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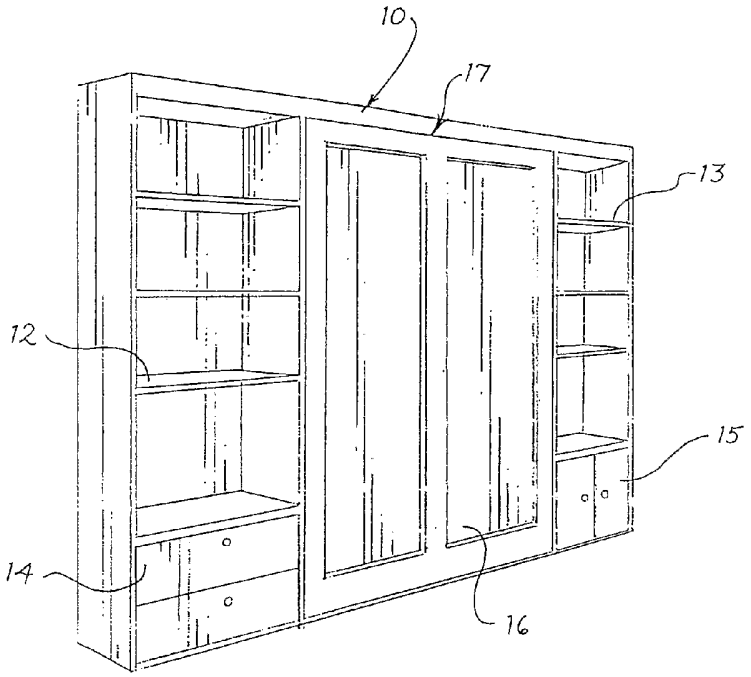
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(54) Title: TILTING FURNITURE SYSTEM AND INFINITELY VARIABLE LIFT TENSIONING MECHANISM THEREFOR



(57) Abstract: A tension mechanism for use with existing conventional bed platforms in the well known Murphy bed system in which the bed platform may be connected to the tension mechanism when the tension is at a low level by only a single installer, and the tension thereafter increased in infinite increments to any desired level by a remotely operated tool, a combination of said tension mechanism and a bed platform, and a combination desk and bed in which the bed is operated by the tension mechanism.

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TILTING FURNITURE SYSTEM AND INFINITELY VARIABLE LIFT TENSIONING MECHANISM THEREFOR

[0001] This invention relates generally to multi-purpose furniture and specifically to a tilting furniture system and, individually or in combination therewith, an infinitely variable lift tensioning mechanism therefor. It is particularly suited for a tilting bed system of the type known generically as a Murphy bed, but it is also adapted for use with auxiliary furniture elements, such as a desk in combination with a Murphy, or tilting, bed.

BACKGROUND OF THE INVENTION

[0002] There has been a trend for some years in many metropolitan areas to increase population density in both new and rehabbed buildings. In areas having building codes which permit increased density, a given floor space is more and more frequently required to serve dual purposes: daytime living and/or working space followed by nighttime sleeping space. The Murphy bed concept, which was commercially introduced over a century ago, is ideally suited to this new trend since the floor space occupied by a bed at night is available as working space during the daytime, the bed being tilted upwardly to a vertical position in which it is in abutting contact with, or received in a recess in, an adjacent wall at night.

[0003] In recent years auxiliary furniture has been combined with the bed, such as a desk, the desk being arranged to be in an open working position during the day when the bed is in its out of use upright position, and then at night the desk being in a non-usable, out of the way position when the bed is in its horizontal, use position.

[0004] Although the general concept has been known for some time, certain difficulties have persisted over the years. One such difficulty is associated with the spring mechanism which is employed to raise and lower the bed, and auxiliary furniture if present. Specifically, many of the spring mechanisms in existing systems are very difficult to operate over portions of the operating cycle, such as the first portion of movement of the bed from its open, use position (when it is parallel to the floor) as it begins its upward movement toward its associated wall. In some cases as much as about fifty pounds of force may be required to initiate the upward tilting movement of the bed and this degree of force is difficult to apply for elderly people, or people of slight stature such as a woman who may weigh only about 110 pounds or less. There is therefore a need for a spring tilting mechanism which can be activated with only a few pounds of force over its entire range of movement including the commencement of bed movement from a horizontal to a vertical position.

[0005] A further drawback to many existing tilting mechanisms is that installation of a bed platform to a spring mechanism requires two installers.

[0006] It has also been thought that many existing tilting mechanisms could advantageously be made more user friendly and safer in operation.

SUMMARY OF THE INVENTION

[0007] The invention includes, in an initial configuration, a spring tilting mechanism

which the necessity of inserting the hand or fingers of an installer into close proximity to the tilting mechanism next to the wall is eliminated during connection of a conventional bed platform to the tilting mechanism.

[0008] The invention has the further advantage that no change is necessary to the conventional configuration of the means for assembling and locking the conventional bed platform to the tilting mechanism whereby redesign of the bed platform and the support structure for the spring mechanism is avoided.

[0009] In addition, the invention has the advantage that the lift tensioning mechanism for actuating the load, such as a bed, may be infinitely variable using only a simple hand tool.

[0010] The invention also contemplates, in an expanded configuration, a bed and an associated piece of furniture, such as a desk, which includes the aforementioned spring mechanism so that the bed may still be tilted upwardly to an inoperative position or downwardly to an operative position by application of only the modest force earlier described, the desk remaining level at all times.

BRIEF DESCRIPTION OF THE DRAWING

[0011] The invention is illustrated more or less diagrammatically in the accompanying drawing in which

[0012] Figure 1 is a perspective view of a bed assembly of the invention in an upright,

out of use, stored position, here stored in a piece of furniture having a recess which is flanked by bookshelves;

[0013] Figure 2 is a perspective view of the bed assembly of Figure 1, with parts broken away for clarity, in a position part way downward towards its in use position on the floor;

[0014] Figure 3 is a perspective view of the bed assembly of Figures 1 and 2 in a use position;

[0015] Figure 4 is a perspective view of a common current type of spring mechanism used to connect a bed platform to a spring tilting mechanisms;

[0016] Figure 5 is a side view of the spring mechanism of the present invention in its condition when a bed platform has been engaged to the spring lever prior to locking;

[0017] Figure 6 is a side view of the bed platform locked to the spring lever of the spring mechanism of the invention;

[0018] Figure 7 is a perspective view of another embodiment of the invention showing a bed and associated desk in a position intermediate the stored and in use positions of the bed;

[0019] Figure 8 is a sectional view of the bed and desk system of Figure 7 with parts broken away and others in phantom for purposes of clarity;

[0020] Figure 9 is a sectional view of the bed and desk system of Figure 7 about midway in its travel from a position in which the bed is in use to the position in which the

bed is stored, taken substantially along the line 9-9 of Figure 7; and

[0021] Figure 10 is a sectional view of the bed and desk system of Figure 7 in which the bed is in its stored position and the desk is in its use position.

DESCRIPTION OF A SPECIFIC EMBODIMENT

[0022] Like reference numerals will be used to refer to like or similar parts from Figure to Figure in the drawings.

[0023] Referring first to Figure 1, a tiltable bed assembly is indicated generally at 10 in its vertical, out of use position, the bed assembly being received within a recess 11 which is shown best in Figure 2. In this instance a plurality of shelves are indicated at 12 and 13 and drawers or doors at 14 and 15 flanking the bed assembly 10. It will be understood that the underside 16 of the bed platform, which is indicated generally at 17, may be flush with a wall surface, or the unit may be a stand alone assemblage whose backside butts against an associated wall.

[0024] The bed assembly 10 includes, in addition to the bed platform 17, a mattress, indicated in phantom at 18 in Figures 2 and 3, and a support leg 19 which pivots around pivot pins 20 located near the outer extremity of side rails 22 and 23 of bed platform 17. The support leg 19 is shown in its stored, mattress restraining position in Figure 2, and in its fully pivoted, in use position in Figure 3. The bed platform includes head rail 24 and foot rail 25, the entire assembly being pivotable about a pivot, later described, associated with a spring

mechanism indicated generally at 27 in Figure 2. Spring mechanism 27 is secured to right and left side support members 28, 29.

[0025] Referring now to Figure 4 a widely used prior art spring mechanism is indicated generally at 30. It includes a base plate 31 secured to, here, a right vertical side support member 29 by bolts 32, 33, 34 and 35. The rear of spring mechanism 30 includes a flange 36 which is perpendicular to the plane of the base plate 31, the flange 36 having a plurality of holes, here eight, to receive the hook 37 at the inner end of each of eight springs 38. A T-shaped tension bar is indicated generally at 40, the tension bar 40 having a base section 41 which is integral with a connector bar 42. The left or inner end of tension bar 40 has a plurality, here eight, holes, not numbered for the sake of clarity, each of which receives a hook 43 at the outer end of an associated spring 38.

[0026] A connector for connecting the spring mechanism 27 to the bed platform 17 is indicated generally at 45, the connector being pivotally connected to right side support member 29 at 46. The connector bar 42 is pivotally connected at 47 to the connector 45 so that as connector 45 rotates clockwise and counterclockwise about pivot 46, the springs 38 will be extended or tensioned, and relaxed, respectively.

[0027] The upwardly projecting bed platform lever 49 is received within a short length of pipe 50 which provides leverage for rotating the connector 45 clockwise about pivot 46 against the increasing tension of spring 38 by hand applied pressure generated by a first installer indicated generally at 51.

[0028] It is necessary in this conventional prior art construction to rotate the connector 45 to the illustrated position in order to enable the temporary locking arm 53, which is pivotally connected to the level 49 at 54, to be swung in a generally horizontal plane by the second installer 48 until the slotted end of the temporary locking arm 53 slips over bolt 34 to hold the platform connector arm 45 in the illustrated position preparatory to receiving the inner end of the bed platform 17.

[0029] Swinging the temporary locking arm 53 in a generally horizontal plane to cause it to engage bolt 34 can only be done by a second installer 48 pressing his finger 55 against the temporary locking arm 53, since the first installer 51 must hold the lever 49 in the illustrated position. As a consequence, in this currently used system, two installers are an absolute necessity.

[0030] Referring now to Figures 5 and 6 a new and unique, infinitely variable tensioning mechanism for moving a load about a fixed axis, here embodied in a spring mechanism and bed platform connector system is illustrated in which all danger to a bed platform installer is eliminated, and, with practice, only one installer is required to assemble a bed platform to the spring mechanism and connector system. Further, a single installer can adjust the tension in the spring mechanism by infinite gradations without regard to the orientation of the spring mechanism with respect to the bed platform connector, and without regard to whether a bed platform is, or is not, connected to the bed platform connector.

[0031] The new and improved spring mechanism of the present invention is indicated

generally at 60 mounted on a vertical side support member 29. The spring mechanism 60 includes a backing plate 61 which is secured to the side support member 29 by recessed bolts 62, 63, 64 and 65. A plurality of conventional coil springs, here ten in number, are indicated at 38. The left end of each spring terminates in a hook 37 which passes through an associated hole 66 in backing plate 61 and curves around the left end of the backing plate 61.

[0032] A tensioning yoke is indicated generally at 68, the yoke having a flat left portion 69 which lies in sliding contact with the adjacent surface of backing plate 61. Left portion 69 has a plurality of holes 70, here ten, each of which receives the yoke hook 71 at the right end of each spring 38.

[0033] The right portion 73 of yoke 65 carries two generally aligned bosses 74, 75 which have coaxial threaded bores therein of identical diameter and thread size. A threaded member, here a threaded eye-bolt is indicated at 77, the threaded shank of the eye-bolt being received in the coaxial threaded bores in bosses 74, 75. In Figure 5 the eye-bolt 77 is shown spaced arcuately away from its retracted position and in Figure 6 the eye-bolt is shown in its retracted position. It will be understood that the Figure 5 position illustrates a convenient spacing of the parts suitable for installing the bed platform to the spring mechanism. The eye-bolt is also threaded through a hex head nut 78 which is received in the aperture 79 in the right portion 73 of yoke 68, the shank of the eye-bolt bring threaded through the internal thread of the nut 78. The aperture 79 is extended radially outwardly from the aligned axes of the bosses 74, 75 to provide easy access for an adjusting tool, such as a crescent wrench, to rotate nut 78, which is spatially confined with respect to the yoke 65, and thereby move

the eye-bolt inwardly toward the left end 66 of backing plate 61, or outwardly toward the right end 80 of backing plate 61.

[0034] The connector 45 of this embodiment has the same configuration as the connector 45 of the embodiment of Figure 3. Thus no reconfiguration of the conventional connector is required.

[0035] Connector 45 is pivotally connected as at 81 to the threaded eye-bolt 77. Since the yoke 68 is not secured to the backing plate 61, the yoke merely slides upwardly, as shown in Figure 5, or downwardly, as shown in Figure 6, as the pivotal connection 81 of the eye-bolt 77 moves upwardly and downwardly following movement of lever 49.

[0036] The side of bed platform 23 carries an upper seating pin 83 which is proportioned to be received in vertical seat 84 in the upper end of lever 49. A lower seating pin 85 is carried by the lower end of the bed platform side rail and so spaced from upper seating pin 84 that when the bed platform is swung from the partially engaged position of Figure 5 to the fully engaged position of Figure 6, the lower seating pin 85 will seat in the notch 86 at the lower end of connector 45. Once the pins 84 and 85 are in their seated positions of Figure 6, a locking pin 87 is passed through aligned holes 88 in lever 49 and 89 in side rail 22 to lock the bed platform 17 to the spring mechanism.

[0037] By virtue of the infinitely variable relationship between the fixed spring backing plate 61 and the adjustably positioned connector 45, the spring tension may be so precisely adjusted that only a few pounds of force, less than 10, is all that is required to pull

the bed platform 17 and mattress 18 down, or lift them up.

[0038] Referring now to the embodiment of Figures 7 through 10, a combination tiltable bed and desk assembly is illustrated generally at 92. The assembly is mounted in a rigid support frame consisting of left side wall 93, right side wall 94, top wall 95 and rear-bottom base member 96, see Figures 8-10.

[0039] The combination tiltable bed and desk assembly includes a bed assembly indicated generally at 98, and a desk assembly indicated generally at 99.

[0040] The bed assembly includes a bed platform 100 having a base 101 and upstanding side edge walls 102, only the right side edge wall appearing in the drawing. A front wall is indicated at 103 and rear wall at 104, see Figure 9, said walls receiving and confining a mattress 105. The spring mechanism 60 of Figures 5 and 6 are secured to the left and right side walls 93 and 94, each spring mechanism including a connector 45 which is pivoted at 46, see Figure 8, to the backing plate 61 and hence to the left and right side support walls 93 and 94. The connector 45 is secured to the bed platform 100 as indicated in Figure 6.

[0041] The desk assembly 99 includes the flat working surface member 108 having upstanding left and right side walls 109, 110 and rear wall 112.

[0042] Left and right support members 113 and 114 extend downwardly from end portions of the bed platform base 101, the support members in this instance being rigid box frames having a top 115 secured to the outer end portions of bed platform 101, legs 116 and

117 which extend perpendicularly outwardly from the ends of top 115, and base member 118. When t he bed platform base 101 is in its horizontal bed use position of Figure 8 the base members 118 of the rigid box frames 113 and 114 are aligned with, and rest upon, the upper edges of their associated left and right side walls 109 and 110 of the flat working surface member 108 as best seen in Figure 8. The box frames 113 and 114 are connected to the flat surface member 108 by a bracket 120, see Figure 8, which is pivoted to a side wall, such as right side wall 110 of Figure 8, by a pivot 121.

[0043] The desk top 108 moves with the bed base 101 as the bed moves from its in use position of Figure 8 through an arc of movement represented by arrow 122 of Figure 9 and into the bed stored position of Figure 10.

[0044] The desk top 108 is maintained horizontal throughout the entire path of travel from the Figure 8 to the Figure 10 position, and in the reverse movement, by the bed-desk linkage system indicated generally at 124, see Figure 10.

[0045] The bed-desk linkage system 124 includes a link 126. The link 126 is pivotally connected at its inner end to the right side wall 94 at 127 and its outer end is pivotally connected to the outside of side wall 110 at 128. From a comparison of Figures 8, 9 and 10 it will be seen that the distance between pivots 127 and 128 of link 126 equals the distance between pivot 46 and pivot 121, and that the geometrical lines formed by said distances are parallel. By the same token, the distance between pivot 46 and pivot 127 , firstly, and the distance between pivot 121 and pivot 128, secondly, are equal. In other

words, pivots 46, 121, 128 and 127 form a parallelogram linkage so that as the desk 108 moves from the daytime use position of Figure 10 to the nighttime out of use position of Figure 8, and vice versa, the desk will remain flat so that round objects as well as flat objects may remain on the desk throughout the 24 hours of the day.

[0046] In the embodiments of both Figure 1 and Figure 7 the force required to move the bed platforms 17 and 100 may be regulated by spring mechanism 60 so that only a modest force, such sufficient to overcome inertia, need be applied to move the embodiments between their extreme positions so that the structures can be easily operated by a person of very modest strength.

[0047] Although several embodiments of the invention have been illustrated and described, it should be understood that the invention should not be limited to the precise structure shown but rather only by the appended claims when interpreted in light of the relevant prior art.

CLAIMS

1. An infinitely variable tensioning mechanism for moving a load about a fixed swing axis, said tensioning mechanism including

a fixed base

a connector,

means for pivoting the connector about a common pivot axis located on the base and the connector,

first means on the connector for connecting a load to the connector so as to move with the connector,

spring means,

one end portion of said spring means engaging the fixed base,

the other end portion of said spring means being connected to a spring tensioning member which is movable with respect to the fixed base,

means for connecting the spring tensioning member to the connector about a second pivot axis on the connector, and

means for adjusting in infinite increments the distance between the spring tensioning member and the second pivot axis

whereby the tension of the spring means may be increased or decreased in consonance with variations in load on the connector.

2. The tensioning mechanism of claim 1 further characterized in that

the means for connecting the spring tensioning member to the connector is a threaded member,

one end of the threaded member being pivotally connected to the connector at the second pivot axis,

the other end of the threaded member being threadably received in a threaded passage on the spring tensioning member.

3. The tensioning mechanism of claim 2 further characterized by and including

a nut spatially fixed with respect to the spring tensioning member,

said nut being in threaded engagement with the threaded member and rotatable around the axis of the threaded member.

4. The tensioning mechanism of claim 3 further characterized in that

the spring means consists of a plurality of individual springs.

5. The tensioning mechanism of claim 4 further characterized in that

the connector includes

means for pivotally receiving a load on the connector and

means for locking the load to the connector

whereby pivotable movement of the locked together load and connector imparts an extending or contracting motion to the springs.

6. A lift mechanism for moving a bed platform from a horizontal to a vertical position, and vice versa, said lift mechanism including

a base plate and means for fixedly connecting the base plate to a fixed support

structure,

a yoke,

a plurality of springs, said springs having one end of each spring connected to the base plate and the other end of each spring connected to the yoke,

said yoke being movable with respect to the base plate and toward and away from the base plate

whereby tension in the springs will be decreased or increased,

a connecting arm pivotally connected to the base plate,

said connecting arm having locking mechanism for locking a bed platform to the connecting arm,

a yoke tensioning member pivotally connected at one end portion to the connecting arm and threadably connected to the yoke tensioning member at its other end portion, and

a nut axially fixed with respect to the yoke but rotatable with respect to the yoke about the axis of the threaded connection of the yoke tensioning member

whereby rotation of the nut causes movement of the yoke tensioning member toward and away from the pivotal connection of the yoke tensioning member to the connecting arm in infinite increments.

7. A tilting bed system, said system including

a bed platform,

a left mechanism for tilting the bed platform about a rigid support structure, said lift mechanism including

a base fixed to the support structure

a connector,

means for pivoting the connector about a common pivot axis located on the base, and the connector,

first means on the connector for connecting a load to the connector so as to move with the connector,

spring means,

one end portion of said spring means engaging the fixed base,

the other end portion of said spring means being connected to a spring tensioning member which is movable with respect to the base,

means for connecting the spring tensioning member to the connector about a pivot axis on the connector, and

means for adjusting in infinite increments the distance between the spring tensioning member and the second pivot axis

whereby the tension of the spring means may be increased or decreased with consonance with variations in load on the connector.

8. The tilting bed system of claim 7

the means for connecting the spring tensioning member to the connector is a threaded member,

one end of the threaded member being pivotally connected to the connector at the second pivot axis,

the other end of the threaded member being threadably received in a threaded passage on the spring tensioning member.

9. The tilting bed system of claim 8

further characterized by and including a nut spatially fixed with respect to the spring tensioning member,

said nut being in threaded engagement with the threaded member and rotatable around the axis of the threaded member.

10. The tilting bed system of claim 9 further characterized in that

the spring means consists of a plurality of individual springs.

11. The tilting bed system of claim 10 further characterized in that

the connector includes

means for pivotally receiving a load on the connector and

means for locking the load to the connector,

whereby pivotable movement of the locked together load and connector imparts an extending or contracting motion to the springs.

12. A tiltable bed and desk furniture system, said furniture system including

a rigid system support structure,

a bed platform,

a lift mechanism for connecting the bed platform to, and tilting the bed platform about, the rigid system support structure,

a desk,

linkage means pivotally connecting the support structure to the desk,

a desk support structure fixed to each end of the underside of the bed platform and depending downwardly therefrom,

the lower end portion of each of said downwardly depending desk support structures being pivotally connected to an associated end portion of the desk,

the pivotal connection of the lower end portion of each desk support structures to its associated end portion of the desk being located above

the pivotal connection of the linkage to the desk to thereby form a parallelogram linkage system.

13. The tiltable bed and desk furniture system of claim 12 further characterized in that

the desk has short upwardly extending side walls at each end thereof, and

the bottom of each of the downwardly depending support structures comes to rest in load bearing contact with the side walls of the desk when the bed platform is in a horizontal, in use position.

14. The tiltable bed and desk furniture system of claim 13 further characterized in that

the bottom of reach of the downwardly extending desk support structures is an elongated member which is in contact with the upper surface of its associated desk side wall whereby the load of the bed platform is transferred to an elongated area on each of the desk side walls.

15. The tiltable bed and desk furniture system of claim 12 further characterized in that

the lift mechanism includes

a connector,

means for pivoting the connector about a common pivot axis located on the rigid system support structure, and the connector,

first means on the connector for connecting a load to the connector so as to move with the connector,

spring means,

one end portion of said spring means engaging the fixed base,

the other end portion of said spring means being connected to a spring tensioning member which is movable with respect to the base,

means for connecting the spring tensioning member to the connector about a second pivot axis on the connector, and

means for adjusting in infinite increments the distance between the spring tensioning member and the second pivot axis

whereby the tension of the spring means may be increased or decreased in consonance with variations in load on the connector.

16. The tiltable bed and desk furniture system of claim 15 further characterized in that

the means for connecting the spring tensioning member to the connector is a threaded

member,

one end of the threaded member being pivotally connected to the connector at the second pivot axis,

the other end of the threaded member being threadably received in a threaded passage on the spring tensioning member.

17. The tiltable bed and desk furniture system of claim 16 further characterized by and including

a nut spatially fixed with respect to the spring tensioning member,

said nut being in threaded engagement with the threaded member and rotatable around the axis of the threaded member.

18. The tiltable bed and desk furniture system of claim 17 further characterized in that

the spring means consists of a plurality of individual springs.

19. The tiltable bed and desk furniture system of claim 18 further characterized in that

the connector includes

means for pivotally receiving a load on the connector and

means for locking the load to the connector

whereby pivotable movement of the locked together load and connector imparts an extending or contracting motion to the springs.

Fig. 1

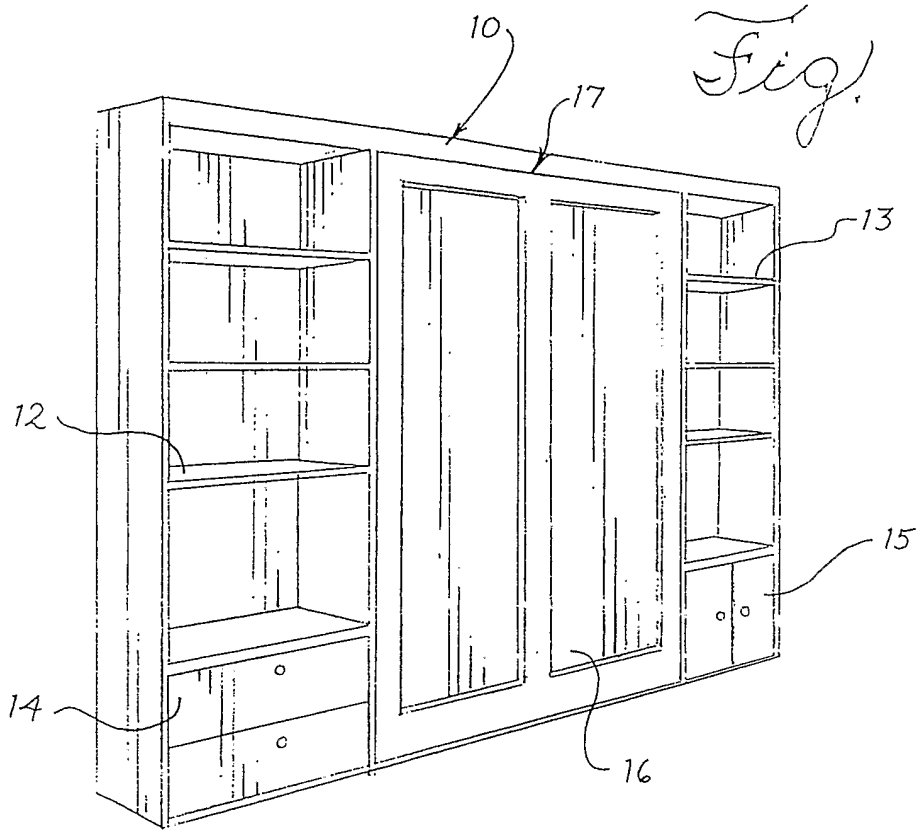
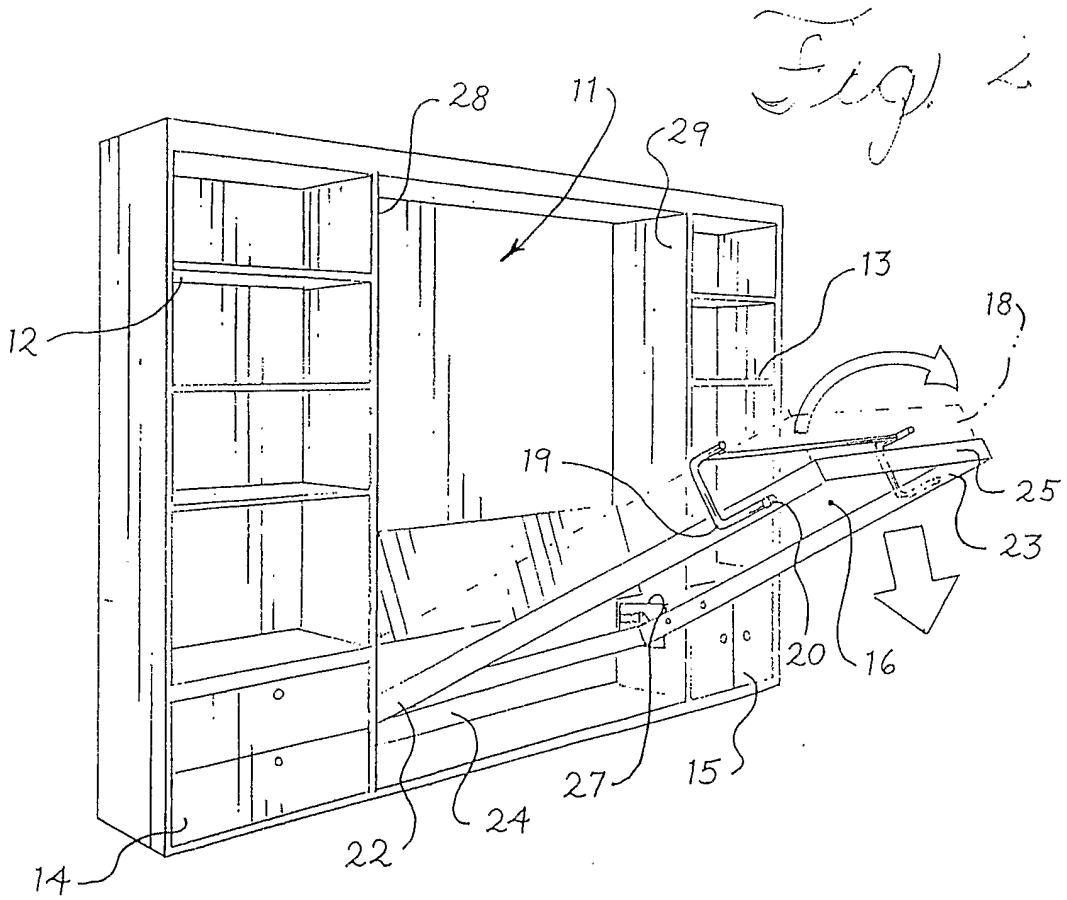


Fig. 2



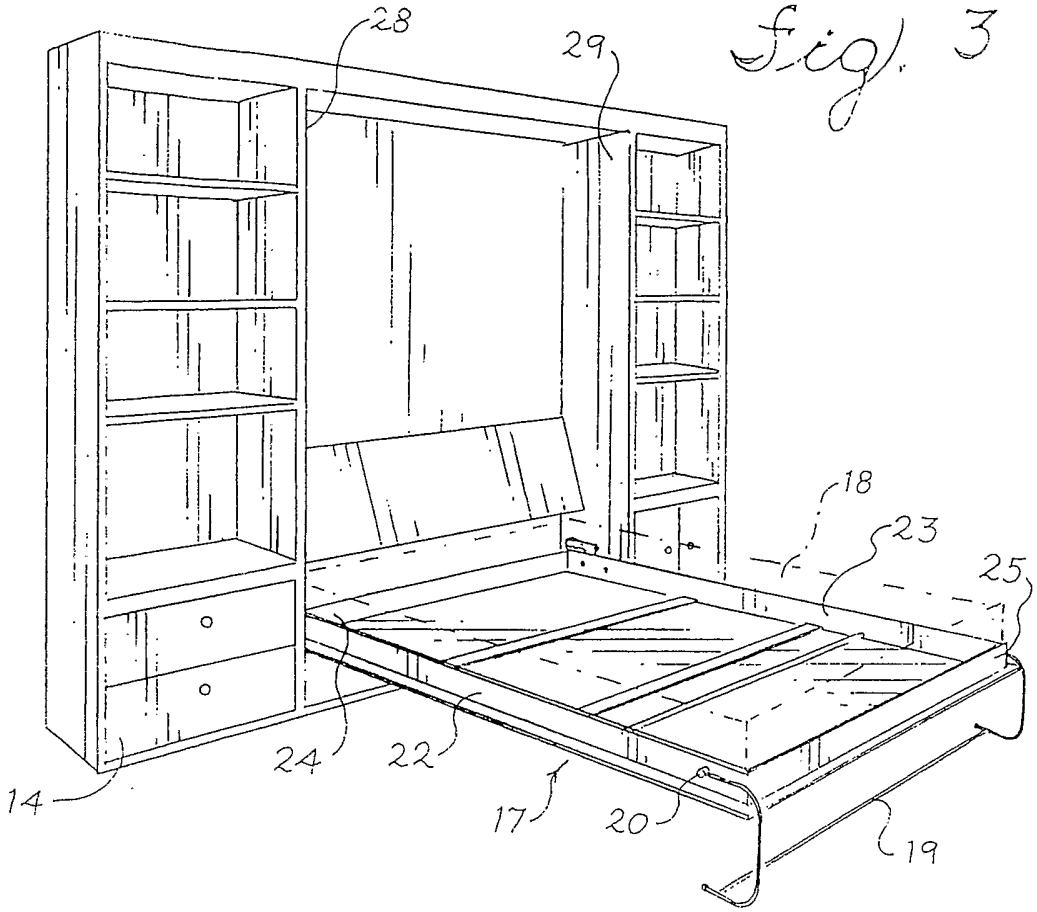


Fig. 3

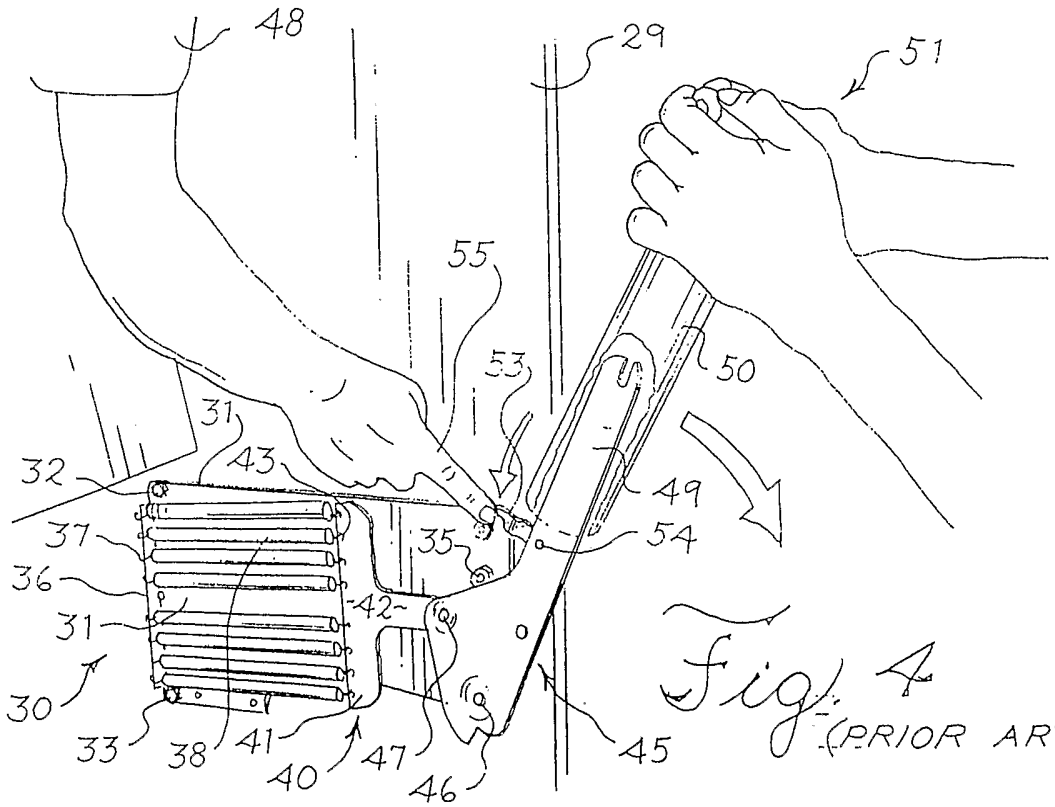


Fig. 4 (PRIOR ART)

Fig. 5

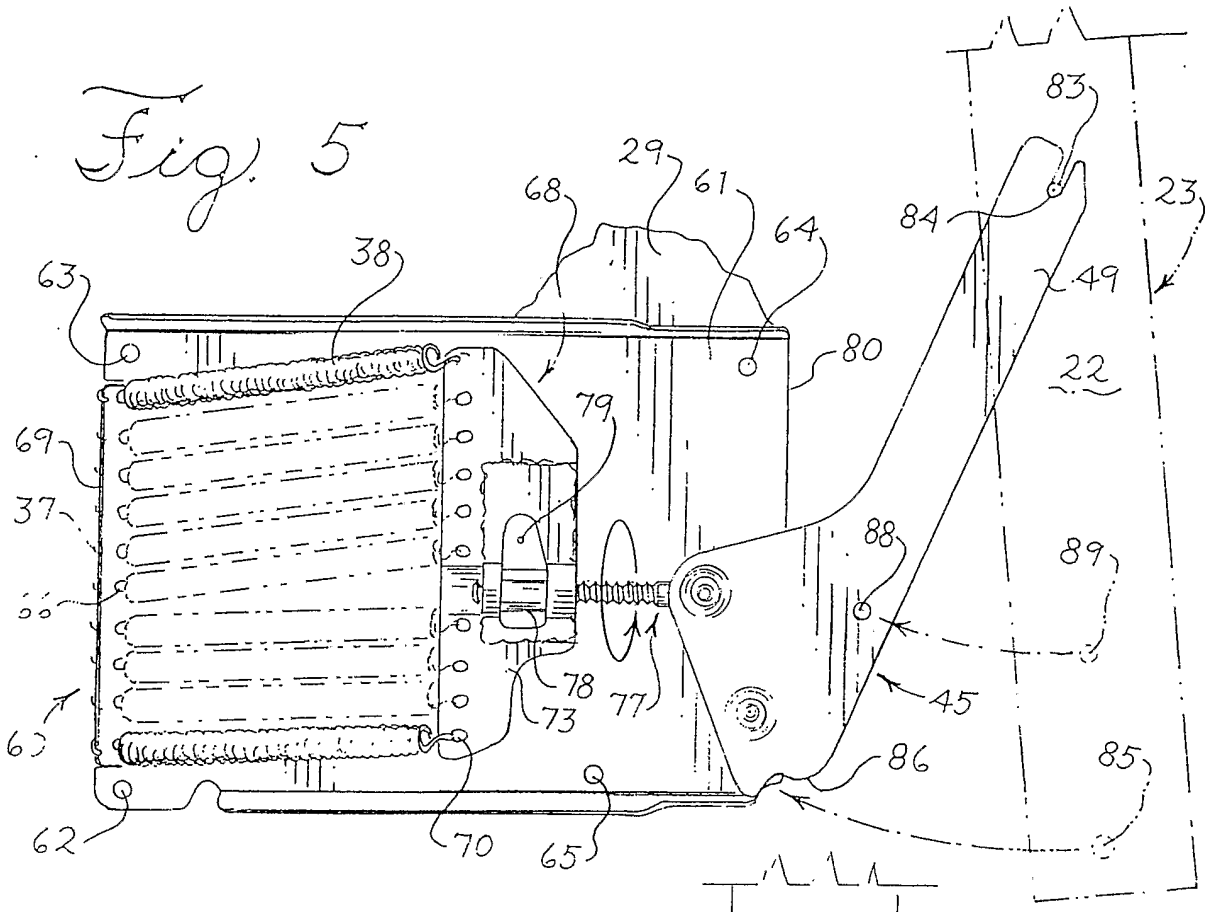
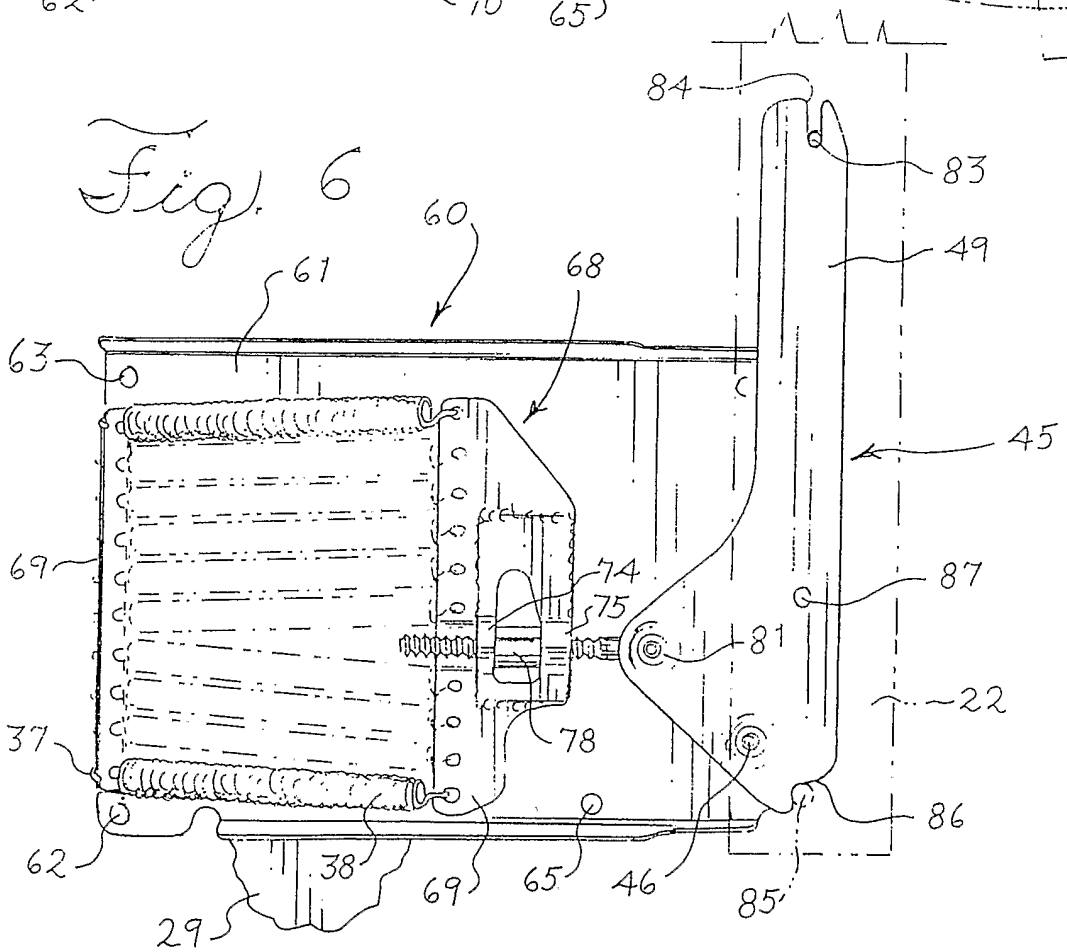

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Fig. 6


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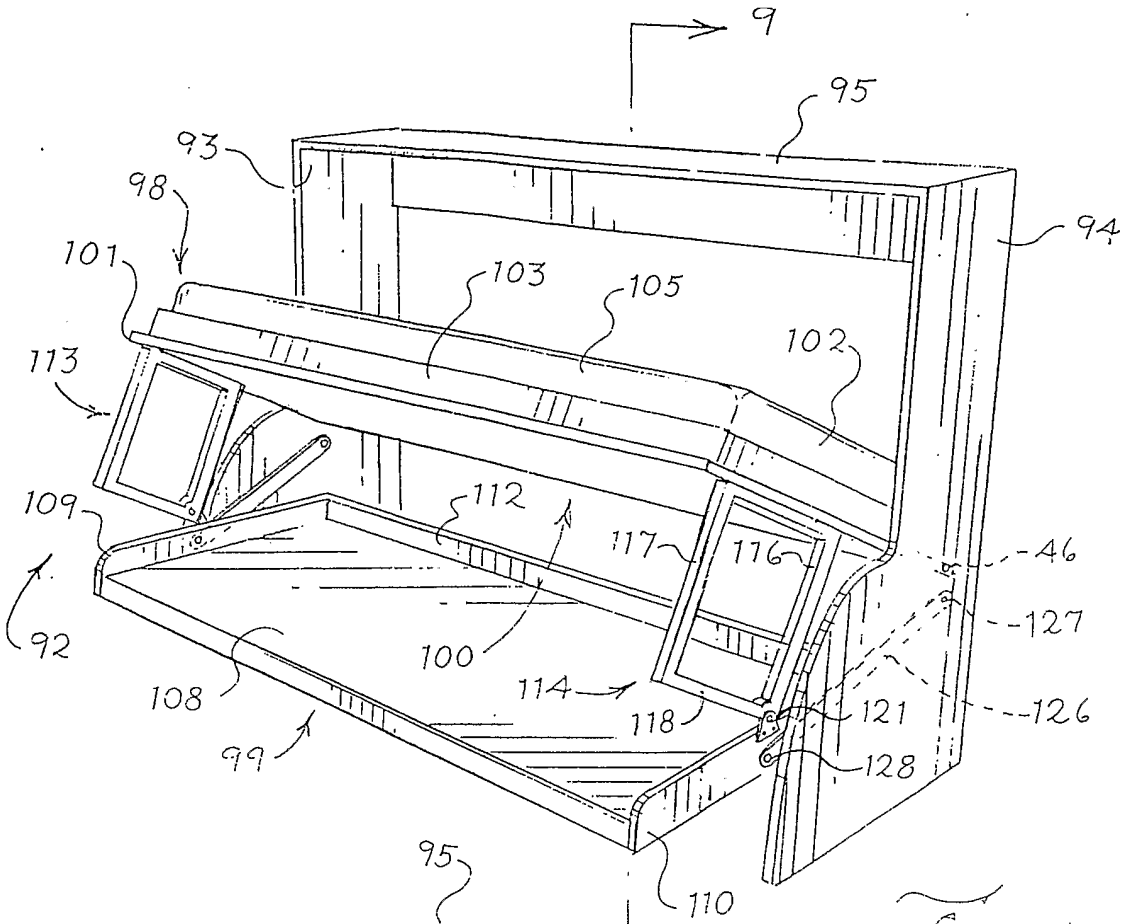

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Fig. 7

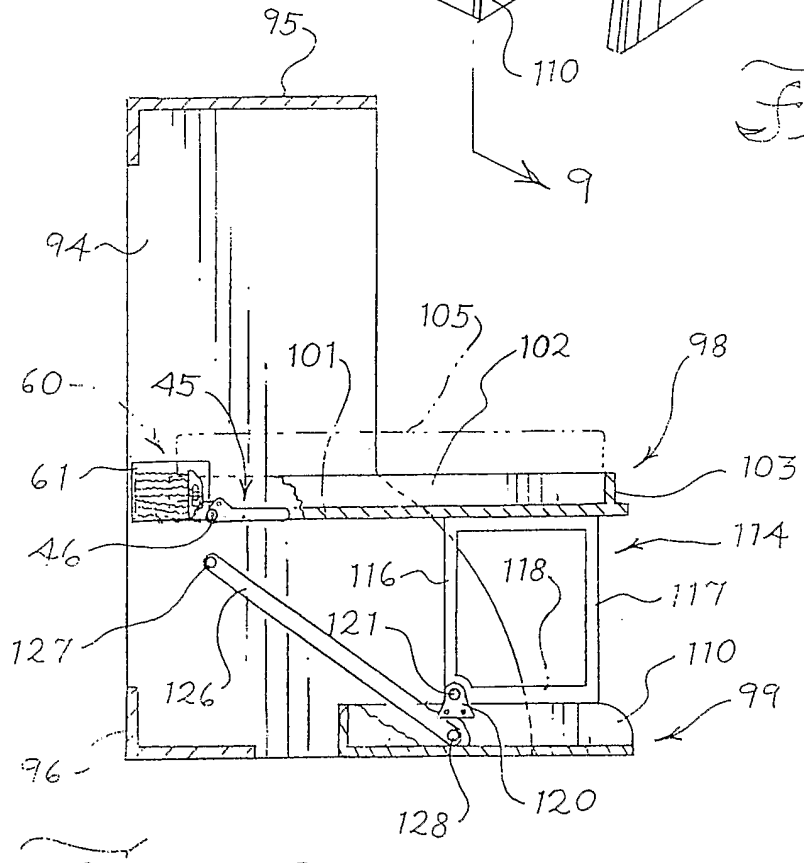

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Fig. 8

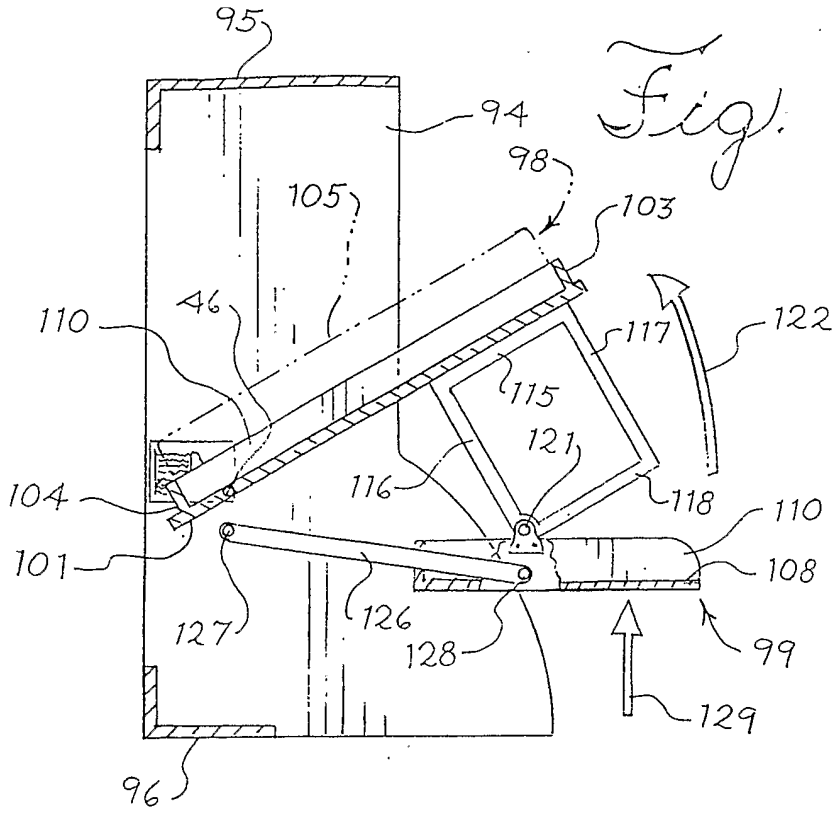

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Fig. 9

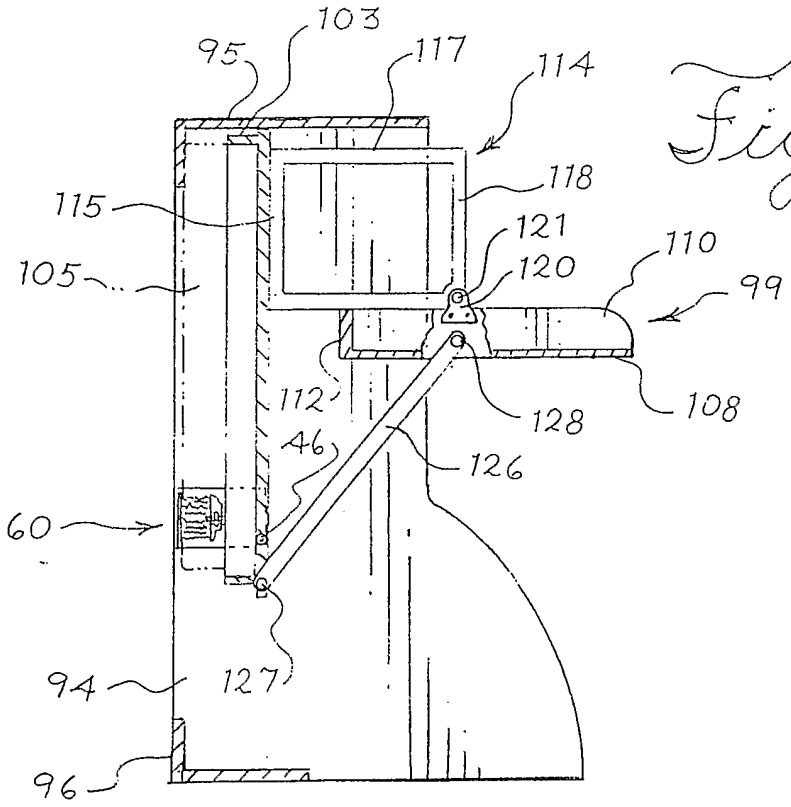

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Fig. 10