Dec. 30, 1969 C. J. BARECKI ET AL 3,486,790

CHAIR ASSEMBLY

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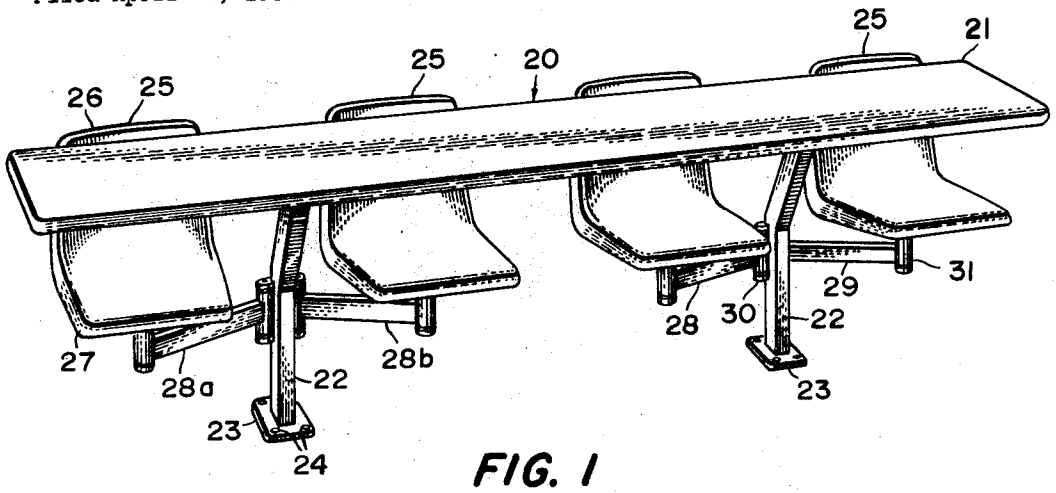


FIG. 1

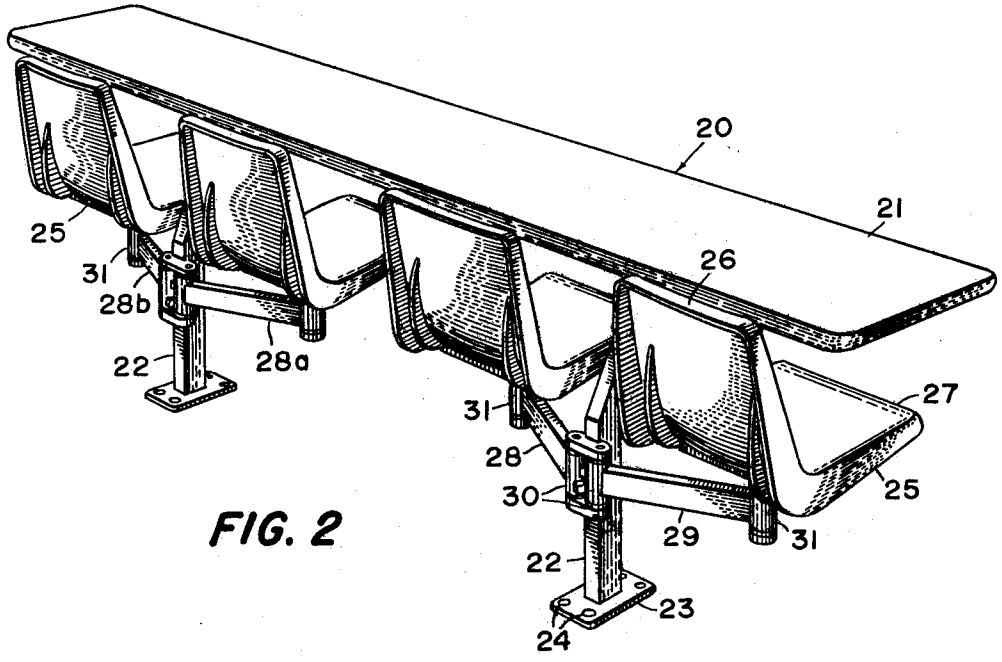


FIG. 2

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Dec. 30, 1969 C. J. BARECKI ET AL 3,486,790

CHAIR ASSEMBLY

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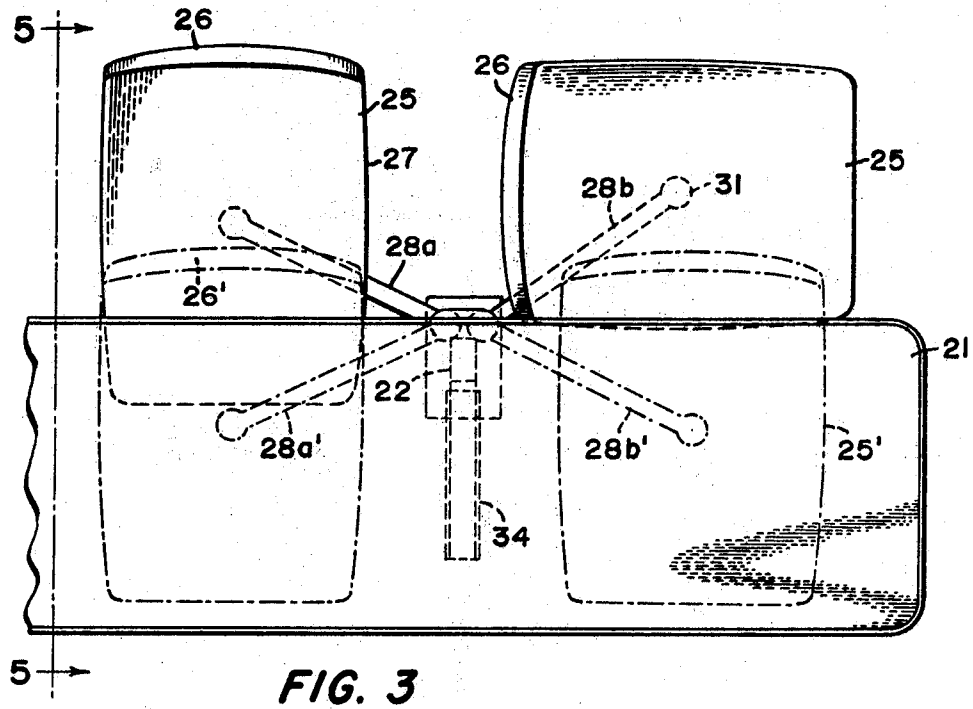


FIG. 3

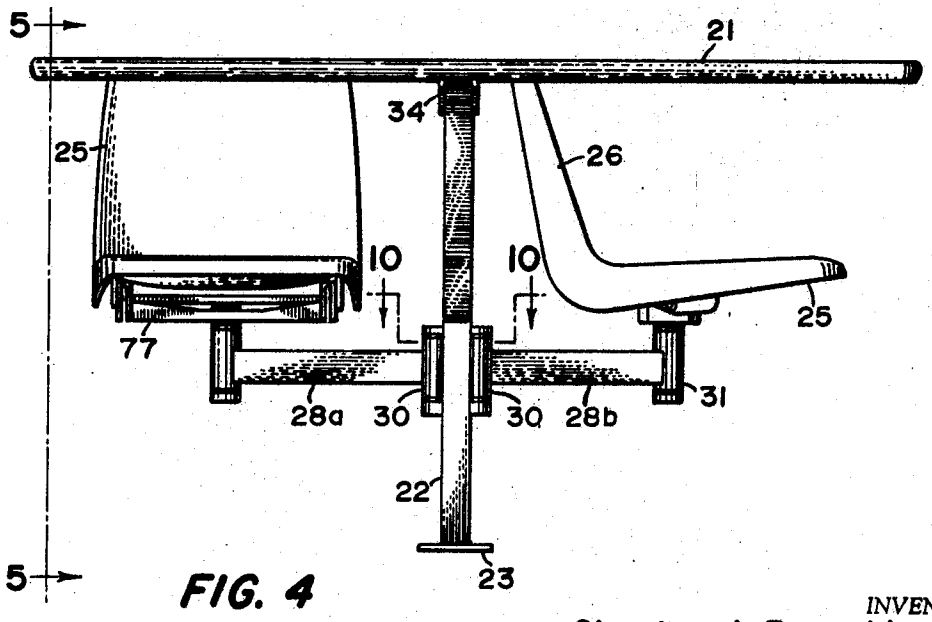


FIG. 4

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CHAIR ASSEMBLY

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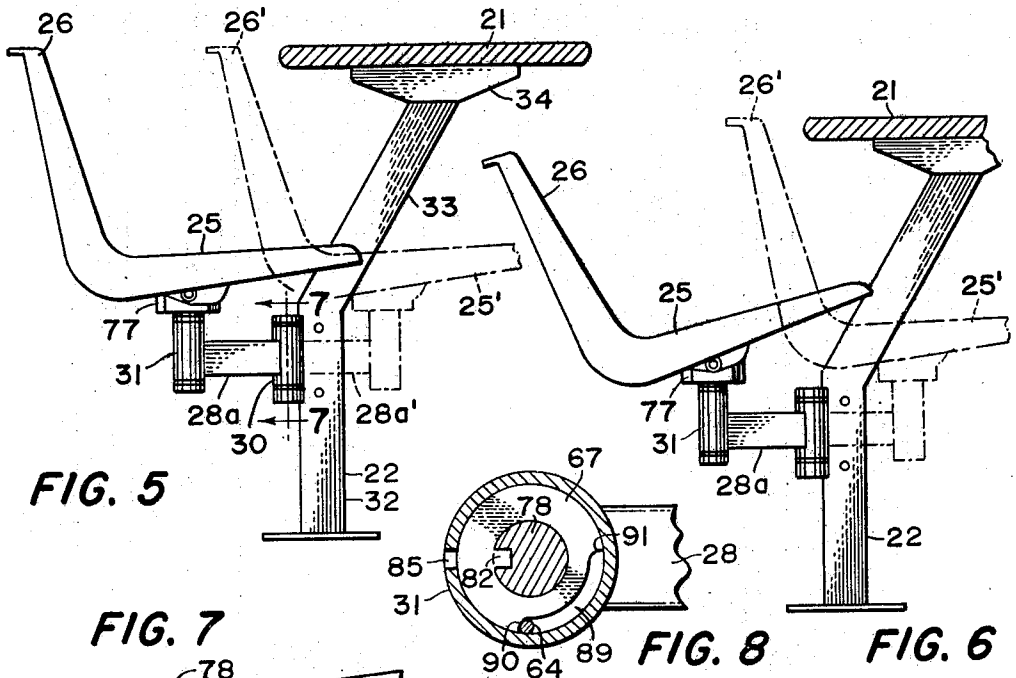


FIG. 5

FIG. 8

FIG. 6

FIG. 7

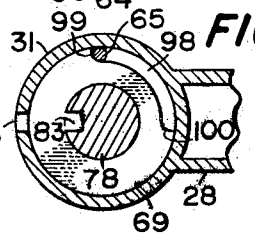


FIG. 9

FIG. 10

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CHAIR ASSEMBLY

Filed April 19, 1968 5 Sheets-Sheet 4

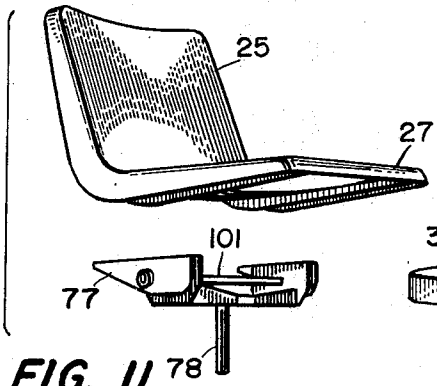


FIG. 11

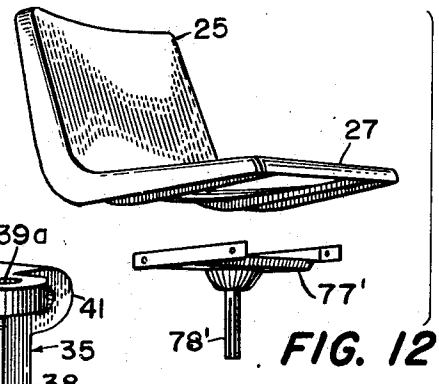


FIG. 12

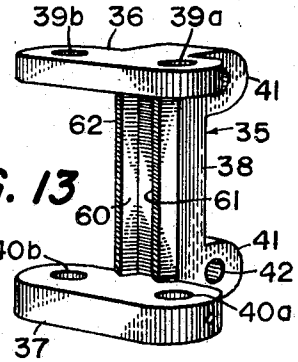


FIG. 13

FIG. 14

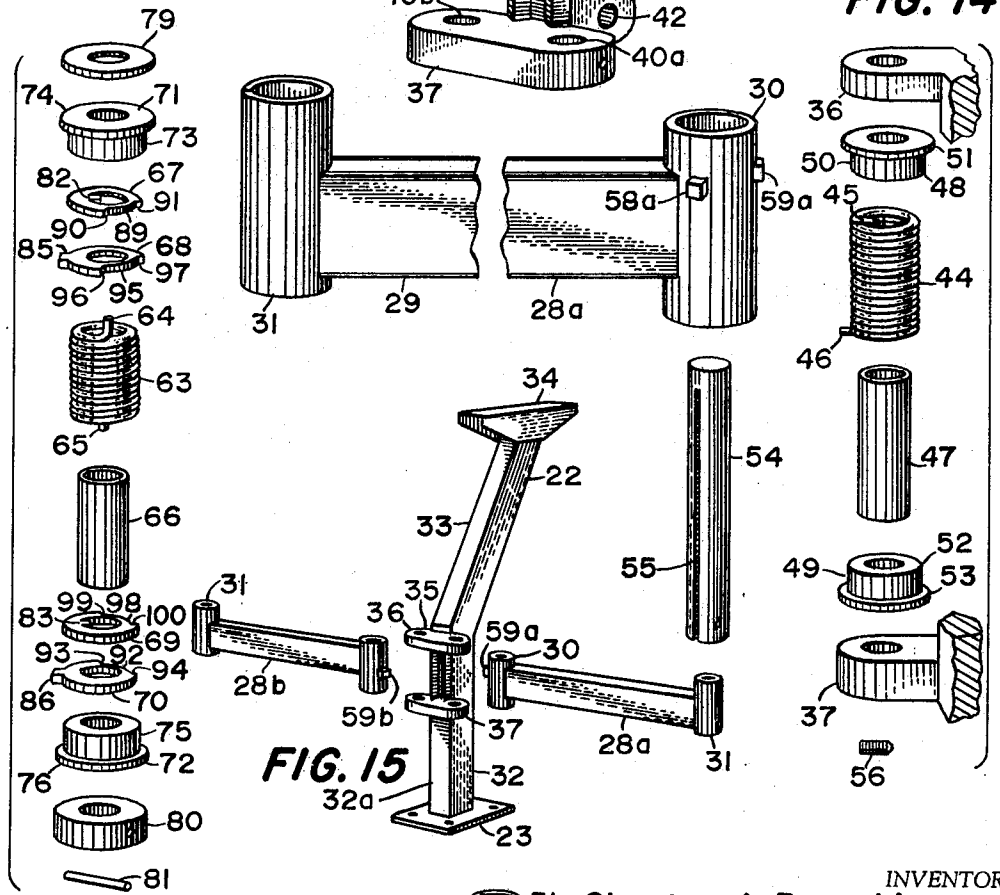


FIG. 15

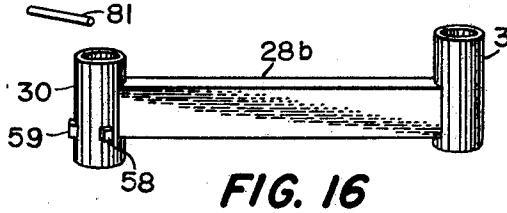


FIG. 16

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CHAIR ASSEMBLY

Filed April 19, 1968 5 Sheets-Sheet 5

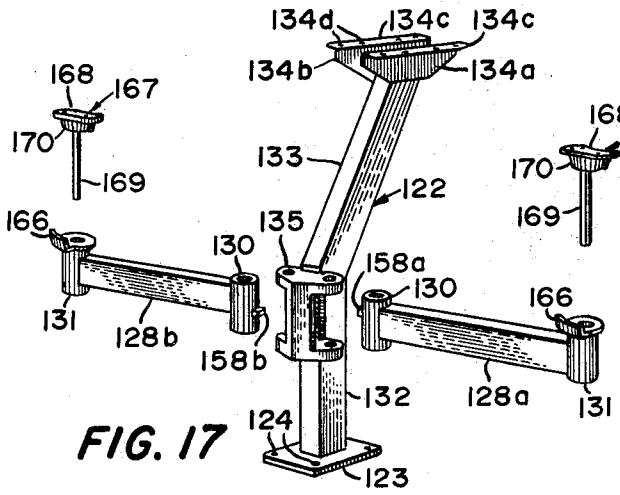


FIG. 17

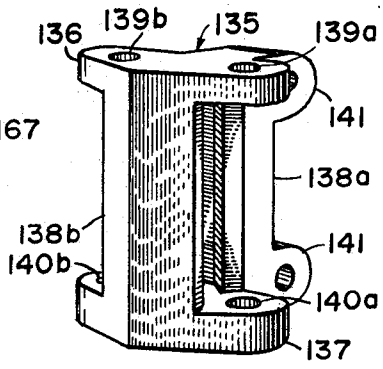


FIG. 18

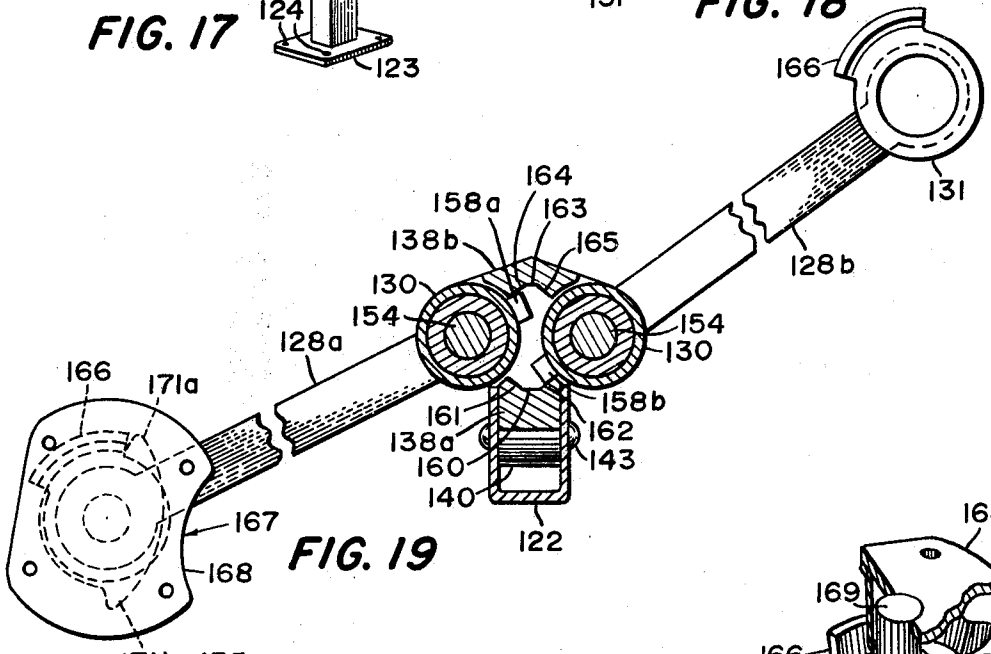


FIG. 19

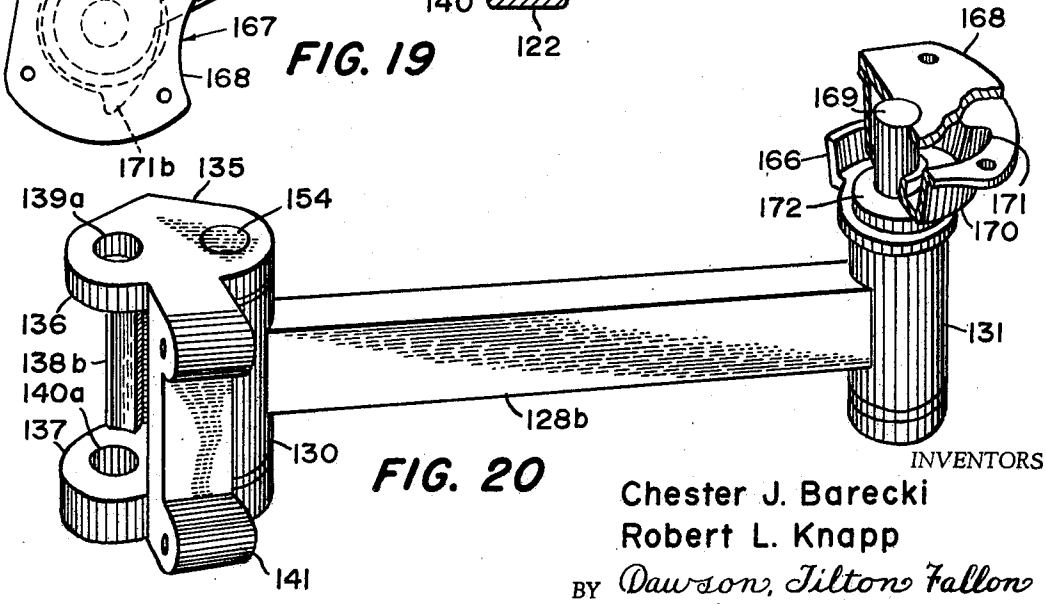


FIG. 20

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United States Patent Office

3,486,790
Patented Dec. 30, 1969

3,486,790

CHAIR ASSEMBLY

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Filed Apr. 19, 1968, Ser. No. 722,583
Int. Cl. A47b 39/00
U.S. Cl. 297—142 19 Claims

ABSTRACT OF THE DISCLOSURE

A chair assembly particularly adapted for use in conjunction with an elongated, counter-like table. The chairs are supported above the floor by arms which extend generally horizontally from the table-supporting pedestal. One end of each chair-supporting arm is rotatably mounted on the pedestal by means of a generally vertically extending sleeve on the end of the arm which is rotatably secured in an arm-supporting bracket by means of a pin. A coil spring interposed between the pin and sleeve biases the supporting arm against rotation away from the table, and radially outwardly extending studs on the sleeve engageable with the pedestal limit the rotational movement of the arm. A chair is rotatably supported by the other end of the arm by a cylindrical post which extends downwardly from the seat and is journaled in a sleeve on the other arm end. A coil spring is interposed between the post and the sleeve, and cam members within the sleeve engage the ends of the spring as the chair rotates so that the spring resiliently biases the seat against rotation in either direction.

BACKGROUND

This invention relates to a chair assembly, and more particularly, to a chair assembly particularly adapted for use with the elongated, counter-like tables commonly seen in school lecture halls.

In the design of school seating several important factors must be kept in mind. One of the most important factors is that the student must be seated comfortably at his desk while maintaining the proper posture. Improper spacing between the chair and desk may result in poor posture, weakened eyesight, and resultant drowsiness. However, not only must the chair be positioned properly with respct to the desk, but it must be relatively easy to get into and out of.

In order to maintain a proper spacing between desk and chair and to decrease maintenance time spent in repositioning school furniture, schools are increasingly utilizing desk and chair combinations which are fixed to the floor. The desk may then be provided by an elongated counter-like table, and the chairs are positioned at spaced intervals along the length of the table. However, if the chairs are fixed to the floor, the maintenance problems of cleaning and waxing the floor is increased. Not only do the supporting means for the seat interfere with sweeping, mopping, etc., but each fixture on the floor presents additional collecting places for dust, dirt, and the like. Further, anchoring the chair in a fixed position with repsect to the table may interfere with the student's ability to get into and out of the seat and to walk between the chairs of one row and the desks of the next row. Anchoring the chair also eliminates any adjustability of the seat. Taller students should be positioned farther away from the table than shorter students for maximum comfort and attentiveness, and some adjustability in the chair is desired for this reason.

Rotatable chairs have been provided in the past, but the mechanism for returning the chair to its original position is frequently complicated and difficult to repair or replace. It will be appreciated that school seating is subject to a certain amount of abuse, and even in normal use a chair may in time be broken or the return mechanism may become defective. It is, therefore, desirable that parts of the chair assembly be both durable and capable of easy replacement.

SUMMARY

The chairs of the inventive assembly are supported by the table-supporting pedestals rather than by the floor, thereby facilitating maintenance of the floor. Each chair is supported by an arm which is rotatably mounted to the pedestal so that the seat may swing away from the table to permit easy access to the seat. The rotatable arm is resiliently biased toward the table so that the arm returns to its original position after the student is seated or leaves the chair. Each chair is rotatably supported by an arm, and the chair may be rotated in either direction to permit the student to get into and out of the chair or to observe the teacher when instructing on either side of the room. The chair is resiliently biased to return to its original position regardless of the direction in which it is rotated. The return mechanisms for the arm and the chair are durable yet easily replaceable.

DESCRIPTION OF THE DRAWING

FIG. 1 is a front perspective view of a chair and table assembly utilizing the present invention;

FIG. 2 is a rear perspective view of the assembly of FIG. 1;

FIG. 3 is a top fragmentary view of the assembly illustrating the various positions of the chairs;

FIG. 4 is a front view of FIG. 3;

FIG. 5 is a side sectional view taken along the line **5—5** of FIG. 3 showing alternate positions of one of the chairs of FIG. 3;

FIG. 6 is a view similar to FIG. 5 illustrating the tilting action of the chair;

FIG. 7 is a fragmentary sectional view taken along the line **7—7** of FIG. 5 and continuing through the chair-supporting arm;

FIG. 8 is a fragmentary sectional view taken along the line **8—8** of FIG. 7;

FIG. 9 is a fragmentary sectional view taken along the line **9—9** of FIG. 7;

FIG. 10 is a fragmentary sectional view taken along the line **10—10** of FIG. 4;

FIG. 11 is an exploded perspective view of the chair illustrating one embodiment of the chair base;

FIG. 12 is a view similar to FIG. 11 illustrating another embodiment of the chair base;

FIG. 13 an enlarged perspective view of the arm-supporting bracket;

FIG. 14 is an exploded perspective view of the chair-supporting arm, the arm return means, and the chair return means;

FIG. 15 is a rear exploded perspective view of the pedestal and the chair-supporting arms;

FIG. 16 is a perspective view of one of the chair supporting arms of FIG. 15;

FIG. 17 is a view similar to FIG. 15 illustrating a different embodiment of the invention;

FIG. 18 is a view similar to FIG. 13 showing the arm-supporting bracket of FIG. 17;

FIG. 19 is a view similar to FIG. 10 showing the embodiment of FIG. 17; and

FIG. 20 is a fragmentary perspective view of one of the supporting arms of FIG. 17.

GENERAL DESCRIPTION OF SPECIFIC EMBODIMENT

Referring to FIGS. 1 and 2, the numeral **20** designates generally a chair and table assembly which includes an elongated counter-like table **21** supported by generally upwardly extending pedestals **22** which are adapted to be attached to the floor of a school room or lecture hall by base plate **23** having screw openings **24**. While the chair and table assembly **20** will be described for use in a school room, it is to be understood that the assembly may be used for other purposes, such as a lunch counter or the like.

Each pedestal **22** supports a pair of chairs **25** on either side thereof, and the pedestals are spaced along the table **21** to provide approximately equal spacing between each of the chairs **25**. The table **21** may be straight or curved. The particular table **21** illustrated is straight and is supported by two pedestals **22**, providing seating for four students. However, a longer table may be provide, or several tables may be positioned end-to-end to provide additional seating. The tables **21** are generally arranged in rows, one behind the other, and if desired, the floor of the room may be inclined or stepped rearwardly to position each chair assembly slightly above the assembly immediately before it to provide the students with unobscured vision.

Each chair **25** includes a back portion **26** and a seat portion **27**, and the seat portion is supported by an arm **28** which extends generally horizontally from the pedestal **22**. The chair-supporting arms **28** include an elongated central portion **29** which is generally rectangular in transverse cross section, the end of the arm adjacent the pedestal terminates in a vertically extending tubular arm-supporting sleeve **30**, and the end of the arm-supporting the chair **25** terminates in a generally vertically extending chair-supporting tubular sleeve **31**.

Each arm-supporting sleeve **30** is rotatably mounted on a pedestal **22**, and each chair **25** is journaled in a chair-supporting sleeve **31**. Each pedestal supports a right chair-supporting arm **28***a* and a left chair-supporting arm **28***b* (with reference to students sitting in the chairs).

FIG. 3 illustrates the various positions into which the chair may be moved. The right chair-supporting arm **28***a* is rotated in its pedestal mounting counterclockwise or away from the table **21** to move its supported chair rearwardly, or away from the table. In this position the back **26** of the chair is positioned substantially rearwardly of the table **21** to permit easy entrance to, and egress from, the chair. The forward position of the arm **28***a* is illustrated in phantom at **28***a'*, and when the arm is in this position, the back **26** of the chair is positioned relatively close to the table **21** when it is unoccupied; when occupied, the occupant moves the chair to a desired position somewhere between positions **26** and **26'** where he may write or read while maintaining correct posture. Similarly, the left arm **28***b* which supports the left chair is shown in its rearward position in FIG. 3, and the forward position of the arm is illustrated in phantom at **28***b'*. The chair supported by the arm **28***b* is also shown to be rotated counterclockwise in its supporting sleeve **31** to permit the student to sit down or stand up with increased facility and to permit the student to comfortably view any instruction being given at the side of the room. The forward position of the chair supported by the arm **28***b* is illustrated in phantom at **25'**.

The forward and rearward positions **26'** and **26**, respectively, of the back of the chair supported by the right arm **28***a* are also illustrated in FIG. 5. The seat supported by the left arm **28***b* is omitted from FIG. 5 for clarity. As illustrated in FIG. 6, the chair may be provided with a tiltable seat support to allow the chair to tilt backwardly.

DETAILED DESCRIPTION OF PEDESTAL AND ARM-SUPPORTING MEANS

Referring to FIG. 15, the pedestal **22** includes a generally vertically extending lower portion **32** and an upper portion **33** extending forwardly and upwardly from the lower portion **32**. Bracket **34** is carried by the top of the angled upper portion **33** and is adapted to support the table **21**. The bracket **34** may be suitably secured to the table by means of screws or the like. The lower and upper portions **32** and **33** are generally channel-shaped or rectangular in transverse cross section, and the rearward face **32***a* of the lower portion is cut away adjacent the juncture between the upper and lower portions **32** and **33** to receive arm-supporting bracket **35** between the spaced-apart side faces **32***b* and **32***c* (FIG. 10).

Referring to FIG. 13, the arm-supporting bracket **35** is seen to include vertically spaced upper and lower flanges **36** and **37**, respectively, which are joined by connecting portion **38**. The flanges **36** and **37** extend generally transversely of the pedestal **22**, and the upper flange **36** is provided with openings **39***a* and **39***b* therethrough adjacent the right and left ends, respectively, of the flange. Similarly, flange **37** is provided with openings **40***a* and **40***b* which are vertically aligned with the openings in the upper flange. The connecting portion **38** includes forwardly extending ears **41** adjacent the ends thereof, and the ears **41** are provided with bores **42**. Referring to FIG. 10, the bracket **35** is received between the side faces **32***b* and **32***c* of the lower portion **32** of the pedestal and secured therebetween by rivets or bolts **43** which pass through the pedestal sides and the bores **42**.

The means for rotatably supporting the arms **28** will now be described. Referring to FIGS. 7 and 14, the hollow tubular sleeve **30** of each of the arms **28** slidably receives a generally cylindrical, spirally wound coil spring **44** having an upper end **45** bent to extend generally radially inwardly and a lower end **46** bent to extend generally radially outwardly. A cylindrical nylon bushing **47** about the same length as the spring **44** is slidably received by the spring, and a pair of upper and lower bearings **48** and **49**, respectively, are positioned above and below the spring. The upper bearing **48** includes a cylindrical plug portion **50** which has approximately the same outside diameter as the inside diameter of the sleeve **30** and a radially extending shoulder portion **51** which has an outside diameter approximately the same as the outside diameter of the sleeve **30**. Similarly, the lower bearing **49** includes a plug portion **52** and a shoulder portion **53**, and when the bearings **48** and **49** are positioned within the sleeve **30** the spring is restrained against vertical movement. Each of the bearings **48** and **49** are provided with a central opening, and after the sleeve **30** is positioned between the upper and lower flanges **36** and **37** of the bracket **35** in general vertical alignment with a pair of openings therein, an elongated cylindrical rod **54** is inserted through the upper flange **36**, the upper bearing **48**, the bushing **47**, the lower bearing **49**, and the lower flange **37**. The rod **54** is sized to be received rotatably but somewhat snugly by the bearings **48** and **49** and the bushing **47** so that the arm **38** is supported securely in cantilever fashion by the bracket **35**. The rod **54** includes a longitudinally extending slot or key way **55** along substantially the entire length thereof. Rod **54** may be rotated to tension spring **44** as needed and then set screw **56** is extended against rod **54** to lock it in place. This provides the retention in both the rotational and vertical direction.

Referring to FIG. 7, the lower end of the sleeve **30** is seen to be provided with a vertically extending slot **57**. When the spring **44** is inserted within the sleeve, it is positioned so that the outwardly extending lower end **46** is received by the slot **57**, and when the rod **54** is inserted, it is positioned so that the inwardly extending upper spring end **45** is received by the slot **55**. The upper end of the spring is thus held stationary by the rod **54**,

and the lower end of the spring is connected to the sleeve **30** for rotation therewith.

The direction of the spiral turns of each coil spring **44** is such that when the arm **28** is swung rearwardly or away from the table **21**, the turns of the spring are tightened, and the spring exerts a force tending to return the arm toward the table. If desired, instead of using two springs, a single spring may be used and when used on the other arm may be turned upside down. Referring to FIG. 10, the arm **28***a* is shown being maintained in its forward position under the urging of its associated spring, while the arm **28***b* is being held in a rearward position against the force exerted by its spring tending to pull the arm forward. Since the arms **28***a* and **28***b* rotate away from the table in different directions, the spiral turns of the respective springs will also be wound in different directions. A radially outwardly extending stud **58** is provided on each sleeve **30** which engages one of the generally flat side faces of the pedestal **22** under the urging of the spring and acts as a forward stop for the arm **28**, preventing further rotation toward the table. In FIG. 10, the forward stop for the arm **28***a* is designated **58***a* while the forward stop for the arm **28***b* is designated **58***b*.

It will be understood that instead of using two springs, a single spring may be used, the spring being turned upside down for use on the other arm. In this way we can get the desired reversal of tension while using only one spring.

If the student desires to sit down or stand up or if the floor beneath the chair is being cleaned, the chair-supporting arm **28** may be rotated rearwardly or away from the table against the urging of the spring **44**. Since the chair need be moved rearwardly only enough to permit easy access to the chair and since excessive rearward movement of the chair may cause it to contact the table positioned behind it, it is desirable to limit the rearward rotation of the arms **28**. For this purpose, the right and left arms **28***a* and **28***b* are provided with studs **59***a* and **59***b* respectively, which are generally rectangular in cross section and which act as rearward stops. As can be seen in FIGS. 10 and 13, the connecting portion **38** of the bracket **35** is provided with a vertically extending generally V-shaped slot **60** having a pair of inclined sides **61** and **62**. Each of the inclined sides extends generally radially with respect to one of the sleeves **30** supported by the bracket so that substantially planar bearing engagement betwen the connecting portion **38** and the rearward stops **59** is possible. Referring to FIGS. 14 and 16, the forward and rearward stops **58***a* and **59***a* of the right arm **28***a* are positioned on the upper portion of the sleeve **30** while the forward and rearward stops **58***b* and **59***b* of the left arm **28***b* are positioned on the lower portion of the sleeve of that arm. Thus, the sleeves **30** of right and left arms **28***a* and **28***b* may be positioned relatively close together without interference from the rearward stops **59***a* and **59***b*.

If it is desired to provide a greater force for returning the arms to the forward position, the tension on the spring **44** may be increased by withdrawing the set screw **56**, rotating the rod **54** to tension the spring, and replacing the set screw.

DETAILED DESCRIPTION OF CHAIR SUPPORTING MEANS

Referring to FIGS. 7 and 14, each of the chair-supporting arms **28** carries a vertically extending generally cylindrical tubular sleeve **31** on the end opposite the sleeve **30**. A generally cylindrical spirally wound coil spring **63** having an upwardly bent upper end **64** and a downwardly bent lower end **65** is slidably received by the sleeve **31**, and a tubular nylon bushing **66** of about the same length of the spring **63** is received by the spring. Disks or washers **67** and **68** are positioned above the spring **63**, and disks or washers **69** and **70** are positioned below the spring. Upper and lower bearings **71** and **72**, respectively, are received by the upper and lower ends of the sleeve **31**. The bearing **71** includes a plug portion **73** which is received by the sleeve and an outwardly extending shoulder portion **74** which extends over the upper end of the sleeve. Similarly, the bearing **72** includes a plug portion **75** and a shoulder portion **76**. The bearings are sized to prevent vertical movement of the spring and washers within the sleeve **31**, and each bearing is provided with a central bore therethrough.

Referring to FIG. 11 a seat-supporting base **77** is secured underneath the seat portion **27** of the chair and supports and reinforces the seat portion over a substantial area thereof. The base **77** includes a generally cylindrical downwardly extending post **78**. Referring to FIG. 7, the post **78** is inserted through the bearing **71**, disks **67** and **68**, bushing **66**, lower disks **69** and **70**, and lower bearing **72**, and the diameter of the post is sized so that the post is received rotatably but rather snugly by these parts. If desired, a washer **79** may be interposed between the upper bearing **71** and the base **77**, and a washer **80** may be inserted over the lower end of the post below the lower bearing **72**. A pin **81** is inserted through the washer **80** and the lower end of the post **78** to retain the post within the sleeve **31** and to prevent the post from being withdrawn vertically from the sleeve. The pin **81** is inserted through the post **78** at a point which will maintain the washers **79** and **80** adjacent the bearings **71** and **72**, respectively, to substantially eliminate vertical play between the various parts, and the spring **63** is prevented from rattling against the post by the bushing **66**.

Each of the disks **67–70** are generally annularly shaped, having an outside diameter approximately equal to the inside diameter of the sleeve **31** and an inside diameter approximately equal to the diameter of the post. The disks **67** and **69** include radially inwardly extending keys **82** and **83**, respectively, which are received by a longitudinally extending slot or key way **84** provided in the post **78**, and the disks **67** and **69** are thereby connected to the post **78** for rotational movement therewith.

Each of the disks **68** and **70** include a radially outwardly extending key **85** and **86**, respectively, and the key **85** is received by a vertically extending slot **87** provided in the sleeve **31** at the upper end thereof (FIG. 7) while the key **86** is received in a slot **88** at the lower end of the sleeve. The disks **68** and **70** are thereby connected to the sleeve **31** and secured against rotation with post **78**.

The disk **67** is provided with a circumferentially extending recess **89** in its outer periphery (FIGS. 8 and 14) which terminates in generally radially extending shoulders **90** and **91**. Similarly, the disk **70** positioned below the spring **63** includes a circumferentially extending recess **92** which terminates in generally radially extending shoulders **93** and **94**. The recess **89** in the upper disk **67** is positioned so that the shoulder **90** is adjacent the upwardly extending spring end **64** when the spring is in a neutral or untensioned position (FIG. 8), and the recess **92** in the lower disk **70** is positioned so that the shoulder **93** is adjacent the downwardly extending lower spring end **65** when the spring is in the neutral position. When the chair supported by the sleeve **31** is rotated in a counterclockwise direction, or to the student's left, the upper disk **67** rotates with the post **78** and the shoulder **90** acts as a camming surface to force the spring end **64** to rotate. The lower disk **70**, however, is connected to the sleeve **31** and remains stationary, the shoulder **93** acting as a camming surface to maintain the lower spring end **65** stationary. The upper portion of the spring is thereby rotated with respect to the lower portion to tighten the coils of the spring, and the chair is resiliently biased by the spring to return to its original position.

The upper disk **68** also includes a recess **95** having shoulders **96** and **97**, and the disk **69** below the spring is provided with recess **98** with shoulder **99** and **100**. When the spring is in the neutral position, the shoulder **96** of

the upper disk **68** is positioned adjacent the upper spring end **64**, and the shoulder **99** of the lower disk **69** is positioned adjacent the lower spring end **65**. When the seat is rotated in the clockwise direction, the lower disk **69** rotates with the post **78** and the shoulder **99** acts as a camming surface to force the lower end **65** of the spring to rotate. The upper disk **68** is maintained stationary and the shoulder **96** prevents rotation of the upper spring end **64**. The coils of the spring therefore tighten, and the spring resiliently biases the seat to return to its original position.

When the chair is being rotated counterclockwise and the upper spring end **64** is being pushed by shoulder **90** of the upper disk **67**, the spring end **64** moved within the recess **95** of the other upper disk **68** and will not be restrained by the disk **68** until it contacts the shoulder **97**, and the camming shoulder **97** of the disk **68** acts as a stop against further counterclockwise rotation. The shoulder **100** of the lower disk **69** may also act as a stop, since rotation of the disk **69** will eventually bring this shoulder into contact with the stationary spring end **65**.

Similarly, when the seat is being rotated clockwise and the lower spring end **65** is being pushed by the camming shoulder **99** of the lower disk **69**, the lower spring end **65** moves within the recess **92** of the other lower disk **70** and is not restrained by the disk **70**. The seat may continue to rotate in the clockwise direction until the lower spring end **65** engages the shoulder **94** of the lower disk **70**. The shoulder **91** of disk **67** may also serve as the stop since continued rotation of the disk **67** will cause this shoulder to engage the stationary upper spring end **64**. In the particular embodiment illustrated the arcs of the recesses of the disks **67–70** are approximately 90°, and the seat may be rotated approximately 90° in either direction from its neutral or rest position in which the seat portion **27** of the seat extends toward the table **21** as in FIG. 1. Greater or less rotation can be obtained by changing the length of the recesses.

Regardless of whether the seat is rotated clockwise or counterclockwise, the ends of the coil spring **63** will be rotated with respect to each other so as to tighten the coils of the spring. If one end of the spring were merely connected to the post **78** and the other end of the spring merely connected to the sleeve **31**, the coils of the spring would be tightened only when the seat was rotated in one direction. Rotation of the chair in the other direction would tend to unwind the coils, thereby possibly damaging the spring.

The particular chair-supporting base **77** illustrated in FIG. 11 includes a pivot rod **101** which permits the tilting action of the chair illustrated in FIG. 6. Such a tilting mechanism is well known in the art and it is believed unnecessary to describe the structure thereof. The chair-supporting base **77'** illustrated in FIG. 12 includes a downwardly extending post **78'** similar to the post **78** of FIG. 11, but does not provide for the tilting action of the chair.

Both the spring return means for the chair-supporting arms **28** and the spring return means for the chairs may easily be assembled in their respective sleeves **30** and **31**. The parts are operatively connected merely by sliding them vertically with respect to each other, and no other connection is required. If the the chair or one of the parts within the sleeves becomes damaged, the defective part may readily be replaced.

Referring to FIGS. 3 and 5, the angled upper portions **33** of the pedestals support the table **21** somewhat forwardly of the lower portions **22**. This permits the chair-supporting arms **28** to extend angularly forwardly somewhat from a vertical plane through the sleeves **30** when they are in their forward positions. When the arms are rotated rearwardly, the chair-supporting sleeves **31** follow an arc passing through this plane, and maximum rearward movement of the chairs is obtained for the length of the arc traveled from the forward position to the rearward position.

A student sitting in a chair may easily adjust the distance between the chair back **26** and the desk **21** for his particular height merely by pushing his legs against the floor. When the student leaves the chair, the chair automatically swings forward, and he may easily walk between the backs of the chairs of one row and the front of the table of the next row.

The forward and rearward swingability of the chair also facilitates cleaning of the classroom. When the floor underneath the table is to be swept, mopped, or waxed, the janitor merely pushes the chair rearwardly.

A modified form of the invention is illustrated in FIGS. 17–20. Generally upwardly extending pedestal **122** includes a generally vertically extending lower portion **132** and an upper portion **133** extending forwardly and upwardly from the lower portion. A generally rectangular base plate **123** is secured to the pedestal and provided with screw openings **124**, and a pair of table-supporting brackets **134***a* and **134***b* are secured to the upper end of the pedestal. Each of the brackets are generally L-shaped in vertical cross-section and includes a generally horizontally extending flange **134***c*, each of which are provided with four screw openings **134***d*. By providing a pair of table-supporting brackets **134***a* and **134***b*, more screws may be used to secure the table to the pedestal and accessibility to the screw holes is greater.

Right- and left-hand chair-supporting arms **128***a* and **128***b*, respectively, similar to the arms **28***a* and **28***b* previously described also include generally vertically extending tubular arm-supporting sleeves **130** and chair-supporting tubular sleeves **131**.

Arm-supporting bracket **135** includes vertically spaced upper and lower flanges **136** and **137**, respectively, which are joined by forward and rearward connecting portions **138***a* and **138***b*, respectively. The flanges **136** and **137** are provided with openings **139***a*, **139***b*, **140***a*, and **140***b*, and the forward connecting portion **138***a* includes ears **141** which arse secured to the pedestal **122** by rivets or bolts **143** as hereinbefore described with respect to bracket **35** and pedestal **22**.

The tubular sleeves **130** of the arms **128***a* and **128***b* also receive the spirally wound coil spring and bearings heretofore described in conjunction with the sleeves **30**, and each arm **128***a* and **128***b* is rotatably mounted in the bracket **135** by a rod **154**, which may be seen in FIGS. 19 and 20. Each of the arms **128***a* and **128***b* include a single stop projection **158***a* and **158***b*, respectively, which are spaced vertically from each other.

The stop projections prevent excessive rearward rotation of the chair-supporting arms by engaging the forward connecting portion **138***a* of the bracket **135**. Referring to FIG. 19, the connecting portion **138***a* is provided with a generally V-shaped slot **160** having a pair of inclined sides **161** and **162**. The rearward connecting portion **138***b* similarly includes a generally V-shaped slot **163** having inclined sides **164** and **165** which engage the stop projection **158***a* and **158***b*, respectively, and limit the forward rotation of the chair-supporting arms.

As can be seen in FIG. 19, the rearward connecting portion **138***b* of the bracket **135** extends to a position adjacent the sleeves **130** of each of the chair-supporting arms, and the stop projections **158***a* and **158***b* are entirely enclosed within the bracket **135**, thereby eliminating the danger that the clothes or skin of the occupants of the chairs will be pinched. In FIG. 19, the right arm **128***a* is in the forward position with the projection **158***a* engaging the rearward connecting portion **138***b* and the left arm **128***b* is being maintained in the rearward position with its stop projection **158***b* engaging the forward connecting portion.

Each of the chair-supporting tubular sleeves **131** similarly receive a coil spring, disk, and bushings as hereinbefore described in conjunction with the sleeves **31**. The sleeves **131** differ in including an arcuately shaped swivel stop **166** which extends upwardly from the rear of the sleeve and which is designed to limit the rotation of the

chairs supported by the arms **128***a* and **128***b*. Seat-supporting base **167** (FIG. 17) includes a cover plate **168** which is adapted to be suitably secured to a chair, a generally cylindrically downwardly extending post **169** welded to the plate **168**, and a swivel cup **170** which is secured to the cover plate. Each of the swivel cups **170** includes a pair of outwardly extending wing-like projections **171** which are adapted to engage the swivel stop **166** on the sleeve **131**. Referring to FIG. 19, the seat-supporting base **167** carried by the arm **128***a* has been rotated to its maximum counterclockwise position and one of the wing-like projections **171***a* is engaging the swivel stop **166**. The chair may be rotated clockwise until the projection **171***b* engages the swivel stop. The degree of permissible rotation of the chairs may be changed as desired by varying the arcuate length of the swivel stop **166** or by changing the position of the wing-like projections **171**. Referring to FIG. 20, washer **172** may be interposed between the swivel cup **170** and the sleeve **131** to facilitate rotation of the chair.

Each rod **169** is provided with a longitudinally extending slot or keyway similar to the slot **84** provided in the rod **78** to operatively connect the rod **169** with the disks and spring received within sleeve **131** in the manner heretofore described. Disks similar to those illustrated in FIG. 15 may be used, but the camming shoulders which act as rotational stops may be eliminated since the rotation of the chairs is limited by swivel stops **166**.

While in the foregoing specification, we have set forth a detailed description of specific embodiments of our invention for the purpose of illustration, it is to be understood that many of the details hereingiven may be varied considerably by those skilled in the art.

We claim:

1. A chair assembly including:

a generally upwardly extending pedestal,

an elongated arm mounted on said pedestal and extending generally horizontally, said arm terminating in a generally vertically extending sleeve, said sleeve being provided with a central bore therethrough,

a chair rotatably supported on one end of said arm, said chair including an elongated downwardly extending post rotatably received by said sleeve,

a generally cylindrical coil spring interposed between said post and said sleeve and having upper and lower spring ends,

a first pair of upper and lower cam members within said sleeve,

the upper cam member of said first pair being positioned above said spring and being operatively connected to said post for rotational movement therewith and the lower cam member of said first pair being positioned below said spring and being operatively connected to said sleeve,

the upper cam member of said first pair being provided with a cam surface for engaging the upper end of said spring and the lower cam member of said first pair being provided with a cam surface for engaging the lower end of said spring when said chair is rotated in one direction whereby said spring resiliently biases said chair against rotation in said one direction,

a second pair of upper and lower cam members within said sleeve,

the upper cam member of said second pair being positioned above said spring and being operatively connected to said sleeve and the lower cam member of said second pair being positioned below said spring and being operatively connected to said post for rotational movement therewith,

the upper cam member of said first pair being provided with a cam surface for engaging the upper end of said spring and the lower cam of said second pair being provided with a cam surface for engaging the lower end of said spring when said chair is rotated in the other direction whereby said spring resiliently biases said chair against rotation in said other direction.

2. The chair assembly of claim **1** in which said post is provided with a longitudinally extending slot, the upper cam member of the first pair and the lower cam member of the second pair each comprising a generally annularly shaped disk provided with a radially inwardly extending key, said disks being received by said post and said keys being received by said post slot whereby said disks rotate with said post.

3. The chair assembly of claim **2** in which each of said disks are provided with a circumferentially extending recess in the outer periphery thereof, each recess terminating in a generally radially extending shoulder providing the cam surface for engaging one of the spring ends.

4. The chair assembly of claim **1** in which the upper cam member of the second pair and the lower cam member of the first pair each comprise a generally annularly shaped disk provided with a radially outwardly extending key, said disks being received by said post, each of said keys being received by a slot provided in said sleeve for preventing rotation of said disk with respect to said sleeve.

5. The chair assembly of claim **4** in which each of said disks are provided with a circumferentially extending recess in the outer periphery thereof, each recess terminating in a generally radially extending shoulder providing the cam surface for engaging one of the spring ends.

6. The chair assembly of claim **1** in which said post is provided with a longitudinally extending slot and said sleeve is provided with an upper slot and a lower slot,

the upper cam member of said first pair and the lower cam member of said second pair each comprising a generally annularly shaped disk received by said post and provided with a radially inwardly extending key, said inwardly extending keys being received by said post slot whereby said disks rotate with said post,

the upper cam member of said second pair and the lower cam member of said first pair each comprising a generally annularly shaped disk received by said post and provided with a radially outwardly extending key, the outwardly extending key of the second pair upper cam being received in the upper slot of said sleeve and the outwardly extending key of the first pair lower cam being received in the lower slot of said sleeve for preventing rotation of said second pair upper cam and first pair lower cam with respect to said sleeve.

7. The chair assembly of claim **1** in which the other end of said arm terminates in a second generally vertically extending sleeve, said second sleeve being provided with a central bore therethrough, bracket means on said pedestal rotatably supporting said second sleeve, said bracket means including an elongated rod received by said second sleeve, said rod being provided with a longitudinally extending slot, a second generally cylindrical coil spring interposed between said second sleeve and said rod and having a pair of spring ends, one of the ends of said second spring extending generally radially inwardly into the slot of said rod, the other of the ends of said second spring being operatively connected to said second sleeve for rotation therewith whereby said second spring resiliently biases said arm against rotation.

8. A chair assembly including:

an elongated generally upwardly extending pedestal, said pedestal including vertically spaced upper and lower flanges, each of said flanges being provided with a pair of openings, each of the openings in the upper flange being generally vertically aligned with an opening in the lower flange,

a pair of elongated generally horizontally extending chair-supporting arms, one end of each arm terminat-

ing in a generally vertically extending sleeve, the sleeve of each arm being positioned between said upper and lower flanges,

an elongated rod received by each sleeve and extending through upper and lower vertically aligned openings in said flanges, each rod being provided with a longitudinally extending slot, said rod being secured against rotation with respect to said flanges,

a generally cylindrical coil spring interposed between each rod and each sleeve and providing a pair of spring ends, one end of each spring extending radially inwardly into a rod slot, the other end of each spring being operatively connected to the sleeve for rotation therewith,

each of said arms being rotatable with respect to its associated rod and being resiliently biased against rotation by its associated spring,

and stop means on said sleeves cooperable with said pedestal for limiting the rotational movement of said arms.

9. The chair assembly of claim **8** including upper and lower bushings received by each sleeve above and below the spring, each of said bushings being provided with a circular bore therethrough, each of said rods being generally cylindrical and being received rotatably and relatively snugly by a pair of upper and lower bushings.

10. The chair assembly of claim **8** in which said pedestal includes a generally channel-shaped portion providing a pair of relatively flat side surfaces, said flanges being formed integrally with a connecting portion to provide an arm-supporting bracket, said bracket being received by a recess in said channel and secured therein, said stop means including a pair of circumferentially spaced generally radially outwardly extending studs on each of said sleeves, one of the studs of each sleeve being engageable with said bracket connecting portion and the other stud of each sleeve being engageable with one of the flat pedestal surfaces.

11. The chair assembly of claim **10** in which said bracket connecting portion is provided with a generally vertically extending recess having a pair of inclined sides, each of the sides of the recess extending generally radially with respect to one of said sleeves whereby substantial planar engagement is permitted between said bracket-engaging studs and said inclined sides.

12. In a chair assembly for rotatably supporting a chair:

a chair,

an elongated generally cylindrical post secured to said chair and extending downwardly therefrom, said post being provided with a longitudinally extending slot,

a tubular sleeve rotatably receiving said post, said sleeve being provided with vertically extending upper and lower slots therein,

a generally cylindrical coil spring interposed between said sleeve and said post and having upper and lower spring ends,

a first pair of generally annularly shaped upper and lower disks received by said post,

the upper disk of said first pair being positioned above said spring and including a radially inwardly extending key received by said post slot and the lower disk of said first pair being positioned below said spring and including a radially outwardly extending key received by said lower slot of said sleeve,

each of the disks of said first pair being provided with a circumferentially extending recess in the outer periphery thereof, each of said recesses terminating in a generally radially outwardly extending shoulder providing a cam surface,

the car surface of the upper disk of the first pair engaging the upper end of said spring when said chair is rotated in one direction and the cam surface of the lower disk of the first pair engaging the lower end of said spring whereby the upper portion of said spring is rotated with respect to the lower portion of said spring to resiliently bias said chair against rotation in said one direction,

a second pair of generally annularly shaped upper and lower disks received by said post,

the upper disk of said second pair being positioned above said spring and including a radially outwardly extending key received by the upper slot of said sleeve and the lower disk of said second pair being positioned below said spring and including a radially inwardly extending key received by said post slot,

each of the disks of said second pair being provided with a circumferentially extending recess in the outer periphery thereof, each of said recesses terminating in a generally radially outwardly extending shoulder providing a cam surface,

the cam surface of the lower disk of said second pair engaging the lower end of said spring when said chair is rotated in the other direction and the cam surface of the upper disk of said second pair engaging the upper end of said spring whereby the lower portion of said spring is rotated with respect to the upper portion of said spring to resiliently bias said chair against rotation in said other direction.

13. The structure of claim **12** including a pair of upper and lower bearings, said upper bearing being received by the upper end of said sleeve above said upper disks, said lower bearing being received by the lower end of said sleeve below said lower disks, each of said bearings being provided with a central bore therethrough, said post being rotatably and relatively snugly received by said bearings, said bearings being sized to prevent substantial vertical movement of said disks and said spring relative to said sleeve.

14. The structure of claim **12** in which the recesses of at least two of said disks terminate in a second generally radially outwardly extending shoulder, one of said second shoulders being engageable with a spring end after limited rotation of said chair in said one direction to prevent further rotation in said one direction, the other of said second shoulders being engageable with a spring end after limited rotation of said chair in the other direction to prevent further rotation in said other direction.

15. The structure of claim **12** in which said tubular sleeve includes an upwardly extending swivel stop, said post including a pair of generally radially outwardly extending stop projections, one of said stop projections being engageable with said swivel stop after limited rotational movement of said chair in one direction and the other of said stop projections being engageable with said swivel stop after limited rotational movement of said chair in the other direction.

16. The structure of claim **15** including a swivel cup received by said post, said swivel cup being generally cylindrical in horizontal cross-section and said stop projections extending from said swivel cup. said swivel stop being generally arcuately shaped and extending from said sleeve radially outwardly of said swivel cup.

17. A chair assembly including:

an elongated generally upwardly extending pedestal,

an arm-supporting bracket secured to said pedestal, said bracket including vertically spaced upper and lower flanges, each of said flanges being provided with a pair of openings, each of the openings in the upper flange being generally vertically aligned with an opening in the lower flange, a connecting portion extending between said flanges and spaced from said pedestal,

a pair of elongated generally horizontally extending chair-supporting arms, one end of each arm terminating in a generally vertically extending sleeve, the sleeve of each arm being positioned between said upper and lower flanges and including a stop projection,

an elongated rod received by each sleeve and extending through upper and lower vertically aligned openings in said flanges

each of said arms being rotatable with respect to said pedestal, the stop projection of each sleeve being engageable with said connecting portion to limit rotational movement of the associated arm.

18. The chair assembly of claim **17** in which said bracket includes a second connecting portion extending between said flanges and spaced from said first connecting portion, said stop projections also being engageable with said second connecting portion to limit rotational movement of said arms.

19. The chair assembly of claim **17** in which each of said connecting portions is provided with a generally V-shaped slot having inclined sides, the stop projection of each of said arms being positioned between an inclined side of each of said connecting portions and engageable therewith for limiting rotational movement of the arm,

said first connecting portion extending from adjacent the sleeve of one of said arms to adjacent the sleeve of the other of said arms, whereby said stop projections are substantially enclosed within said bracket.

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U.S. Cl. X.R.

297—349