007] Similarly, in U.S. Pat. No. 6,626,494 B2 to Yoo, a chair is disclosed with an adjustable backrest assembly that is adjusted by the worker to a desired position. However, there is no limitation on the adjustment to the backrest in Yoo, making the backrest infinitely adjustable. This could lead to continual adjustments by the worker, tending to prevent correct positioning. Moreover, because the worker can be unfamiliar with what backrest position is necessary to correctly align the spine, Yoo presents an opportunity for the worker to adjust the chair backrest into a less desirable or possibly detrimental position. Without supervision by a person qualified to determine the correct orthopedic position of the chair, Yoo does not solve the need to provide ergonomic support.

[0008] A further prior art reference that attempts to simplify the adjustment of the chair backrest is U.S. Pat. No. 7,147,282 B2 to Hatcher et. al., that incorporates the adjustment structure into the backrest support structure. Hatcher et. al. allows adjustments to be made by the worker without having to awkwardly reach behind or underneath the worker to make adjustments to the chair backrest. As Hatcher et. al. only provides backrest depth adjustment with respect to the seat, the issues of multiple adjustments with multiple potential reliability issues is solved, however the need still exists to correctly position the lower body of the worker to the chair backrest. Further, in Hatcher et al., there is no method disclosed on how to set the various adjustments of the backrest for specific MSD disorder issues from prolonged sitting.

[0009] Similarly, in U.S. Pat. No. 6,938,956 B1 to Piretti discloses a double backrest support structure for a chair with the desired solution of proper back support. Piretti discloses structure to provide lumbar support to the worker through the use of two separate backrest members that, like Adat et. al., employ a variety of adjustment mechanisms to provide the worker with desired back comfort. The adjustments in Piretti provide greater complexity to the worker using the chair and can allow the worker to adjust the chair backrest members to a less desirable ergonomic position. Additionally, in Piretti the added adjustment mechanism complexity adds to the overall cost and time required to manufacture and assemble the chair, making the design less feasible for mass production. Piretti has no teachings related to specific settings for the backrest in response to particular extended sitting fatigue problems experienced by the worker.

[0010] Continuing in the prior art, a chair having again two back support portions that are each independently adjustable is disclosed in US. Pat. No. 7,040,703 B2 to Sanchez. In Sanchez, separate back support members attach each chair back support to the seat of the chair. Such an arrangement in Sanchez only complicates the existing problem of adjustment complexity, as to adjust the back portions to the desired position to promote ergonomic support, there are an increasing number of adjustments that need to be made by the worker, thus increasing the time required to make the adjustments and increasing the difficulty in getting the chair back support positioned to a beneficial or desirable position. Moreover, Sanchez represents increasing complexity in the manufacturability and assembly of chairs leading to increased costs of production. Also as in Piretti, Sanchez has no disclosure of a method for selecting various adjustments to better accommodate chronic fatigue problem a worker has from extended periods of sitting.

[0011] Similarly, in U.S. Pat. No. 6,655,731 B2 to Martin disclosed is an adjustment mechanism that leads to complex adjustments and difficulty in replicating the desired position.

In Martin, both the chair seat and chair back are adjustable rotationally about a parallel pair of axes of each the chair seat and chair back. The chair seat and chair back are also adjustable by adjusting the chair seat and chair back to various discrete adjustment positions that are provided along the horizontal and vertical members of the frame of the chair. While the arrangement in Martin does provide increasing versatility for a variety of workers, the limited adjustment ability leads to incorrect adjustments, as well as an inability to reproduce or replicate a desirable adjustment setting once the setting has been realized. Also, Martin lacks specific teaching as to how to set the various adjustments in accordance with the various worker ailments resulting from prolonged sitting periods.

[0012] Another common solution in the prior art is the use of a seat that may have a specific size or contour. While the use of a seat of a specific shape or size does not present the aforementioned problems of the adjustable back, the particularity of each shape may not be accommodating to all workers. This requires a plurality of designs or manufacturing techniques to accommodate different workers. In this respect, some prior art has sought to assist male or female genders through various differing forms specific to either male or female genders. While particularly shaped seats may alleviate some MSDs and other ailments related to the soft tissue of the posterior of the workers, the designs do not provide for any specialized support for the worker's back. Thus there is also a need to provide specifically designed chairs that accommodate gender specific anatomy, for instance, the anatomy of a woman's body. As the shape of a woman's body is unique, a chair design should similarly reflect and conform to the specific needs of women.

[0013] A prior art reference that discusses the need to use specific structure for chairs that differ with respect to men and women is in U.S. patent application publication number 2002/0175553 A1 to Steifensand. Steifensand discloses two species of chairs that differ based upon the gender of the worker. While Steifensand discloses a shorter seat for the female species of the chair, Steifensand fails to provide an adapted chair back for the female. Therefore, while Steifensand recognizes the need for specifically designed chairs for the differing body contours of the male and female worker, the invention in Steifensand falls short of adequately providing a chair back that is designed specifically for the female gender.

[0014] Similarly, in U.S. Pat. No. 5,110,183 to Jeanes, III teaches how the different anatomy of female and male genders effect the proper design of chairs. Jeanes, III uses tables of data compiled to represent the respective anatomies of males and females. Additionally, Jeanes, III discloses that a shorter seat in the distance that is parallel to the femur bone is preferable to a longer seat for the anatomy of a female. However, Jeanes, III attempts to solve the problem of discomfort for the infirm or persons confined to a wheelchair; therefore, Jeanes, III does not disclose a desirable position of the back of a worker that is performing tasks. Jeanes, III provides a chair that is suited for reclining or converting to a prone position. Thus, Jeanes, III is not feasible for a worker that is required to perform tasks. Moreover, Jeanes, III teaches away from using any contour of the seat or back, but instead teaches of using a flat, planar surface for both the back and seat portions of the chair. Jeanes, III also fails to provide a specific back to seat relationship desirable to promote correct ergonomics.

[0015] Next in U.S. Pat. No. 6,193,313 B1 to Jonsson provides a unique seat structure that predisposes the worker to a

position in which the legs, hips, and back are aligned in a particular way. However, Jonsson teaches that it is desirable to pivot the worker's hips toward the chair backrest such that the worker's back is driven positionally into the lumbar support of the chair. Jonsson accomplishes this position by the structure of the seat alone. The invention in Jonsson tends to create a position that leads to a slouching posture where the top of the worker's spine is arched so that the worker's shoulders are positioned forward of the hips of the worker creating a position that leads to fatigue. In addition the posture Jonsson induces may promote discomfort in the lower portion of the worker's back.

**[0016]** Another prior art example of the use of contour to provide ergonomic support comes in U.S. Pat. No. 7,077,469 B2 to Badia i Farre that includes a seat surface designed to be straddled by the worker such that the legs of the worker are positioned so that the worker's legs are disposed on opposite sides of the seat. Additionally, Badia i Farre incorporates voids in the seating surface to accommodate the male genitals of the worker to prevent soft tissue contact with the seat. Again, due to the unconventional method of straddling the seat, a worker may not feel comfortable with using the Badia i Farre seat. Additionally, workers that use the design in Badia i Farre may find it difficult to mount and dismount the seat. Further, especially for women, the wearing of a dress as opposed to slacks would preclude the use of this straddling of the seat.

**[0017]** Other prior art solutions take on unconventional designs that position workers in fundamentally different positions than a traditional chair. One such position includes providing ventral support to the worker. These designs can lead to complexity and difficulty in use, especially when the worker mounts or dismounts the chair. As an example the following prior art references use either dorsal or ventral support structures to help induce correct ergonomic position. One such reference is U.S. Pat. No. 4,650,249 to Serber. Serber discloses an office chair that uses a ventral support in combination with a seat to help induce correct ergonomic position. However, in Serber such an arrangement where ventral support is used, the positioning of the support can lead to interference with the work task movements performed by the worker, as well as difficulty sitting on the chair and returning to a standing position. However, this type of office chair design being introduced decades ago has not meet with much market acceptance most likely due to the difficulty of the worker mounting and dismounting the chair, the lack of seating position flexibility, and the potential interference of the chair with desks and other office equipment. These problems are also present in U.S. Pat. No. 7,104,606 B2 to Congleton et. al. Congleton et. al. discloses a chair that is convertible from ventral to dorsal support. Again, in Congleton et. al. when in the dorsal support arrangement, the seat and back do not properly orient the hips of the worker and when in the ventral support arrangement, the issues of sitting and standing from the chair arise, much like in Serber.

**[0018]** Similarly, U.S. Pat. No. 7,090,303 B2 to Kropa discloses a chair that supports the worker ventrally by providing a rest that contacts the worker's abdomen and allows the worker to perform tasks in front of the worker. The primary problem Kropa addresses is the ability to rehabilitate lower leg injuries while seating through the use of abductor and adductor type movement attachments that allow the legs to be exercised while seated. However, in Kropa again, the design presents challenges for using the chair in that worker mount-

ing and dismounting the chair becomes awkward with the addition of the abductor and adductor type movement extensions. Also, due to the ventral support of the worker in Kropa, the design may limit the number of workers willing or able to use such a design, especially as related to limitations to use of the workers hands and arms. Again, Kropa does not teach a method of setting adjustments in response to worker fatigue stemming from extended periods of sitting.

**[0019]** There exists a need to provide a chair that assists in positioning a worker in a manner that promotes prevention of MSDs, other related ailments, and reduces fatigue by utilizing the shape of the seat and back in addition to the position of the seat and/or back with respect to each other. Such a chair should be simple and inexpensive to produce and use without excess adjustability that adds complexity to the overall design. Such a design should also accommodate the varying sizes of workers, yet also be able to serve a large portion of the working population effectively, without drastic changes in the design or use of the chair. One such solution to the dichotomy of providing a chair to serve a specific shape, yet also be useful to a large population of workers may be to provide a chair designed especially for the unique anatomy of the female gender. The design of a female specific chair would allow for a large population of workers to be accommodated, while still tailoring the chair to the specific needs that a female anatomy presents. Additionally, to further assist in the reduction of MSDs, related ailments, and fatigue, it is desirable to perform a series of tests to determine what position is most desirable for a worker to take while working for an extended duration of time. Such tests should focus on the ability to reduce fatigue, and seek to determine the optimal position to provide ergonomic support to a worker. An objective measure for fatigue should be developed to accurately measure what size and relative position should be realized in the seat and back to accommodate a worker. Also, to overcome the problems in the prior art of common workers having difficulty in adjusting a chair into a desirable position, a method should be developed whereby a worker can properly and simply adjust a chair into the optimal position by following steps to properly orient the workers body prior to extended durations of time.

#### SUMMARY OF THE INVENTION

**[0020]** The present invention is for a chair that is adapted for a female anatomy; the chair includes a seat having a proximate end portion and a distal end portion that forms a first substantially convex arcuate profile surface therebetween on the seat. The seat also including a length that is substantially parallel to the first substantially convex arcuate profile surface and a distance substantially transverse to the length, with the first substantially convex arcuate profile surface formed from a first partial arc of a first radius, the first radius being greater than the length. In addition, the first substantially convex arcuate profile surface includes a first seat tangential point on the proximate end portion and a second seat tangential point on the distal end portion, wherein the first seat tangential point and the second seat tangential point are at a first distance apart forming a seat plane.

**[0021]** Further included in the chair is a back having a first end portion and a second end portion, the first and second end portions forming a second substantially convex arcuate profile surface, the back also including a dimension substantially parallel to the second substantially convex arcuate profile surface and a first measure and a second measure both being

substantially transverse to the dimension. Wherein, the second measure on the second end portion is less than the first measure on the first end portion, with the second substantially convex arcuate profile surface formed from a second partial arc of a second radius, the second radius being greater than the dimension. In addition, the second substantially convex arcuate profile surface including a first back tangential point on the first portion and a second back tangential point on the second portion, wherein the first back tangential point and the second back tangential point are at a second distance apart forming a back plane.

**[0022]** The seat plane and an extension axis that is perpendicular to the surface are relatively positioned to one another to form an acute angle to one another at an intersection point positioned therebetween the first seat tangential point and the second seat tangential point, in addition the seat and back are relatively positioned such that a span from the first seat tangential point to the first back tangential point is at least equal to half of said dimension. Further, a support base is disposed between the seat and the surface, and a support structure disposed between the seat and the back.

#### BRIEF DESCRIPTION OF DRAWINGS

**[0023]** FIG. 1 shows a prior art side elevation view of a female chair user sitting in a typical conventional technology office chair, wherein it can be seen that the femur bone lengthwise portion of the leg is parallel with the support surface with the back posture somewhat hunched over noting that the shoulder joint is not vertically aligned of the hip joint adding toward poor posture which is shown skeletally in FIGS. 2 and 3;

**[0024]** FIG. 2 side elevation view of a skeletal structure from FIG. 1, with the female chair user sitting in a typical conventional technology office chair, wherein it can be seen that the Femur bone lengthwise portion of the leg is parallel with the support surface with the back posture somewhat hunched over making for poor posture, noting that the pivotal movement of the Femur bone in the hip joint is limited to about sixty (60) degrees, thus from the standing position as shown in FIGS. 4 and 5, the user leg upper portion can move from standing to sitting through an arc of about sixty (60) degrees or in other words about thirty (30) degrees short of the standard sitting position on the Femur bone lengthwise being at ninety (90) degrees to the back bone as shown in FIGS. 1, 2, and 3, thus the Femur bone lengthwise must bend the pelvis and the back bone for the last thirty (30) degrees of movement to achieve the ninety (90) sitting position in FIGS. 1, 2, and 3, this results in the situation wherein the discs have unequal spacing as between the bones, see especially FIG. 3, which can be termed a Kyphosis operational state, wherein the pressure placed upon the disc increases significantly from their uneven edge loading, being up to a 400% increase in disc pressure from the standing position in FIGS. 4 and 5 to the high forward leaning positions for the back as seated in FIGS. 1, 2, and 3;

**[0025]** FIG. 3 shows expanded view 3-3 from FIG. 2 detailing out the femur bone, pelvic, and discs area, wherein it can be more clearly seen that the femur bone being parallel to the support surface causes the pelvic bone to rotate counter clockwise putting the discs in a hunched-over position in an arcuate posture opposite from that of the standing position as shown in FIGS. 4 and 5, with this being combined with the conventional chair user tending to lean somewhat forward causes the portions of the discs adjacent to the femur to be compressed

axially more than the portion of the discs oppositely positioned, resulting in the undesirable aforementioned increase in disc pressure which can be termed the Kyphosis operational state;

**[0026]** FIG. 4 shows a side elevation view of a skeletal section of a normal human in a standing position, showing the most natural posture of the upper portion of the femur bone, the pelvis and the backbone, wherein the backbone is in a Lordosis operational state with the lumbar curve in its natural state, or more importantly that the discs of the back have equal spacing around their entire periphery as between the disc and the bone resulting in more equal pressure placed upon the discs which is desirable, as when the discs have unequal spacing as between the bones, which can be termed the Kyphosis operational state, see FIGS. 2 and 3, wherein the pressure placed upon the disc increases significantly, being up to a 400% increase in disc pressure from the standing position to high forward leaning positions for the back;

**[0027]** FIG. 5 shows expanded view 5-5 from FIG. 4 detailing out the femur bone, pelvic, and discs area, wherein it can be more clearly seen that the femur bone position in the normal standing attitude resulting in the pelvic bone is in its natural positional state putting the discs in the evenly spaced state around their entire periphery, wherein the backbone is in the Lordosis operational state with the lumbar curve in its natural state;

**[0028]** FIG. 6 shows a side elevation view of a skeletal section of a normal human in a laying on their side relaxed position, such that there is no gravitational force on the skeletal structure that would be bearing upon the feet upward, as in a normal standing attitude, thus this relaxed on the side laying position showing the most natural default positional posture of the upper portion of the femur bone, wherein the femur bone is at one-hundred and thirty-five (135) degrees of angle from the back bone, plus the pelvis and the backbone, wherein the backbone again is in what can be termed the Lordosis operational state with the lumbar curve in its natural state, or more importantly that the discs of the back have equal spacing as between the disc and the bone resulting in more equal pressure placed upon the discs which is desirable, as opposed to again as when the discs have unequal spacing as between the bones, which can be termed the Kyphosis operational state, wherein the pressure placed upon the disc increases significantly being up to a 400% increase in disc pressure from the standing position to high forward leaning positions for the back;

**[0029]** FIG. 7 shows expanded view 7-7 from FIG. 6 detailing out the femur bone, pelvic, and discs area, wherein it can be more clearly seen that the femur bone position in the normal laying on the side position resulting in the pelvic bone is in its natural positional state putting the discs in the evenly spaced state around their entire periphery, wherein the backbone is in the Lordosis operational state with the lumbar curve in its natural state;

**[0030]** FIG. 8 shows a perspective view of the present invention of the chair adapted for the female anatomy, noting the downward sloping seat away from the back to the support surface to allow the user's knees to be positioned below the hip, wherein the chair back has a great amount of spacing away from the seat to allow for a slight back arching, further to accommodate space for the user's buttocks, and the back having an upper narrow portion to accommodate non binding movement of the user's shoulder blades as the user's arms are moved for work motions, i.e. using a keyboard and the like,

further a foot rest is shown, that is formed as a partial periphery chord segment that has a radial arcuate section for receiving a user's heel;

[0031] FIG. 9 shows a front elevation view of the present invention of the chair adapted for the female anatomy, again noting the downward sloping seat away from the back to allow the user's knees to be positioned below the hip, wherein the back has a great amount of spacing away from the seat to allow for a slight back arching, further to accommodate space for the user's buttocks, and the back having an upper narrow portion to accommodate non binding movement of the user's shoulder blades, further the foot rest is shown, that is formed as the partial periphery chord segment that has the radial arcuate section for receiving the user's heel;

[0032] FIG. 10 shows a side elevation view of the present invention of the chair adapted for the female anatomy, again noting the shorter in length from the rear proximal portion to the front distal portion downward sloping seat at an angle going from the rear of the seat to the front of the seat, again to allow the user's knees to be positioned below the hip, wherein the back has a span of spacing away from the seat to allow for the user to have the slight back arching, further to accommodate space for the user's buttocks, wherein the chair back is positioned to nest in the small of the back of the user to further support a better skeletal posture for the user sitting in the present invention chair, further the foot rest is shown, that is formed as the partial periphery chord segment that has the radial arcuate section for receiving the user's heel;

[0033] FIG. 11 shows the same side elevation view as FIG. 10, with the user in position in the chair with their legs between the hip and knee being angled downward toward the floor surface, plus showing the span of the free and open space as between the seat and back for the user's hips and lower back open space to slightly arch rearward, further to accommodate space for the user's buttocks, and the chair back nesting in the small of the user's back for support on the user's skeletal structure to approach the more ideal back positioning as shown in FIGS. 2 and 3, further the foot rest is shown, that is formed as the partial periphery chord segment that has the radial arcuate section for receiving the user's heel;

[0034] FIG. 12 shows the same side elevation view as FIG. 11, with the addition of a skeletal cross section of the user in position in the chair with their legs or the femur bone between the hip and knee being angled downward toward the floor surface, plus showing the span of the free and open space as between the seat and back for the user's hips and lower back open space to slightly arch rearward, further to accommodate space for the user's buttocks, and the chair back nesting in the small of the user's back for support on the user's skeletal structure to approach the more ideal back positioning as shown in FIGS. 6 and 7, further, the positional relationship of the femur to the pelvis to the discs is also shown, that is between the Lordosis and Kyphosis positions as previously described, further the foot rest is shown, that is formed as the partial periphery chord segment that has the radial arcuate section for receiving the user's heel;

[0035] FIG. 13 shows a compilation of raw data samples taken of women for the scope of distances as between their waist and their shoulder blades with a quasi somewhat bell shape statistical variance curve of variation of this measured distance, wherein it was shown that the majority of the thirty (30) test sample subjects came in at a distance of about 8.06 inches, this was done to determine the range of adjustment

movement vertically of the back and for the upper of second portion narrowing of the back to accommodate clearance for the user's shoulder blades;

[0036] FIG. 14 shows another compilation of raw data samples taken on a group of thirty (30) participants for the scope of distances from their waist to the curve or the small of their backs for determining placement of the maximum second radius extension portion or largest protrusion portion of the back to enable the nesting of this protrusion portion in the small of the back for the user, the mean distance for the waist to small of the back distance was 1.83 inches; and

[0037] FIG. 15 shows a further compilation of raw data samples also taken on a group of thirty (30) participants for the scope of distances from the bottom of the chair of seat portion to their waists, for the purpose of enabling the measurements as taken in FIGS. 13 and 14 to be associated with the chair structure itself, wherein the distance from the bottom of the chair seat portion to the users waists had a mean of 8.23 inches.

#### REFERENCE NUMBERS IN DRAWINGS

- [0038] 30 Ergometric chair apparatus adapted for a female anatomy
- [0039] 35 Seat
- [0040] 40 Proximate end portion of seat 35
- [0041] 45 Distal end portion of seat 35
- [0042] 50 First substantially convex arcuate profile surface
- [0043] 55 Length substantially parallel to the first substantially convex arcuate profile surface 50
- [0044] 60 First distance substantially traverse to the length 55
- [0045] 65 First radius
- [0046] 70 First partial arc of the first radius 65
- [0047] 75 First seat tangential point
- [0048] 80 Second seat tangential point
- [0049] 85 Second distance
- [0050] 90 Seat plane
- [0051] 91 Support base in-between the seat 35 and the surface 210
- [0052] 95 Back
- [0053] 100 First end portion of back 95
- [0054] 101 Foot rest
- [0055] 102 Partial periphery chord segment of the foot rest 101
- [0056] 103 Radial arcuate section of the foot rest 101
- [0057] 105 Second end portion of back 95
- [0058] 110 Second substantially convex arcuate profile surface
- [0059] 115 Dimension substantially parallel to second substantially convex arcuate profile surface 110
- [0060] 120 First measure of back 95
- [0061] 125 Second measure of back 95
- [0062] 130 Second radius
- [0063] 135 Second partial arc of the second radius 130
- [0064] 140 First back tangential point
- [0065] 145 Second back tangential point
- [0066] 150 Third distance
- [0067] 155 Back plane
- [0068] 156 Support structure between the seat 35 and the back 95
- [0069] 160 Transition from the back first end portion 100 to the back second end portion 105
- [0070] 165 Maximum second radius extension portion

- [0071] 170 Overlap as between the seat proximate end portion 40 and the maximum second radius extension portion 165
- [0072] 175 Extension axis that is perpendicular to the surface 210
- [0073] 180 Acute angle
- [0074] 181 Femur bone center line inclination angle that is complementary to the acute angle 180
- [0075] 182 Femur bone center line parallel to surface 210 in the prior art
- [0076] 185 Intersection point of the acute angle 180
- [0077] 186 Inline user shoulder joint and hip joint vertical alignment
- [0078] 187 Lateral offset of the user shoulder joint and hip joint vertical alignment, either forward or rearward
- [0079] 190 Span from the first seat tangential point 75 to the first back tangential point 140
- [0080] 200 High friction surface of seat 35
- [0081] 205 Memory foam of seat 35
- [0082] 210 Surface
- [0083] 215 User
- [0084] 216 Heel of the user 215
- [0085] 217 Buttocks of the user 215
- [0086] 220 Female anatomy
- [0087] 225 Leg length of user 215
- [0088] 230 Waist of the user 240 or the small of the user's 240 back
- [0089] 235 Seat height above the surface 210
- [0090] 240 User sitting in the chair 30
- [0091] 245 Distance from the first seat tangential point 75 to the small 230 of the user's 240 back
- [0092] 250 Horizontal measurement of the buttocks 217 to the user's 240 waist 230 or small of the user's
- [0093] 240 back
- [0094] 255 Waist to shoulder blade distance of the user 240
- [0095] 265 Bottom of chair or seat 35 to waist of the user 240 distance
- [0096] 270 Distance from the maximum second radius extension portion 165 to transition 160

#### DETAILED DESCRIPTION

[0097] With initial reference to FIG. 1 shown is a prior art side elevation view of a female chair user 240 sitting in a typical conventional technology office chair, wherein it can be seen that the femur bone lengthwise portion of the leg is parallel 182 with the support surface 210, with the back posture somewhat hunched over, noting that the shoulder joint is forward 187 of the hip joint, adding toward poor posture which is shown skeletally in FIGS. 2 and 3.

[0098] Continuing, as the basis for FIGS. 2, 3, 4, 5, 6 and 7, in a study completed by German orthopedic surgeon, Hanns Schoberth in 1962, x-rays were taken in showing that the femur has about sixty (60) degrees of pivotal movement in relation to the pelvis, meaning that when an individual moves into a seated position requiring a ninety (90) degree angle of femur movement from standing for instance, in relation to the pelvis necessitates that the pelvis and the lumbar curve must accommodate the additional thirty (30) degrees of movement, with this additional bending occurring between the 4<sup>th</sup> and 5<sup>th</sup> lumbar discs, see FIGS. 2 and 3. Thus, in FIGS. 4 and 5 shown is a side elevation view of a skeletal section of a normal human in a standing position, showing the most natural posture of the upper portion of the femur bone, the pelvis, and the backbone, wherein the backbone is in what could be termed a

Lordosis operational state with the lumbar curve in its natural state, or more importantly that the discs of the back have equal spacing as between each of the disc and the bone adjacent sets, resulting in a more equal pressure distribution placed upon each of the discs which is desirable. This is as opposed to when the discs have unequal spacing as between the bones, which can be termed the Kyphosis operational state, see FIGS. 2 and 3, wherein the pressure placed upon each disc can increase significantly being up to a 400% increase in disc pressure from the standing position to undesirable high forward leaning positions for the back.

[0099] Further, referring specifically to FIGS. 6 and 7 in a study conducted by American orthopedic surgeon J. J. Keegan in 1953, in a series of x-rays of people laying on their sides in documenting the movements in the lumbar section of the spinal column, FIGS. 6 and 7 show a side elevation view of a skeletal section of a normal human in a relaxed laying on their side position, such as resting in a bed, such that there is no gravitational force on the skeletal structure in its normal vertical axis, i.e. as in standing, thus FIGS. 6 and 7 showing the most natural default positional posture of the upper portion of the femur bone, wherein the femur bone lengthwise is positioned at one-hundred and thirty-five (135) degrees of angle from the back bone as shown. Thus in FIGS. 6 and 7, as shown in the pelvis and the backbone positioning, wherein the backbone again is in what can be termed a Lordosis operational state with the lumbar curve in its natural state, or more importantly that the discs of the back have the desirable equal spacing as between each of the disc and the bone adjacent sets resulting in a more equal pressure distribution placed upon the discs which is desirable, again as opposed to when the discs have the undesirable unequal spacing as between the adjacent bones, which can be termed the Kyphosis operational state, see FIGS. 2 and 3, wherein the pressure placed upon the disc increases significantly being up to a 400% increase in disc pressure from the standing position to high forward leaning positions for the back, see FIGS. 1, 2, and 3.

[0100] Referring again to FIGS. 2 and 3, for the side elevation view of a skeletal structure from FIG. 1, with the female chair user 240 sitting in a typical conventional technology office chair, wherein it can be seen that the Femur bone lengthwise portion of the leg is parallel 182 with the support surface 210 with the user's 240 back posture somewhat hunched over making for poor posture, noting that the pivotal movement of the Femur bone in the hip joint is limited to about sixty (60) degrees, as previously discussed, thus from the standing position as shown in FIGS. 4 and 5, the user 215 leg upper portion can move from standing to sitting through an arc of about sixty (60) degrees or in other words about thirty (30) degrees short of the standard ninety (90) degree sitting position on the Femur bone lengthwise being positioned at ninety (90) degrees as shown in FIGS. 1 and 2. Thus, as FIGS. 2 and 3 show, the Femur bone lengthwise must bend the pelvis and the back bone for the last thirty (30) degrees of movement to achieve the ninety (90) sitting position as shown in FIGS. 1 and 2, this results in the situation wherein the discs have unequal spacing as between the adjacent bones, which can be termed the Kyphosis operational state, wherein the pressure placed upon the disc increases significantly being up to a 400% increase in disc pressure from the standing position to high forward leaning positions for the back in the user 240, see FIGS. 1, 2, and 3.

[0101] Yet further, in FIG. 8 shown is a perspective view of the present invention of the chair 30 adapted for the female

anatomy 220, noting the downward sloping chair seat 35 away from the chair back 95 to allow the user's 240 knees to be positioned below their hip, wherein the chair back 95 has a great amount of spacing via a span 190 away from the seat 35 to allow for the slight back arching of the user 240, further to accommodate space for the user's 240 buttocks 217, and the chair back 95 having an upper narrow portion or second measure 125 to accommodate non binding movement of the user's 215 shoulder blades. Further a foot rest 101 is shown, that includes a partial periphery chord segment 102 and that has a radial arcuate section 103 for receiving a user's 215 heel 216, see FIG. 11. Continuing, FIG. 9 shows a front elevation view of the present invention of the chair 30 adapted for the female anatomy 220, again noting the downward sloping chair seat 35 away from the chair back 95 to allow the user's 240 knees to be positioned below their hip, wherein the chair back 95 has a great amount of spacing or span 190 away from the chair seat 35 to allow for the user 240 back to slightly arch to form a type of swayback curve at the small 230 of the user's 240 back bone, further to accommodate space for the user's 240 buttocks 217, and the chair back 95 having an upper narrow portion or second measure 125 to accommodate non binding movement of the user's 240 shoulder blades. Further a foot rest 101 is shown, that includes a partial periphery chord segment 102 and that has a radial arcuate section 103 for receiving a user's 215 heel 216, see FIG. 11.

[0102] Continuing, FIG. 10 shows a side elevation view of the present invention of the chair 30 adapted for the female anatomy 220, again noting the shorter in length 55 from the rear proximal portion 40 to the front distal portion 45 downward sloping angle 180 seat at an angle 181 going from the rear 40 of the seat 35 to the front 45 of the seat 35, again to allow the user's 240 knees to be positioned below the hip, wherein the chair back 95 has a span 190 of spacing away from the seat 35 to allow for user 240 slight back arching or creating the small of the back 230 curve, wherein the chair back 95 is positioned to nest in the small of the back 230, allowing free space for the user's 215 buttocks 217 to not be impeded by the chair back 95, resulting in the user 240 being able to further support a better skeletal posture for the user 240 sitting in the present invention chair 30, see also FIGS. 11 and 12. Further a foot rest 101 is shown, that includes a partial periphery chord segment 102 and that has a radial arcuate section 103 for receiving a user's 215 heel 216, see FIG. 11. Continuing, FIG. 11 shows the same side elevation view as FIG. 10, with the user 240 in position in the chair 30 with their legs between the hip and knee being angled 181 downward toward the floor surface 210, plus showing the span 190 of the free and open space as between the seat 35 and back 95 for the user's 240 hips and lower back open space to slightly arch rearward 230 allowing free space for the user's 215 buttocks 217, and with the chair back 95 nesting in the small 230 of the user's 240 back for support on the user's 240 skeletal structure to approach the more ideal back positioning as shown in FIGS. 6 and 7. Further a foot rest 101 is shown, that includes a partial periphery chord segment 102 and that has a radial arcuate section 103 for receiving a user's 215 heel 216, see FIG. 11.

[0103] Next, FIG. 12 shows the same side elevation view as FIG. 11, with the addition of a skeletal cross section of the user 240 in position in the chair 30 with their legs or the femur bone between the hip and knee being angled downward 181 toward the floor surface 210, plus showing the span 190 of the free and open space as between the seat 35 and back 95 for the

user's 240 hips and lower back open space to slightly arch rearward 230, allowing free space for the user's 215 buttocks 217, and with the chair back 95 nesting in the small 230 of the user's 240 back for support on the user's 240 skeletal structure to approach the more ideal back positioning as shown in FIGS. 6 and 7, further, the positional relationship of the femur to the pelvis to the discs is also shown, that is between the Lordosis and Kyphosis positions as previously described. Thus given that the user's 215 upper legs and femur bone angle downward 181 helps reduce the thirty (30) degree angle that the pelvis must normally take up, as shown in FIGS. 2 and 3, thus helping to alleviate the uneven disc pressure as shown in FIGS. 2 and 3, with there being a comfort limit as to how large of an angle 181 can be tolerated without the user 215 sliding forward in the seat 35. Further a foot rest 101 is shown, that includes a partial periphery chord segment 102 and that has a radial arcuate section 103 for receiving a user's 215 heel 216, see FIG. 11.

[0104] Further, FIG. 13 shows a compilation of raw data samples taken of women for the scope of distances as between their waist and their shoulder blades 255 with a quasi somewhat bell shape statistical variance curve of variation of this measured distance 255, wherein it was shown that the majority of the thirty (30) test sample female subjects came in at a distance of about 8.06 inches as between the waist and shoulder blades 255, this was done to determine the range of adjustment movement vertically of the back 95 and for the upper of second portion 105 narrowing second measure 125 of the chair back 95 to accommodate clearance for the user's 240 shoulder blades. Next, FIG. 14 shows another compilation of raw data samples taken on a group of thirty (30) female participants for the scope of distances being horizontal measurements of the user's 240 buttocks 217 to the user's 240 waist 230 or small of the back defined as distance 250 for determining placement of the maximum second radius extension portion 165 or largest protrusion portion of the chair back 95 to enable the nesting of this protrusion portion 165 in the small of the back 230 for the user 240, wherein the mean distance for the waist to small of the back distance 250 was 1.83 inches. Next, FIG. 15 shows a further compilation of raw data samples also taken on a group of thirty (30) female participants for the scope of distances from the bottom of the chair or seat 35 portion to their waists 265, for the purpose of enabling the measurements as taken in FIGS. 13 and 14 to be associated with the chair 30 structure itself, wherein the distance 265 from the bottom of the chair seat 35 portion to the users 240 waists had a mean of 8.23 inches. Note that the dimension for the 265 measurement, the seat thickness is included, thus in say taking a measurement from the seat proximal end portion 40 or the first set tangential point 75, upward the seat thickness should be subtracted from dimension 265, being about four (4) inches.

[0105] Broadly, as best shown in FIGS. 8 through 12, the present invention is for a chair 30 that is adapted for a female anatomy 220; the chair 30 includes a seat 35 having a proximate end portion 40 and a distal end portion 45 that forms a first substantially convex arcuate profile 50 surface therebetween on the seat 35. The seat 35 also including a length 55 that is substantially parallel to the first substantially convex arcuate profile surface 50 and a distance 60 substantially transverse to the length 55, with the first substantially convex arcuate profile surface 50 formed from a first partial arc 70 of a first radius 65, the first radius 65 being greater than the length 55. In addition, the first substantially convex arcuate



profile surface 50 includes a first seat tangential point 75 on the proximate end portion 40 and a second seat tangential point 80 on the distal end portion 45, wherein the first seat tangential point and the second seat tangential point are at a second distance 85 apart forming a seat plane 90, best shown in FIG. 10.

[0106] The concept here is that the length 55 is shorter than a conventional office chair seat to allow the user's 240 legs to angle 181 more toward the surface 210 with seat support focused in the area of the user's 240 hip joint as opposed to a longer more conventional seat 35 length 55, as shown in FIGS. 1 and 2, that would put pressure on the user's 240 leg just behind the knee, thus restricting the desired angle 181, as best shown in FIG. 11. In addition, the seat 35 convex arcuate profile surface 50 further facilitates angle 181, as the seat 35 surface 50 allows somewhat of a "roll off" i.e. the distal end portion 45 curves even more towards the surface 210 than does the seat 35 area adjacent to an intersection area 185 which would be more parallel to the angle 181, again see FIG. 11, as opposed to a conventional chair that has a relatively flat seat surface that is parallel to the surface 210, as shown in FIGS. 1 and 2.

[0107] Further included in the chair 30 that is adapted for a female anatomy 220 is a back 95 having a first end portion 100 and a second end portion 105, the first 100 and second 105 end portions forming a second substantially convex arcuate profile surface 110, the back 95 also including a dimension 115 substantially parallel to the second substantially convex arcuate profile surface 110 and a first measure 120 and a second measure 125 both being substantially transverse to the dimension 115, as best shown in FIGS. 8, 9, and 10. Wherein, the second measure 125 on the second end portion 105 is less than the first measure 120 on the first end portion 100, with the second substantially convex arcuate profile surface 110 formed from a second partial arc 135 of a second radius 130, the second radius 130 being greater than the dimension 115. In addition, the second substantially convex arcuate profile surface 110 including a first back tangential point 140 on the first portion 100 and a second back tangential point 145 on the second portion 105, wherein the first back tangential point 140 and the second back tangential point 145 are at a third distance 150 apart forming a backplane 155. As the back 95 is designed to nest into or adjacent to the small of the back 230 of the user 240, as shown in FIG. 11, thus with the back 95 being of minimal size to support the small of the back 230 while leaving a larger span 190 as between the seat 35 and the back 95 accommodating room for the somewhat swayback user 240 posture going from their hip joint to their lower back to allow for additional body adjustment movement to achieve what is shown in FIG. 11, primarily with the user's 240 shoulder joint and hip joint being in a vertical alignment 186 in moving more toward a better skeletal posture as shown in FIGS. 4, 5, 6, and 7.

[0108] Continuing on the chair 30 that is adapted for a female anatomy 220, the seat plane 90 and an extension axis 175 that is perpendicular to the surface 210 are relatively positioned to one another to form an acute angle 180 to one another at an intersection point 185 positioned therebetween the first seat tangential point 75 and the second seat tangential point 80. In addition the seat 35 and back 95 are relatively positioned such that a span 190 from the first seat tangential point 75 to the first back tangential point 140 is at least equal to half of the dimension 115, to accommodate the measurement distances 255, 250, and 265 based upon data taken as

shown in FIGS. 13, 14, and 15 all as previously described, wherein the span 190 is a larger dimension i.e. the distance as between the seat 35 and back 95 is greater than a typical conventional chair, see FIG. 1, wherein the chair in FIG. 1 doesn't allow the user as much freedom of movement to adjust for better posture, further not allowing for hardly any buttocks 217 rearward clearance, thus aiding in promoting the undesirable slouching forward of the user's 215 back as previously described.

[0109] Preferably the seat 35 and back 95 are relatively positioned such that the span 190 from the first seat tangential point 75 to the first back tangential point 140 is about six (6) to nine (9) inches, based upon the data in FIGS. 13, 14, and 15, as opposed to a conventional office chair in FIG. 1, wherein the span is in the range of zero (0) to four (4) inches, that would severely restrict the freedom of movement as between desirable positioning of the user's 240 femur, pelvis, and back bone or spine. Continuing, on the back 95 positioning, based upon the data in FIGS. 13, 14, and 15, for the chair 30 adapted for a female anatomy 220 wherein the seat proximate end portion 40 and the maximum second radius extension portion 165 are positioned at a preferred distance 245 of about eight (8) to eleven (11) inches apart, as shown in FIG. 11, to best position the back 95 to be nested in the user's 240 small of their back 230. Further, in looking at the lateral positioning of the back 95, the chair 30 adapted for a female anatomy 220, wherein the seat proximate end portion 40 and the maximum second radius extension portion 165 are positioned with a preferable overlap distance 170 of about two (2) inches being parallel to the surface 210, as best shown in FIG. 7, as this is to better ensure positioning of the back 95 to be nested in the user's 240 small of their back 230, to better accommodate the desired shoulder joint and hip joint vertical in-line alignment 186, as shown in FIG. 11.

[0110] Alternatively looking at FIG. 10 in particular for the acute angle 180 for the chair 30 adapted for a female anatomy 220, the preferred acute angle 180 is in the range of about fifty-five to eighty-five (55-85) degrees. This particular range for the acute angle 180 is derived from FIGS. 2, 3, 4, 5, 6, and 7 and in particular FIGS. 2, 3, 4, and 5 for the sixty (60) degree range of Femur bone movement in the hip joint before the pelvis and back bone have to move (causing the previously described undesirable uneven spacing of the back bone disc sets), thus the sixty (60) degree movement falls within the range fifty-five to eighty-five (55-85) degrees for the acute angle 180. Also looking at FIGS. 6 and 7, the one hundred-thirty-five (135) degree angle for the Femur from the back bone would result in acute angle 180 being forty-five (45) degrees which is just out of the preferred range. However, there are practical considerations to make as when the user 240 is seated in the chair 30 as shown in FIGS. 11 and 12, to take the acute angle 180 to a lower number such as forty-five (45) degrees would risk the user 240 uncomfortably sliding forward out of the chair, even with a high friction surface seat 35 covering 200 and/or memory foam 205/or seat 35 surface sculpting for the user 240, thus the past need for the kneeling chair like Serber U.S. Pat. No. 4,650,259, as previously discussed in the field and background section, utilized knee and abdominal ancillary supports to better allow the complementary angle 181 (to acute angle 180) as shown in FIG. 11, such that as angle 181 is to be increased to beyond, for instance greater than thirty-five (35) degrees, wherein the user 240 could stay in the seat with these ancillary supports that add



their own problems of cramping and soreness to the user from pressure against their knee and abdominal area used as supports.

[0111] Further, these ancillary supports were not popular with users as these ancillary supports caused additional problems with abdominal and knee cramping, nerve irritation, and just plain getting in the way in front of the desk, keyboard, computer, and the like, plus causing awkward and difficult movement to get in and out of the chair by the user 240. Thus the acute angle 180 preferred range of range fifty-five to eighty-five (55-85) degrees is the most practical while trying to allow for angle 181 to fall within the desired range of thirty-five (35) to five (5) degrees, with the ideal being thirty (30) degrees as per the Hanns Schobert study previously discussed, for improved skeletal posture without the need for ancillary support devices as previously described that do not have much popularity. Further in a modified embodiment for the chair 30, the acute angle 180 could have a narrowed range of position of about seventy-five (75) to eighty-seven (87) degrees, thus resulting in complementary angle 181, in FIG. 7 being in the range of three (3) to fifteen (15) degrees.

[0112] As shown in FIGS. 8 through 12, a support base 91 is disposed between the seat 35 and the surface 210, wherein the support base 91 has conventional castors, conventional vertical height adjustment, and further the foot rest 101 that includes the partial periphery chord segment 102, with the radial arcuate section 103, and further an angular 180 seat 35 adjustment that can be of a frictional clamping type, or a ratcheting mechanism, or a dowel pin that is received in a plurality apertures, or a suitable equivalent. Additionally, also as shown in FIGS. 8 through 12, a support structure 156 is disposed between the seat 35 and the back 95 that controls the positional relationship as between the seat 35 and the back 95 as previously described to effectuate the distance 245 and the horizontal measurement 250, via conventional adjustment mechanisms of frictional clamping, or dowel pins that are received in a plurality apertures, or a suitable equivalent.

[0113] Continuing to a number of preferred specifics for the chair 30 for a female anatomy 220 are the dimensions that are based upon the data gathered from FIGS. 13, 14, and 15 for the group of thirty (30) female participants the following is given; the length 55 is in the range of about thirteen (13) inches, noting that this dimension is shorter than a conventional office chair, which is in the range of eighteen to twenty (18-20) inches, to allow for the user's 240 knees to drop below their hips, as shown in FIGS. 11 and 12, as a first step toward minimizing the pelvis and backbone bending causing uneven disc loading as shown in FIGS. 2 and 3, thus moving toward the more ideal pelvis/backbone positioning shown in FIGS. 4 and 5. Further, on the chair 30 adapted for a female anatomy 220 the first distance 60 is in the range of about sixteen (16) inches, however, this first distance 60 could be a larger distance and not affect the function of the chair 30 and the second distance 85 is in the range of about eleven (11) inches, being the distance between the first tangential point 75 and the second tangential point 80 on the seat 35 that is used as intersection points to develop the seat plane 90.

[0114] Continuing, on the chair 30 adapted for a female anatomy 220 the dimension 115 is in the range of about seven (7) inches, noting that this is the height of the chair back 95, that is also smaller than a conventional office chair, that are in the range of eleven (11) to eighteen (18) inches, thus the present invention has a shorter back 95 for several reasons, being to accommodate a female anatomy 220 based upon the

data in FIGS. 13, 14, and 15, and as previously discussed the desired function of the back 95 is to nest in the small of the back 230 of the user 240 dictating that the back is smaller than a conventional office chair, further this nesting of the back 95 in the small of the user's back 230 facilitates the skeletal posture approaching that of FIGS. 4 and 5. In accordance, on the back 95, the third distance 150 is in the range of about six (6) inches, being the distance between the first back tangential point 140 and the second back tangential point 145 to form the back plane 155.

[0115] Continuing on the back 95, as another feature unique to the female anatomy 220 also based upon the data in FIGS. 13, 14, and 15, the back is narrower at its upper or second end portion 105 to accommodate a narrower distance as between a female's shoulders and shoulder blades and to again allow for more freedom of movement in settling into the desired skeletal posture of FIGS. 4 and 5. Thus on the back 95 the first measure 120 is in the range of about twelve (12) inches as best shown in FIG. 9, and then transitioning 160 to the second measure 125 is in the range of about four (4) inches, which allows the females more narrowly spaced shoulder blades full freedom of movement as compared to a males wider spaced shoulder blades, noting that the conventional office chair has a back width in the range of twelve (12) to sixteen (16) inches typically without any narrowing at the upper portion being a consistent width over its entire height. Also, on the back 95, distance 270 in going from the maximum second radius extension portion 165 to the transition 160 defines on the back 95 the distance from the small of the back 230 of the user 240 to the start of the shoulder blades of the user 240, thus distance 270 is equal to distance 255 plus distance 265 less distance 245 which equals about two and one-half (2-1/2) inches. Further, based upon the data in FIGS. 13, 14, and 15, for the chair adapted 30 for a female anatomy 220, preferably wherein the seat proximate end portion 40 and the transition 160 are positioned being the combination of 255 and 265 about fourteen (14) to seventeen (17) inches apart, as shown in FIG. 11.

[0116] A few other optional useful features of the chair 30 adapted for a female anatomy 220 would include a high friction surface 200 disposed upon the seat 35. Wherein the preferred materials of construction for the high friction surface 200 would include velvet, velour, a thick nap fabric, and the like to help resist the tendency for the user 240 to slide forward on the seat 35 due to the acute angle 180, and its complementary angle 181, as best shown in FIGS. 10 and 11 respectively. In addition, optionally, the seat 35 can include a memory foam 205 disposed upon the seat 35 as shown in FIG. 9, which could be combined with a sculpted seat again to better resist the tendency for the user 240 to slide forward on the seat 35 due to the acute angle 180, and its complementary angle 181, as best shown in FIGS. 10 and 11 respectively.

#### METHOD OF USE

[0117] Referring in particular to FIGS. 4, 5, 6, 7, 11, and 12, a method of using a chair 30 adapted for a female anatomy 220, wherein the chair 30 is adjacent to a surface 210 is disclosed, comprising the steps of: firstly providing a chair 30 as previously described. A next step of adjusting the seat plane 90 to an extension axis 175 that is perpendicular to the surface 210 such that they are relatively positioned to one another to form an acute angle 180 from between about fifty-five (55) to eighty-five (85) degrees to one another, wherein the angle 180 is taken at an intersection point 185 positioned

therebetween the first seat tangential point **75** and the second seat tangential point **80**. The determination of the angle **180** will be based upon a user's leg length **225**, seat height above the surface **235**, and the user's comfort level in said adjusting of the angle **180** in not uncomfortably sliding forward on the inclined seat **35**, however as also previously discussed the ideal angle **180** is sixty (60) degrees for zero pelvis and lumbar backbone flexing meaning that the discs are not unevenly loaded as previously discussed, however, even if the user **240** has some sliding forward discomfort, they should set the angle **180** as close to sixty (60) degrees as possible for maximum posture benefit, see FIGS. **10** and **11**.

[0118] A further step of adjusting the seat **35** and back **95** such that they are relatively positioned to one another to result in a selected span **190** from the first seat tangential point **75** to the first back tangential point **140**, the selected span **190** being based upon the user **240** sitting in the chair **30** after completing the previous angle **180** adjusting step and measuring a distance **245** from the first seat tangential point **75** to a small **230** of the back of the user **240**, wherein the maximum second radius extension portion **165** is positioned to be in contact with the small **230** of the back of the user **240** at the selected span **190**, as shown in FIGS. **11** and **12**. A next step of laterally adjusting the maximum second radius extension portion **165** in a selected measurement **250** parallel to the surface **210** to be positioned in contact with the small **230** of the back of the user **240** while the user is **240** sitting in the chair **30** after completing the angle **180** adjusting step and the span **190** adjusting step, as best shown in FIGS. **11** and **12**, wherein as previously described the maximum second radius extension portion **165** is to be nested in the small **230** of the back of the user **240** to facilitate the user's shoulder joint and hip joint to be in vertical alignment **186** as best shown in FIGS. **11** and **12**.

### CONCLUSION

[0119] Accordingly, the present invention of a chair apparatus adapted for a female anatomy and method of using the same has been described with some degree of particularity directed to the embodiments of the present invention. It should be appreciated, though, that the present invention is defined by the following claims construed in light of the prior art so modifications the changes may be made to the exemplary embodiments of the present invention without departing from the inventive concepts contained therein.

1. A chair adapted for a female anatomy, wherein said chair is adjacent to a surface, comprising:

- (a) a seat having a proximate end portion and a distal end portion forming a first substantially convex arcuate profile surface there between, said seat also including a length substantially parallel to said first substantially convex arcuate profile surface and a first distance substantially transverse to said length, said first substantially convex arcuate profile surface formed from a first partial arc of a first radius, said first radius being greater than said length, in addition said first substantially convex arcuate profile surface including a first seat tangential point on said proximate end portion and a second seat tangential point on said distal end portion, wherein said first seat tangential point and said second seat tangential point are at a second distance apart forming a seat plane;
- (b) a back having a first end portion and a second end portion, said first and second end portions forming a second substantially convex arcuate profile surface, said

back also including a dimension substantially parallel to said second substantially convex arcuate profile surface and a first measure and a second measure both being substantially transverse to said dimension, wherein said second measure on said second end portion is less than said first measure on said first end portion, said second substantially convex arcuate profile surface formed from a second partial arc of a second radius, said second radius being greater than said dimension, in addition said second substantially convex arcuate profile surface including a first back tangential point on said first portion and a second back tangential point on said second portion, wherein said first back tangential point and said second back tangential point are at a third distance apart forming a backplane;

- (c) said seat plane and an extension axis that is perpendicular to the surface are relatively positioned to one another to form an acute angle to one another at an intersection point positioned therebetween said first seat tangential point and said second seat tangential point;
  - (d) said seat and back are relatively positioned such that a span from said first seat tangential point to said first back tangential point is at least equal to half of said dimension;
  - (e) a support base disposed between said seat and the surface; and
  - (f) a support structure disposed between said seat and said back.
2. A chair adapted for a female anatomy according to claim 1, wherein said acute angle is in the range of about fifty-five to eighty-five (55-85) degrees.
3. A chair adapted for a female anatomy according to claim 1, wherein said length is in the range of about thirteen (13) inches.
4. A chair adapted for a female anatomy according to claim 3, wherein said first distance is in the range of about sixteen (16) inches.
5. A chair adapted for a female anatomy according to claim 3, wherein said second distance is in the range of about eleven (11) inches.
6. A chair adapted for a female anatomy according to claim 1, wherein said dimension is in the range of about seven (7) inches.
7. A chair adapted for a female anatomy according to claim 6, wherein said third distance is in the range of about six (6) inches.
8. A chair adapted for a female anatomy according to claim 1, wherein said first measure is in the range of about twelve (12) inches.
9. A chair adapted for a female anatomy according to claim 8, wherein said second measure is in the range of about four (4) inches.
10. A chair adapted for a female anatomy according to claim 2 further comprising a high friction surface disposed upon said seat.
11. A chair adapted for a female anatomy according to claim 2 further comprising a memory foam disposed upon said seat.
12. A chair adapted for a female anatomy, wherein said chair is adjacent to a surface, comprising:

- (a) a seat having a proximate end portion and a distal end portion forming a first substantially convex arcuate profile surface there between, said seat also including a length substantially parallel to said first substantially

convex arcuate profile surface and a first distance substantially transverse to said length, said first substantially convex arcuate profile surface formed from a first partial arc of a first radius, said first radius being greater than said length, in addition said first substantially convex arcuate profile surface including a first seat tangential point on said proximate end portion and a second seat tangential point on said distal end portion, wherein said first seat tangential point and said second seat tangential point are at a second distance apart forming a seat plane;

- (b) a back having a first end portion with a transition to a second end portion, said first and second end portions forming a second substantially convex arcuate profile surface, said back also including a dimension substantially parallel to said second substantially convex arcuate profile surface and a first measure and a second measure both being substantially transverse to said dimension, wherein said second measure on said second end portion is less than said first measure on said first end portion, said second substantially convex arcuate profile surface formed from a second partial arc of a second radius, said second radius being greater than said dimension, in addition said second substantially convex arcuate profile surface including a first back tangential point on said first portion and a second back tangential point on said second portion, with a maximum said second radius extension portion positioned therebetween said first and second back tangential points, wherein said first back tangential point and said second back tangential point are at a third distance apart forming a backplane;
- (c) said seat plane and an extension axis that is perpendicular to the surface are relatively positioned to one another to form an angle of about seventy-five (75) to eighty-seven (87) degrees to one another at an intersection point positioned therebetween said first seat tangential point and said second seat tangential point;
- (d) said seat and back are relatively positioned such that a span from said first seat tangential point to said first back tangential point is about six (6) to nine (9) inches;
- (e) a support base disposed between said seat and the surface; and
- (f) a support structure disposed between said seat and said back.

13. A chair adapted for a female anatomy according to claim 12 wherein said seat proximate end portion and said transition are positioned about fourteen (14) to seventeen (17) inches apart.

14. A chair adapted for a female anatomy according to claim 12 wherein said seat proximate end portion and said maximum second radius extension portion are positioned about eight (8) to eleven (11) inches apart.

15. A chair adapted for a female anatomy according to claim 12 wherein said seat proximate end portion and said maximum second radius extension portion are positioned with an overlap of about two (2) inches parallel to the surface.

16. A method of using chair adapted for a female anatomy, wherein said chair is adjacent to a surface, comprising the steps of:

- (a) providing a chair that is adapted for a female anatomy that includes a seat having a proximate end portion and a distal end portion forming a first substantially convex

arcuate profile surface therebetween, said seat also including a length substantially parallel to said first substantially convex arcuate profile surface and a first distance substantially transverse to said length, said first substantially convex arcuate profile surface formed from a first partial arc of a first radius, said first radius being greater than said length, in addition said first substantially convex arcuate profile surface including a first seat tangential point on said proximate end portion and a second seat tangential point on said distal end portion, wherein said first seat tangential point and said second seat tangential point are at a second distance apart forming a seat plane, further included is a back having a first end portion with a transition to a second end portion, said first and second end portions forming a second substantially convex arcuate profile surface, said back also including a dimension substantially parallel to said second substantially convex arcuate profile surface and a first measure and a second measure both being substantially transverse to said dimension, wherein said second measure on said second end portion is less than said first measure on said first end portion, said second substantially convex arcuate profile surface formed from a second partial arc of a second radius, said second radius being greater than said dimension, in addition said second substantially convex arcuate profile surface including a first back tangential point on said first portion and a second back tangential point on said second portion, with a maximum said second radius extension portion positioned therebetween said first and second back tangential points, wherein said first back tangential point and said second back tangential point are at a third distance apart forming a backplane, a support base disposed between said seat and the surface, and a support structure disposed between said seat and said back;

- (b) adjusting said seat plane to an extension axis that is perpendicular to the surface such that they are relatively positioned to one another to form an acute angle from between about fifty-five (55) to eighty-five (85) degrees to one another, wherein said angle is taken at an intersection point positioned therebetween said first seat tangential point and said second seat tangential point, determination of said angle will be based upon a user's leg length, seat height above the surface, and the user's comfort level in said adjusting of said angle;
- (c) adjusting said seat and back such that they are relatively positioned to one another to result in a selected span from said first seat tangential point to said first back tangential point, said selected span being based upon the user sitting in said chair after completing said angle adjusting step and measuring a distance from said first seat tangential point to a small of the back of the user, wherein said maximum second radius extension portion is positioned to be in contact with the small of the back of the user at said selected span; and
- (d) adjusting said maximum second radius extension portion in a selected reach parallel to the surface to be positioned in contact with the small of the back of the user while the user is sitting in said chair after completing said angle adjusting step and said span adjusting step.

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