A chair (12) has a support pedestal (22) with a pair of front legs, a pair of rear legs, a pair of side members, a rear frame member connecting the two rear legs and a cross member connecting the side members at a location between the front and rear legs. A pair of tunable leaf springs (32,34) is attached to the underside of the cross member with portions thereof extending forwardly and rearwardly therefrom in a substantially horizontal manner. Each tunable leaf spring (32,34) includes a U-shaped bight or loop portion (62) at the forwardmost extremity of the leaf spring coupling the forwardly extending portion with a horizontal overlying portion which passes over the cross member and extends rearwardly therefrom terminating in an orthogonally generally upwardly extending back support portion (75). Each leaf spring (32, 34) is provided with two spaced apart resilient members (42, 44) possibly rectangular, cylindrical, conical, or another shape, which are fixed to the chair and engage the horizontal overlying portion when the seat is supporting a load. The resilient members (42, 44) contribute to the spring action opposing closing of the U, but not to the spring effect opposing opening of the U.
QUATERNARY SPRING WITH TUNABLE SUSPENSION

BACKGROUND OF THE INVENTION

1. Field of the invention.

The present invention relates to chairs and more particularly, patient chairs as used, for example, in health care facilities.

2. Description of the related art.

Patient or health care chairs are commonly used in hospital rooms, assisted living homes, waiting rooms, hospices, extended care facilities, and at home. Health care chairs are used primarily, but not exclusively, by persons who have difficulty rocking or reclining in commonly available rockers and/or recliners. An additional complication with the latter chairs is, a health care requiring person may have difficulty in entering, sitting, or egressing that chair. Further, such chairs do not automatically compensate for the user’s mass.

There are many recliners and rocker type chairs on the current market and used in health care applications. Most of these recliners, and rockers, require some type of physical effort to make the chair rock or recline, that is by pulling on levers, pushing buttons, or using the force of legs onto a leg panel, or the human back pressing onto a chair's back-rest, to make it recline. All or any one of these physical efforts, i.e. motion, may not be possible for a sitting person who is recovering from surgery, age enfeebled or obese. The latter persons usually cannot lean down to grab a handle, or a post surgery person is unable or restricted from use of arm, chest, or back muscles. There are also powered chairs which are motor driven between a seated or reclining position and a forward upright position which aids ingress and
egress. These powered chairs are relatively large, heavy and expensive, and not well suited to use in health care facilities.

Health care patient chairs typically have only two primary legs integral with and extending upward at the front of the chair from a sled type base. This type of structure possesses a significant degree of instability. The seat of this type of chair is supported by, and on, or cantilevered directly off of the front legs. This type of construction is inherently unstable for a person who may need to sit by impacting the seat, or otherwise falls into the seat due to disability. This type of impact could cause the entire chair to "skitter" backwards, away from the entering person, causing them to lose balance and fall. This type of action could impose a force upon the chair that would have force vector components that are substantially perpendicular to the support, the front legs, and be of a sufficient magnitude to result in upsetting the chair from its normal upright position. The seat of the typical patient chair has no structural connection to or support directly from the rear legs, if any, of the chair, thus adding to the instability of the chair.

The arm supports of typical patient chairs are supported only by the vertical extension of the front legs of the chair. The arm supports lack any structural connection to or support directly from the rear legs, if any, of the chair. Thus, even further instability is added to the typical patient chair. A weakened patient attempting to sit down in the typical patient chair will naturally use the arm supports to assist in maintaining balance and to enable a gradual entry into the chair. In so doing, a patient will impose a force which is, at any one moment in time, composed of vertical and horizontal vector components. In an unsteady patient, the magnitudes of those horizontal and vertical vector components will vary significantly over a very brief period
of time. The typical patient chair, with arm supports lacking, connection to or support from the rear legs, if any, will become unstable when the sum of those horizontal and vertical vector components of the force applied by the patient is of a direction and magnitude which is not substantially and directly aligned with the support structure of the chair.

The front edge of the seat of the typical patient chair is positioned in line with the front legs, thereby making it difficult for an unsteady patient to place his feet and legs in a position and orientation that will enable sitting or standing. Furthermore, the arm supports of the typical patient chair do not extend substantially in front of the front edge of the seat, thereby increasing the difficulty encountered by an unsteady patient attempting to position their body in preparation for ingress or egress.

Some patient chairs provide a rocking motion. However, the rocking motion provided often forces the feet of the patient seated in the chair to lose contact with the floor, thus placing a degree of pressure on the back of the thigh of the patient's legs. Such pressure can severely restrict or cut off the circulation in a patient's lower legs. Furthermore, the rocking motion provided by some patient chairs is relatively undamped. An undamped rocking motion can cause an excited state in patients, particularly patients recovering from heart surgery and Alzheimer's.

Patient chairs typically have either all wood frames, or frames composed of wood and metal, which are mechanically fastened together. With continued use of a patient chair such mechanical fasteners are prone to loosen. Further, most prior art chairs with springs have only a single spring constant available for use.
What is needed in the art is a patient chair which remains stable during a user's ingress and egress, reduces the difficulty of ingress and egress, and provides a self-damped rocking motion.

SUMMARY OF THE INVENTION

This invention provides a chair, such as a health care patient chair, having a pair of arm supports extending forward of the seat, a seat positioned substantially rearward of the front legs. The present invention further provides a stable, self-damping, rocking motion, and a limited recline sitting position. Chair use is, of course, not limited to the infirmed.

The invention comprises, in one form thereof, a chair having a seat, a backrest, a support pedestal adapted to rest on a floor or other horizontal support surface, and a pair of U-shaped compound springs coupling the seat and backrest to the pedestal. Each spring has an upper longer portion, a lower shorter portion extending generally horizontally and parallel to the longer portion, and a bight or U-shaped end coupling the shorter and longer portions together. The shorter portion is fastened to the support pedestal between the shorter portion free end and the bight. The seat is fastened to the longer portion between the bight and longer portion free end, and the backrest is fastened to the longer portion free end. A pair of resilient pads are fixed to each spring shorter portion, engage the longer portion when the spring is compressed by a chair occupant and contribute to the overall spring action.

The quaternary spring motion and/or system created, to be later identified simply as Q4, is separately operable in various styles of sitting equipment (e.g., chairs, sofas, loveseats) and includes the ability to be dropped into various types of housings.
In another form of the invention, a spring system is created that may be tuned or adjusted on-the-fly, or during manufacturing, such that the system may have alternate or differing rates of spring action based on positions and structures of the springs utilized. In one embodiment of the invention, a conical puck solid spring may be utilized or insertable within the system to change the system spring action for different uses or user categories. In other embodiments, progressive rate springs formed from materials that vary in a cross section along their width, or length, or both, assist in the function of the device.

In some uses of the system, across different styles and classes of chairs, different positions of the spring location may be utilized to change system behavior based on the expected mass or weight of the user. Such changability, either during manufacturing or on-the-fly after manufacturing allows tuning of the seat characteristics to the particular market segment of the chair and chair system.

An advantage of the present invention is that the structure and configurations of the chair inhibit continued, volunteer oscillation since the system is self damped, yet provides a stable rocking motion.

Another advantage is that the structure and configuration of the chair prevent movement as a result of the forces applied by a person during the process of sitting in or standing up (egressing) from the chair.

A further advantage of the present invention is that the suspension senses the size and weight of the sitting, person and reacts and compensates to these attributes, and/or limitations.
An additional advantage is that the suspension of this invention does not require external actuating levers, buttons, or manually activated mechanisms to achieve rocking or reclining motion.

An other advantage of the present invention is that of having different rates of spring action, based on spring position, and/or the incorporation into the system of progressive rate springs of the disclosed design.

**BRIEF DESCRIPTION OF THE DRAWINGS**

The above-mentioned and other features and advantages of this invention, and the manner of attaining them, will become more apparent and the invention will be better understood by reference to the following description of an embodiment of the invention taken in conjunction with the accompanying drawings, wherein:

Fig. 1 is a perspective view of the basic chair components of leg frame, mesh seat, backrest and removable arms;

Fig. 2 is a more detailed perspective view of the chair suspension components;

Figs. 3a-3f are side elevation views of progressive development of the spring system;

Fig. 4 is an exploded perspective view showing all the components of the basic chair of Fig. 1;

Fig. 5 is a graph of load vs. deflection for an illustrative spring system;

Fig. 6 is an exploded view of one style of mounting system;

Fig. 7 is a view of prior art rocking motion on a classical rocking chair;

Fig. 8 is a view of rocking motion in a glide style rocker;

Fig. 9 is a graph of the constraints of rocker movement now found desirable to solve the problem in the art;
Figs. 10 a and b respectively show a linear spring and its flexure potential; and
Figs. 11 a and b respectively show a progressive spring, in one form, and its flexure potential.

Corresponding reference characters indicate corresponding parts throughout the several views. The exemplification set out herein illustrates one preferred embodiment of the invention, in one form, and such exemplification is not to be construed as limiting the scope of the invention in any manner.

**DETAILED DESCRIPTION OF THE INVENTION**

Referring now to the drawings and particularly to Figs. 1 and 4, there is shown a patient chair 12 having support pedestal 22 comprising two front legs 14 and 16, two rear legs 18 and 20, and a pair of side members 24 and 26. A rear frame member 28 connects the two rear legs 18 and 20. A cross member 30 connects the side members 24 and 26 intermediate the front and rear legs at a position substantially rearward of the front legs 14 and 16. Two configured leaf springs 32 and 34 are attached to the bottom of the cross member 30, for example, by screws such as 36, and thereafter extend rearwardly in a substantially horizontal manner.

Comparing Figs. 2 and 3, the front of the leaf spring extends forward of the cross member 30, but terminates rearward of the front legs 14 and 16, curves substantially downward and loops rearwardly passing under the cross member. The leaf spring attaches to the cross member as it passes thereunder, then the leaf spring continues rearwardly for a short distance or extension 38 (Fig. 3b), past the cross member, under and parallel to the leaf spring upper, longer top layer 60.

The seat 40 is connected to and supported by the leaf springs 32 and 34. The seat may be formed of a flexible, porous fabric sewn into a hammock shape and
disposed between the two primary seat springs. This hammock shape and flexible, porous fabric allow the springs to act in harmony with each other, creating a continuously flexible seat. The front edge of the seat bottom is positioned rearwardly of the front of the front legs 14 and 16. A compression spring medium such as and elastomeric spring mass 42 is attached to the topside of the cross member 30 under each leaf spring top layer, at the point where each leaf spring, passes over the cross member 30. A second compression spring such as 44 is attached to the bottom rearward facing projection such as 38 of each leaf spring, and touches the underside of the leaf spring top layer.

Two arm supports 46 and 48 are positioned above the seat and extend substantially forward of the front edge of the seat 40. The armrests or supports have reduced diameter sections such as 52 which are telescopically inserted into and supported by the open tops of the rear legs 18 and 20. A rigid molded wood backrest 50 is connected to and supported by the leaf springs and terminates the ends of the two primary springs 32 and 34 by attachment to these springs in a substantially vertical position. The backrest is attached by screws such as 68. This backrest has flexibility limited by its cantilever position at the terminus of the primary spring. Each of the rear legs 18 and 20 is angled forward upwardly toward the seat. Decorative and/or protective caps such as 70, 76 and 78 may be inserted into or over the upper open arm and leg ends, and floor engaging feet such as 72 may be inserted into or over the open lower leg ends.

In Fig. 3a, primary leaf spring 32 is attached to cross bar 30 by bolt 36. This is the primary spring system, a cantilevered leaf spring. In Fig. 3b, secondary spring 42 is fixed to the cross bar 30, also by the bolt 36. In Fig. 3c, trinary spring 44 is fastened
to the lower extension 38 of leaf spring 32 by screw 54. Fig. 3e illustrates a reverse (counterclockwise) deflection of one of the primary leaf springs, the fourth or quaternary spring mode of the support system.

For a simple horizontally cantilevered beam, the deflection or deformation $x$, is directly proportional to the product of the applied (concentrated) load, $W$, and the cube of the distance, $L$, from the load to the beam support, and inversely proportional to three times the flexural rigidity ($EI$, the product of the moment of inertia of the beam cross-section and the modulus of elasticity), that is

$$x = \frac{WL^3}{3EI}.$$  

For a fixed distance between support and load, and assuming modest deflections, all terms except for the load are constants and this relationship may be written as

$$W = k_1 x_1.$$  

For large deflections, the effective lever arm length is not a constant, but continuously decreases with increased deflection. This relationship is also a good approximation of the deflection of other beam configurations, such as the doubly cantilevered beam of Fig. 3a.

Assume that, in an unoccupied state, the chair upper spring portion 60 is spaced away from both compression springs 40 and 42. For relatively small displacements, the spring assembly behaves as though these resilient members were absent as depicted in Fig. 3a, the above linear relationship holds and is illustrated by the linear segment between the origin and the abscissa value at 56 in Fig. 5. Further assume that at this abscissa value, the upper spring portion engages the only the compression spring 42 as depicted in Fig. 3b. Now the upper spring portion begins to behave like an overhanging beam and the load vs. displacement curve slope
increases due to the additional resistance of the member 42 and due to an effectively shorter lever arm length. Depending on the respective stiffnesses, the beam may actually experience an upward deflection between the bight 62 and resilient member 42. The relationship continues along the second linear path until the second resilient member 44 is engaged at abscissa value 58. Between the values at 56 and 58, the force required to depress the spring a distance \( x_2 \) is the force required to move it from its rest position into engagement with the compression spring plus the additional force required to compress the spring 42 and further flex the beam an additional incremental distance \( x_i \)

\[
W = k_1 x_1 + k_2 x_i.
\]

If the upper spring portion is initially in contact with the compression spring 42, the two distances are the same and the overall load may be approximated by

\[
W = k_1 x_2 + k_2 x_2.
\]

When the deformation reaches point 58, further downward seat motion

additionally compresses the resilient member 44 as illustrated in Fig. 3c and, depending on the relative stiffness of the upper spring portion and resilient member, may deflect the lower spring portion 64 downwardly as in Fig. 3d. In either case, there is even more resistance to loading and the slope of the relationship increases beyond point 58. \( k_3 x_i \) expresses the additional force required to incrementally compress the member 44 beyond point 58 and \( k_4 x_i \) expresses the additional force to depress the free lower spring portion 64. The natural resonant frequencies of the different spring elements corresponding to the differently sloping regions of the graph of Fig. 5 are, of course, different.
If both resilient members are initially engaged by the upper spring portion 60, the three line segments of Fig. 5 blend together into a single generally linear relationship between the net deflection $x$ and force required to achieve the deflection may be approximated as

\[ W = (k_1 + k_2 + k_3 + k_4) x. \]

When an occupant of the chair moves forward to exit the chair, the load may be shifted to the front seat edge as indicated by the egress load arrow 66 of Fig. 3e. Upper spring portion 60 separates from the two resilient members and behaves much as discussed in conjunction with Fig. 3a, but the deformation or deflection is counterclockwise with the bight 62 opening as deflection increases. Thus, the first and second resilient members 42 and 44 contribute forces opposing spring compression to close the U-shape from its unstressed position, while the forces opposing opening the U-shape are contributed solely by the leaf primary spring 32. This relationship between load and deflection is illustrated by line 74 in Fig. 5. The effective lever arm is much shorter than earlier, the slope of line 74 is greater and the deflection in Fig. 3e is somewhat exaggerated. Note the force is still inboard of the front legs such as 14 and the probability of pivoting of the chair forwardly with potential injury to the occupant is minimized.

Fig. 3f includes an additional upright, substantially vertical portion 75, that terminates the overall shape of the invention, and to which the backrest is attached. This vertical portion 75 becomes another spring component, once the resilient member 44 activates the free lower spring portion 64. At this point, it becomes a shorter length spring with a new, but flexible fulcrum, after member 44, but which is still available to flex independent of the horizontal top portion of the u-shaped spring. This
spring member 75 allows the backrest to flex in response to the users weight, at any position of recline angle of the seat. This structure also allows for complete conformance of the users mass. A benefit of this structure is that it does not restrict the seat motion in any way, because the top spring member becomes an instant fulcrum/pivot immediately after resilient member 44 is fully loaded, e.g., depressed.

In total, the requirement of spring member 75 adds a cantilever spring and is the vertical termination of the U-shaped spring. This portion allows the recline angle to be independent of the seat pitch angle.

Tuning of the system, and its many spring elements may be created by utilization of, for example, a wood spring that tapers, there by forming a progressive rate spring. As shown in Fig.11. Alternatively, in other locations, such as spring member 44, the member or spring may be formed conically or another shape that varies in dimension along its width, length or both, such that the spring does not operate in a linear fashion. Such tunable spring components, and their replacement or substitution during manufacturing or after manufacturing can greatly alter the operating characteristics of the system.

In one form of the invention, a method of changing the entire operating envelope of the system, for example, creating a heavy duty operating system (for larger mass people) would be accomplished by replacing or substituting a different spring, for example elements 44, or 75 or both, such that the system would therefore be tuned, or able to accommodate a larger person, without correspondingly changing the outside physical dimensions of the system. Such substantial change in operation without corresponding large changes in structure are beneficial in the manufacturing, planning, use and sale of the device. Such changes to operation of the system could
even take place on the showroom floor, a substantial time after shipment from the manufacturer.

Fig. 6 is an exploded composite view of the utilization of the Q4 spring suspension and optional mounting systems such that the spring suspension side members may be utilized in dropping in a web seat port or web sling style seat. In one case, a torsion may be utilized as the mounting adapter into the chair frame prop.

Classic rocking motion utilized in classical rocking chairs may cause sea sickness or nausea for nursing mothers, patients with dementia, or other psychological problems. Classic rocking motion in which the point of rocking is in contact with the floor, is shown in Fig. 7.

Fig. 8 diagrammatically shows the use of a glide rocker in which head movement is shown in an out and forward or out and up motion. The rocking focus, as seen by the user of the glide rocker, translates as the slider translates front and back, and is maintained beneath the user of the chair along the user’s center of gravity.

By use of the new Q4 quaternary spring suspension, the present invention moves the focus of the point of rocking forward of the center of gravity of the patient or user while preventing its translation along the ground. Additionally, the point of rocking as viewed from the patient is not centrally located around the patient’s center of gravity, but is located forward of the center of gravity. More preferably, the present invention attempts to locate the point of rocking at a point above the floor and most preferably on or forward of two-thirds the length of the seat’s length, or alternatively, two-thirds of the user’s depth in the seat. The requirements of this point of rocking that it is in front of the center of gravity of the user or more preferably in front of the
two-thirds length of the user’s depth from the edge of the seat to the user’s posterior.

This creates a rocking sensation that assists the user and does not cause difficult rocking side effects such as sea sickness or nausea. By use of the Q4 system as shown in Figs. 1-5 the system is safe for use in patient’s chairs, since the patient’s feet have no ability to come off of the ground because of rocking.

While this invention has been described as having a preferred design, the present invention can be further modified within the spirit and scope of this disclosure. This application is therefore intended to cover any variations, uses, or adaptations of the invention using its general principles. Further, this application is intended to cover such departures from the present disclosure as come within known or customary practice in the art to which this invention pertains and which fall within the limits of the appended claims.
WHAT IS CLAIMED IS:

1. A chair having a seat, a backrest, a support pedestal adapted to rest on a floor or other horizontal support surface, and a pair of U-shaped tunable compound springs coupling the seat and backrest to the pedestal, each spring having a longer portion, a shorter portion extending generally parallel to the longer portion, and a bight coupling the shorter and longer portions, the shorter portion fixed to the support pedestal intermediate the shorter portion free end and the bight, the seat fixed to the longer portion intermediate the bight and longer portion free end, and the resilient backrest connected to the longer portion free end.

2. The chair of claim 1, wherein each spring further includes a first resilient member fixed to one portion and engaging the other portion when the seat is supporting a load.

3. The chair of claim 2, wherein the first resilient member is fixed to the shorter portion in substantially the same region as the region in which the shorter portion is fixed to the pedestal.

4. The chair of claim 2, wherein each spring further includes a second resilient member spaced from the first resilient member, fixed to one of the portions and engaging the other portion when the seat is supporting a load.

5. The chair of claim 4, wherein the second resilient member is fixed to one of the portions near the free end of the shorter portion.

6. The chair of claim 5, wherein the first resilient member is fixed to the shorter portion in substantially the same region as the region in which the shorter portion is fixed to the pedestal and the second resilient member is fixed to the shorter portion near the free end of the shorter portion whereby, as an occupant slides rearwardly in
the seat, or the load otherwise increases, the bight closes somewhat and the upper
longer portion bends downwardly compressing the first and second resilient members
and urging the free end of the shorter portion downwardly.

7. The chair of claim 5, wherein, the first resilient member is fixed to the shorter
portion in substantially the same region as the region in which the shorter portion is
fixed to the pedestal and the second resilient member is fixed to the shorter portion
near the free end of the shorter portion whereby, as an occupant slides forwardly in the
seat, the lower portion intermediate the bight and region in which the shorter portion is
fixed to the pedestal bends downwardly, the bight opens somewhat, and the upper
longer portion bends upwardly separating from the first and second resilient members
to aid occupant egress from the chair.

8. The chair of claim 1, wherein the pedestal comprises a frame, two front legs
and two rear legs extending downwardly therefrom, the forward extremity of the seat
being located rearwardly of the front legs.

9. The chair of claim 8, wherein the rear legs extend from the frame
downwardly and rearwardly to provide an expanded pedestal rest area of enhanced
stability.

10. A patient chair, comprising:

a support pedestal having a pair of front legs, a pair of rear legs, a pair of side
members, a rear frame member connecting the two rear legs and a cross member
connecting the side members intermediate the front and rear legs; and

a pair of tunable leaf springs attached to the underside of the cross member
and having portions extending forwardly and rearwardly therefrom in a substantially
horizontal manner, each leaf spring including a U-shaped bight portion at the
forwardmost extremity of the leaf spring coupling the forwardly extending portion with a horizontal overlying portion which passes over the cross member and extends rearwardly therefrom terminating in an orthogonally generally upwardly extending back support portion.

11. The chair of claim 10, further comprising a seat fixed to the horizontal overlying portion of each leaf spring for receiving and supporting a chair occupant.

12. The chair of claim 11, wherein the seat is formed of a flexible, porous fabric sewn in to a hammock shape and disposed between the two leaf spring horizontally overlying portions.

13. The chair of claim 11, further comprising a backrest fixed to the generally upwardly extending back support portion of each leaf spring.

14. The chair of claim 11, wherein the front of each leaf spring extends forward of the cross member, but rearward of the front legs, curves substantially downward and loops rearwardly passing under the cross member.

15. The chair of claim 14, wherein the leaf spring attaches to the cross member as it passes thereunder and continues rearwardly for a short distance past the cross member under and generally parallel to the leaf spring overlying portion.

16. The chair of claim 15, wherein each leaf spring is provided with a first resilient member fixed to the cross member and engaging the horizontal overlying portion when the seat is supporting a load.

17. The chair of claim 16, wherein leaf spring is further provided with a second resilient member spaced from the first resilient member and fixed to the spring in the region where the leaf spring continues rearwardly for a short distance past the cross
member, the second resilient member engaging the horizontal overlying portion when
the seat is supporting a load.

18. The chair of claim a pair of armrests extending upwardly, then forwardly
from the rear legs, and terminating forwardly of the seat forwardmost end and
rearwardly of the forward most edge of the front legs.

19. A chair support spring assembly, comprising:
a leaf primary spring fabricated from spring-steel, and shaped into a double
cantilever spring-form of generally U-shape having a longer portion, a shorter portion
extending generally parallel to the longer portion, and a bight coupling the shorter and
longer portions;
a first resilient member fixed to one portion and engaging the other portion; and
a second resilient member spaced from the first resilient member, fixed to one
of the portions and engaging the other portion.

20. The chair support spring assembly of claim 19, wherein the first and second
resilient members contribute forces opposing spring compression to close the
U-shape from its unstressed position, while the forces opposing opening the U-shape
are contributed solely by the leaf primary spring.

21. A chair having a seat, a backrest, a support pedestal adapted to rest on a
floor or other horizontal support surface, and a pair of U-shaped compound springs
coupling the seat and backrest to the pedestal, each spring having a longer portion, a
shorter portion extending generally parallel to the longer portion, and a bight coupling
the shorter and longer portions, the shorter portion fixed to the support pedestal
intermediate the shorter portion free end and the bight, the seat fixed to the longer
intermediate the bight and longer portion free end, and the backrest connected to the
longer portion including a first segment connected to said bight and also connected to a second segment connected to and including said longer portion free end, said second segment approximately orthogonal to said first segment, for each said spring said shorter segment said bight, said first segment and second segment of unitary construction.
Large Head Movement

Rocking Chair

Floor

Rocking Focus in Contact with Floor

PRIOR ART

Fig. 7

Glide Rocking Movement

Glide Rocker

Rocking Focus Translates as Glider Translates Front to Back

Fig. 8

SUBSTITUTE SHEET (RULE 26)
Fig. 9

Q4 System

\[ \frac{2}{3} L \]

No Front/Rear Translation

Center of Gravity

New Location of Center of Motion (Range)

Depth of Seat