Disclosed is an anti-tip chair leg device that is attachable to the foot of a chair’s rear leg, to prevent or reduce the risk of the chair tipping over backwards. This feature of the device is especially beneficial when a child is using the chair. The anti-tip chair leg device has a leg receiver housing mounted on a footplate. The leg receiver housing has means to grip the lower (or foot) portion of a leg of the chair leg received into the leg receiver housing. The grip means holds the foot of the chair leg in place when the chair leg is received in the leg receiver housing. The footplate then acts to shift the distance of a tipping moment-arm of the chair backward and away from the center of mass of the chair and increase the force required to tip the chair backward.
ANTI-TIP CHAIR FOOT

CONTINUITY DATA

FIELD OF THE INVENTION
[0002] The present invention is in the field of devices for supporting the weight of a person in a seated position (Class 297). Specifically, the present invention relates to chairs having means to prevent the chair from falling over backwards (subclass 310). More specifically, the present invention is a leg attachment for aiding in the structural stability of the chair (subclass 463.1).

SUMMARY OF THE INVENTION
[0003] The present invention is an attachable anti-tip chair leg device. The chair leg device is “anti-tip” or “anti-tipping” in that it is attachable to the foot of a chair leg and improves the stability of the chair. That is, the anti-tip leg device prevents or reduces the risk of the chair from falling over by increasing the amount of force required to tip the chair backward. This feature of the present invention is especially beneficial when a child is using the chair. As shown in the figures, the anti-tip leg device comprises: a footplate, a leg receiver housing, and a grip means that holds the chair leg in place. The anti-tip leg chair device is intended to attach to the lower (or foot) portion of a chair leg on the two back legs of a chair.

BRIEF DESCRIPTION OF THE DRAWINGS
[0004] FIG. 1A is a perspective view of an embodiment of the present attachable anti-tip chair leg device showing the opening of the leg receiver housing.
[0005] FIG. 1B is a perspective view of the leg receiver housing of the present attachable anti-tip chair leg device showing a relationship of the wedges of the gripping mechanism prior to being inserted into the opening of the leg receiver housing.
[0006] FIG. 2A is a side elevation cross sectional view of the present attachable anti-tip chair leg device showing the relationship of the front and rear wedges of gripping means to the key ridges of the leg receiver housing, and an alternative embodiment of a rear wedge grip.
[0007] FIG. 2B is a side elevation cross sectional view of the leg receiver housing portion of the present attachable anti-tip chair leg device showing the relationship of the leg gripping means to a chair leg (in phantom) retained in the leg receiver housing.
[0008] FIG. 3 is a front elevation cross sectional view of the present attachable anti-tip chair leg device showing a reinforcing bead or weld.
[0009] FIG. 4 is a rear elevation cross sectional view of the present attachable anti-tip chair leg device showing the leg receiver housing/socket mounted in a recess in the top-side of the footplate.
[0010] FIGS. 5A & 5B are top plan views of the present attachable anti-tip chair leg device showing alternative embodiments of the opening of the leg receiver housing, and an alternative footplate configuration.
[0011] FIGS. 6A & 6B are side elevation cross sectional views of the leg receiver housing portion of one embodiment of the present attachable anti-tip chair leg device illustrating an alternative means for adjusting the receiver housing to grip chair legs of different sizes and/or configurations.
[0012] FIG. 7A is top plan and side elevation views illustrating an alternative embodiment of the present anti-tip chair foot practiced from a single sheet metal work piece.
[0013] FIG. 7B is side elevation, top plan and rear-end elevation views illustrating the work piece of FIG. 7A after being initially folded as indicated.
[0014] FIG. 7C is top plan and rear-end elevation views illustrating the work piece of FIG. 7B after being finally folded as indicated.
[0015] FIGS. 7D & 7E respectfully are top plan and partial side elevation cross-sectional views of the finished work piece of FIG. 7C illustrating a chair leg retained in the leg receiver housing of the present invention.
[0016] FIG. 7F is a top plan view of the finished work piece of FIG. 7C illustrating an alternative means for retaining a chair leg in the leg receiver housing of the present anti-tip chair foot.
[0017] FIG. 8A is top plan and side elevation views illustrating another alternative embodiment of the present anti-tip chair foot practiced from a single sheet metal work piece.
[0018] FIG. 8B is side elevation, top plan and rear-end elevation views illustrating the work piece of FIG. 8A after being initially folded as indicated.
[0019] FIG. 8C is side elevation, top plan and front-end elevation views illustrating the work piece of FIG. 8B after being folded as indicated.
[0020] FIG. 8D is top plan, front-end and side elevation views of the finished work piece of FIG. 8C.
[0021] FIGS. 9A and 9B is a perspective view illustrating an alternative embodiment of the present anti-tip chair foot practiced with the footplate and the leg receiver housing integrated as a single molded piece.
[0022] FIG. 9C is a top plan view of the embodiment of FIGS. 9A & 9B illustrating use of leg grips and an adjustable leg engaging means.
[0023] FIGS. 10A to 10C respectively are back-end, front-end and side elevations views of the molded embodiment of FIGS. 9A-9C, adapted to utilize a “string-tie” or “zip-tie” as a chair leg engaging means.
[0024] FIGS. 11A and 11B are side elevation views of the present anti-tip chair foot showing an adjustable leg engaging means and the leg receiver housing from the rear (A) and from the front (B) of the device respectively.
[0025] FIG. 12A is a combination top plan and side elevation of an alternative embodiment of the present invention wherein the leg receiver is pivotally connected to the footplate via a bendable/flexible joint.
[0026] FIGS. 12B and 12C respectively are side elevation and top plan views of the device of FIG. 12A with the foot of a chair leg fixed in the leg receiver.
[0027] FIG. 12D is a side elevation view similar to FIG. 12B, but illustrating an alternative means of clamping/fixing the front of the leg receiver housing to the chair leg.
[0028] FIGS. 2, 13A & 13B are each a combination of top plan and side elevation views of an alternative configuration
of a bendable/flexible joint for pivotally connecting the leg receiver housing to the footplate.

DETAILED DESCRIPTION OF THE INVENTION

[0029] Referring now to the drawings, the details of preferred embodiments of the present invention are graphically and schematically illustrated. Like elements in the drawings are represented by like numbers, and any similar elements are represented by like numbers with a different lower case letter suffix.

[0030] The present invention is an attachable anti-tip chair leg device 10. The chair leg device 10 is “anti-tip” or “anti-tipping” in that it is attachable to the foot of a chair leg 60 and improves the stability of the chair. That is, the anti-tip chair leg device 10 prevents or reduces the risk of the chair from falling over backwards. This feature of the present invention is especially beneficial when a child is using the chair. As shown in the figures, the present anti-tip chair leg device 10 comprises three primary components: a footplate 12, a leg receiver housing 14 and leg grips 18. The anti-tip chair leg device 10 is intended to attach to the lower (or foot) portion 62 of a chair leg 60 (see FIG. 2B) on the two back legs of a chair. [0031] In practicing the present anti-tip chair leg 10, the footplate 12 and the leg receiver housing 14 can be accomplished as initially separate component parts and subsequently joined together, as exemplified in FIGS. 1A to 6B. Alternatively, the footplate 12 and leg receiver housing 14 can be accomplished in an integrated fashion from a single (e.g., sheet metal) starting piece, as in FIG. 7A to 8D, or as a single molded piece, as in FIGS. 9A to 11B. In view of the teachings and illustrations contained herein, an ordinary skilled artisan in this field is able to other manners of accomplishing the footplate 12 and leg receiver housing 14 of the present invention.

[0032] In the embodiment exemplified in FIGS. 1A & 1B and 2A & 2B, the footplate 12 has a front-portion 20 and a back-portion 22, a top-surface 24 and a bottom surface 26. The footplate 12 is adapted to shift the distance of the moment-arm backward from the center of mass of the chair to reduce the tendency of the chair to rotate backward about an imaginary axis between the points of contact of the back legs of the chair and the floor on which the chair stands. The dimensions of the footplate 12 in part depend on the configuration of the rear chair leg (i.e., the center of mass of the chair relative to the point of contact of the leg with the floor). It was found that a footplate having an overall length L of about 4 to 8 inches and a width W of about 2 to 4 inches at its widest portion was generally satisfactory for a variety of rear leg configurations and chair types, with the rear chair leg 60 set back about an inch from the front-edge of the plate 12. Thickness T of the footplate 12 depends on the material composition of the plate itself. In a preferred embodiment the footplate was composed of a rigid plastic material with a thickness T of ¼-inch. Depending on the style and weight of the particular chair the device 10 it to be used on, the footplate 12 may need to be thicker. A wooden footplate may need to be thicker, and a metal one might be thinner, as is selectable by one of ordinary skill in the art.

[0033] The leg receiver housing 14 in a preferred embodiment was an oblong or square box, as generally shown in the figures. However, the leg receiver housing 14 can have other configurations (see FIGS. 5A & 5B), so long as the interior portions of the front-side 42 and rear-side 44 of the leg receiver housing includes wedge key 16 features to engage the leg grips 18. A particular configuration for the leg receiver housing 14 is selectable by one of skill in the art depending in part on the configuration or variety of configuration chair leg 60 that the leg receiver housing 14 is to receive. In the embodiments illustrated in FIGS. 3 & 4, the leg receiver housing 14 was a 3-inch square box constructed of a ¼-inch thick rigid plastic material with about a 2.5-inch receiver housing opening 40, and had an overall height H of about 4 inches.

[0034] The leg receiver housing 14, into which a rear leg of a chair is receivable, has an upper-end 54 including an opening 40 into which a foot end 62 of the rear leg 60 of a chair is insertable, and a lower-end 56 mounted to the upper surface 24 of the footplate 12. Additionally, the leg receiver housing 14 has a front-side 42 and a rear-side 44. In FIGS. 1A-4, the front-side 42 is shorter than the other three sides of the leg receiver housing 14, and is only about ¾ of the overall height H1 of the leg receiver housing 14. This created a gap in the front-side 42, which was continuous with the receiver housing opening 40. The purpose of the gap is to facilitate inserting and seating the chair leg foot 62 in the leg receiver housing 14. The front-side gap may be reduced or eliminated for a straight up & down chair leg or for a leg receiver housing 14 having less overall height H1. Embodiments eliminating the front-side gap are illustrated in FIGS. 8A-10B.

[0035] In some of the embodiments illustrated, a wedge key 16 is disposed on the interior surface of both the front-side 42 and the rear-side 44 of the leg receiver housing 14 as shown in FIGS. 1A & 2. The wedge key 16 is a ridge or lip that engages a key way 46 on a leg grip 18 (explained below). The rear-side wedge key 16B is disposed proximate the upper-end opening 40 (see FIG. 3), and the front-side wedge key 16A is disposed near the footplate 12 at the lower-end of the leg receiver housing 14 (see FIG. 4). The front-side wedge key 16A positively retains and prevents from slipping the leg grip 18 that engages the lower portion of the foot 62 of the chair leg 60, while the back-side grip key 16B positively retains and prevents from slipping the leg grip 18 that engages the foot 62 of the chair leg 60 at an upper portion of the foot 62 (see FIG. 2B).

[0036] The leg wedge grips 18 have a key-way 46 and a chair leg mating surface 48. The key-ways interface with the grip keys 16 of the leg receiver housing 14 to help hold the wedge grips 18 in place when inserting a chair foot 62 into the leg receiver housing, and to prevent the wedge grips 18 from sliding up or down once the chair foot 62 is in place in the device 10. The mating surface 48 is adaptable by the skilled artisan to increase the surface area of the wedge grips 18 that interface with the chair foot 62, as the skilled artisan considers useful. The combination of a grip key 16 with a leg grip 18 increases the stability of the present device 10 during use by reducing or eliminating the possibility of the leg grip slipping under a force and resulting in the chair leg 60 pulling out of the leg receiver housing 14.

[0037] In the embodiment of FIG. 2B, the leg grips 18 are substantially configured the same and can be used interchangeably. In an alternative embodiment, the rear grip 19 was configured as a wedge, which was inserted and jammed into the leg receiver housing 14 behind the chair foot 62. In a preferred embodiment shown in FIG. 2A, the wedge grip 19 not only has a wedge shape, but also has detents 50 arranged as a series of saw teeth. When the wedge grip 19 is inserted into the leg receiver housing 14 behind the chair foot 62, the detents progressively engage the grip key 16 of the rear-side
of the leg receiver housing 14. Once fully engaged, the detents limit the movement of the wedge grip 19 to prevent it from slipping out.

[0038] Typically, the lower-end of the leg receiver housing 14 of the anti-tip chair leg device 10 is mounted to the top surface 24 of the footplate 12, as illustrated in FIG. 3. To improve the strength of the mounting of the leg receiver, the cross section of the footplate 12 is configured with a recess 20 on the lower side of the footplate, allowing the recessed portion of the leg receiver housing 14 to be fixed on the footplate 12. In another embodiment, the footplate 12 can be replaced by the rear side of the chair, where a recess can be provided in the outer edge of the footplate 12, allowing the recessed portion of the leg receiver housing 14 to be fixed to the footplate 12 (see FIG. 4).

[0039] As shown in FIGS. 5A & 5B, the opening 40 of the leg receiver housing 14 of the attachable anti-tip chair leg device 10 can be adapted to have a cross section which complements the cross section of the chair foot 62 that it is intended to receive. Shown are square and circular openings 40a & 40b. Also illustrated is that the footplate 12 can be configured in different shapes as are selectable by one of skill in the art.

[0040] In another preferred embodiment illustrated in FIGS. 6A and 6B, the leg receiver housing 14 has an oblong shape, with the rear-side grip key 16c having an arcuate configuration. Correspondingly, the rear leg grip 18a is adapted to closely receive the arcuate grip key 16c. In FIG. 6A, the corresponding arcuate configured rear leg grip 18a is shown first in a top view, then the rear leg grip 18a is rotated to a side view before it is shown in place on the rear-side grip key 16c.

[0041] In this embodiment, the front-side leg grip 70 incorporates the front-side grip keys (ears/tabs) 72, while the leg receiver housing 14 and footplate 12 incorporate the mating surface (slot) sets 74 that receive the front-side grip keys 72. As illustrated in FIGS. 6A and 6B, the grip keys 72 of the front-side leg grip 70 selectively mate with any of a series of front-side mating surfaces 74. As exemplified in the figures, a mating surface set 74 consists a series of a number of aligned receiver holes and/or slots of two different types: ear slots 76 and key slots/holes 78. The ear slots 76 receive the ear tabs 72a of the of the front-side leg grip 70, and the key slots/key holes 78 receive the key tabs 72b of the front-side leg grip 70 as it is inserted into a key grip 72, as illustrated in FIG. 6B.

[0042] In one embodiment of the front-side leg grip 70 as exemplified in FIG. 6B, the leg grip has a leg shim 82 with a first thickness mounted on one surface. Optionally, the second surface 70 also can have mounted thereon an alternative leg shim 84 having a different thickness. This allows the leg grip 70 to be inserted into a mating surface set 74 with a surface/finish orientation that brings the appropriate thickness of leg shim 82, 84 to bear against the chair leg 60.

[0043] In an alternative embodiment exemplified in FIGS. 7A to 7C, the present anti-tip chair foot 10 is practiced from a single piece of sheet metal. FIG. 7C illustrates a completed work piece integrating the footplate 12 and the leg receiver housing 14. The initial sheet metal work piece 100 shown in FIG. 7A has two slots 94 cut out of it. Additionally, in the embodiment illustrated, the sheet metal work piece 100 initially has a pair of leg clamp mounting means 98 (thru holes 98a) in a position the will become the front-side 42 of the leg receiver housing 14 in the finished work piece. The leg clamp mounting means 98 provide for attaching or mounting an adjustable leg clamp 17 to the leg receiver housing 14. The dashed lines in FIGS. 7A and 7B indicate a line along which the work piece 100 is to be bent to accomplish the integrated footplate 12 and leg receiver housing 14 of this embodiment. FIGS. 7B and 7C also include an elevation view of the work piece as viewed from the rear portion 28 of the footplate 12.

[0044] FIGS. 7D and 7E illustrate this embodiment utilizing a "U-bolt" type fastener as an adjustable leg clamp 17a to grip and secure the chair leg 60 within the leg receiver housing 14. FIG. 7F illustrates use in this embodiment of a "zip" or "cable" tie as an adjustable leg clamp 17b to grip the chair leg 60 and secure it within the leg receiver housing 14. Other types of adjustable leg grips are intended for practice in the present invention, as exemplified in certain of the figure to follow. For example, the subsequent figures illustrate an additional alternative means for accomplishing an adjustable leg clamp practicable in the present invention to secure the chair leg 60 within the leg receiver housing 14.

[0045] FIGS. 8A to 8D illustrating another alternative embodiment of the present anti-tip chair device 10 practiced from a single piece metal work piece 100. This embodiment can be practiced in a manner similar to that of FIGS. 7A to 7F, and differs in that a chair leg 60 is inserted or slid into the leg receiver housing 14 from the front portion 30 of the anti-tip chair device 10, rather than from the rear portion 28, as in FIGS. 7A-7F.

[0046] FIGS. 9A to 10C illustrate an alternative embodiment of the present anti-tip chair foot 10a practiced with the footplate 12 and the leg receiver housing 14 integrated as a single molded piece. The material composition and the dimensions of the footplate 12 are selected to provide the structural integrity necessary to avoid bending or breaking under planned loads forces ranges. FIGS. 9A-9C show the leg clamp mounting means 98 that provides for attaching or mounting an adjustable leg clamp strap 17c to the leg receiver 14a. The adjustable leg clamp means 17c is a "zip" strap & closure as illustrated. FIGS. 11A & 11B show the adjustable leg clamp means as a "dimpled" strap & closure 17d.

[0047] FIGS. 10A to 10C exemplify alternative means of accomplishing a leg clamp mounting means for attaching or mounting a closure means to the sides of a leg receiver 14a. FIGS. 10A & 10B illustrate use of loop leg clamp mounting means 102 fixed to the sides of the leg receiver housing 14, through which an adjustable closure strap may be passed. FIG. 10C illustrates use of a retention channel leg clamp mounting means 104 fixed to the sides (and outer surface) of the leg receiver 14a, along which an adjustable closure strap may be passed. FIG. 10C illustrates use in this embodiment of a "zip" or "cable" tie as an adjustable leg clamp 17b to grip the chair leg 60 and secure it to the leg receiver 14a. Other leg clamping/gripping means are known to and selectable by one of skill in this art for practice in the present invention.

[0048] FIGS. 11A and 11B illustrate the present anti-tip chair foot device 10a having an embodiment wherein the leg receiver 14a receives a chair leg 60 from the rear portion 28 of the footplate 12 of the anti-tip chair device 10a (FIG. 11A), and an embodiment wherein the leg receiver 14a receives a chair leg 60 from the front portion 30 of the footplate 12 of the anti-tip chair device 10a (FIG. 11B). Also shown is an
alternative embodiment of the adjustable leg clamp 17 means as a “dimpled” strap & closure 17d.

[0049] FIGS. 12A-12D and 13A & 13B illustrate the present anti-tip chair foot 10 having embodiments wherein leg receiver housing 14 and the leg receiver 14a portion of the anti-tip chair foot device 10 are same structure, which is pivotally connected to the footplate 12. In this embodiment, the footplate 12 and the leg receiver 14a are pivotable or bendable about a joint 112. See FIGS. 12A & 12B and FIGS. 13A & 13B. As illustrated in the figures, the leg receiver 14a is on one side of the bendable joint 112, and the footplate 12 is on the opposite side. In FIGS. 12A-12D, the bendable joint 112 is accomplished using a pin-and-knuckle assembly 112a. Also illustrated in FIG. 12D is an alternative means of clamping/mounting a leg receiver 14-14a to a chair leg 60 using a screw type fastener 17e. Because it is beneficial that the (angular) relationship between the leg receiver 14a and the footplate 12 be fixable (i.e., the footplate 12 does not droop excessively when the chair is moved), preferably there is a high friction coefficient between the pin 116 and the knuckles 118 of the assembly 112a.

[0050] Other means of accomplishing the bendable joint 112 are known to and selectable by the skilled artisan for practice in the present invention. For example, FIG. 13A illustrates a bendable joint 112b of a sheet metal anti-tip chair foot 10. FIG. 13B illustrates a bendable joint 112c in a molded (e.g., plastic) anti-tip chair foot 10, having a fastener hole 120 in through the footplate 12 portion, through which a tack, screw, or other fastener can be inserted into the bottom of the chair foot to prevent the footplate 12 from drooping as the chair is raised from the floor. This arrangement can also be used with the pin-and-knuckle joint 112a to prevent drooping of the footplate 12. These figures illustrate that the pivotable leg receiver 14a can have a variety of configurations in addition to the front side 42 feature, such as the leg receiver 14a having a “winged” configuration with additional leg clamping means 98b to facilitate mounting and securing a chair leg 60 in the leg receiver 14a.

[0051] While the above description contains many specifics, these should not be construed as limitations on the scope of the invention, but rather as exemplifications of one or another preferred embodiment thereof. Many other variations are possible, which would be obvious to one skilled in the art. Accordingly, the scope of the invention should be determined by the scope of the appended claims and their equivalents, and not just by the embodiments.

What is claimed is:

1. An anti-tip chair leg device (10a) attachable to a foot end (62) of a rear leg (60) of a chair, the chair leg device comprising:

a footplate (12) having a top-surface (24) and a bottom surface (26);

a receiver housing (14) integrated with the footplate (12) as a single molded piece, the receiver housing (14) having a leg receiver (14a) against which the foot end (62) of the rear leg (60) is receivable, the leg receiver (14a);

a leg clamp attaching means (98) integral to the receiver housing (14), and adapted to provide for attaching/mounting an adjustable leg clamp (17) to the receiver housing (14); and

the adjustable leg clamp (17) adapted to grip and to secure the chair leg (60) to the leg receiver (14a), the combination of the footplate (12), receiver housing (14), leg receiver (14a) and leg clamp means (17) providing said device (10a) to reduce a tendency of the chair to tip backward.

2. The anti-tip chair leg device (10a) of claim 1, wherein the footplate (12) has dimensions and a material composition selected to provide a structural integrity necessary to avoid bending or breaking under an appropriate range of tipping moment forces.

3. The anti-tip chair leg device (10a) of claim 1, wherein the leg clamp attaching means (98) is adapted for attaching/mounting a “zip” strap & closure adjustable leg clamp means (17c) to the leg receiver (14a).

4. The anti-tip chair leg device (10a) of claim 1, wherein the leg clamp attaching means (98) is adapted for attaching/mounting a “dimpled” strap type adjustable leg clamp means (17d) to the leg receiver (14a).

5. The anti-tip chair leg device (10a) of claim 1, wherein the receiver housing (14) includes leg clamp attaching means (98) that is adapted for fastening the leg receiver (14a) to the chair foot (62) using a screw type fastener (17c).

6. The anti-tip chair leg device (10a) of claim 1, wherein the leg clamp attaching means (98) is a loop-type leg clamp mounting means (102) fixed to a side of the leg receiver housing (14), through which an adjustable closure strap (17) can be passed.

7. The anti-tip chair leg device (10a) of claim 6, wherein the adjustable closure strap is embodiment of a “zip”/”cable” type tie (17b).

8. The anti-tip chair leg device (10a) of claim 1, wherein the receiver housing (14) of the leg receiver (14a) receives a chair leg (60) from the rear portion (28) of the footplate (12).

9. The anti-tip chair leg device (10a) of claim 1, wherein the receiver housing (14) of the leg receiver (14a) receives a chair leg (60) from the front portion (30) of the footplate (12).