An adjustable arm chair has a chair body including a stiff tub-shaped back portion, a stiff tub-shaped leg portion, and a flexible substantially flat seat portion connecting the back rest portion and the leg portion; and a support construction for the chair body for continuous adjustment of the back rest portion, the seat portion and the leg portion relative to one another and to the support construction, so that the chair can be tilted forwardly and rearwardly in a continuous stepless manner into any desirable rest or upright positions, when the user shifts his body weight in the chair, without requiring the provision of separate adjustment means of any kind.

4 Claims, 6 Drawing Figures
BACKGROUND OF THE INVENTION

The present invention relates generally to a chair, and more particularly to an upholstered arm chair having a chair body and support means.

It is already known in the art to provide arm chairs or the like, which can be tilted from a more or less upright position to a more or less inclined rest position and back again to an upright position by means of an adjustment system consisting of levers, bars, rod and/or the like. The construction of such an adjustment system naturally is difficult and expensive. In addition, such an adjustment system usually makes the chair bulky and clumsy.

SUMMARY OF THE INVENTION

It is, accordingly, an object of the present invention to provide an improved adjustable or tiltable chair, such as an upholstered arm chair or the like, which does not have the foregoing disadvantages.

More particularly it is an object of the present invention to provide a chair which can be tilted from a substantially upright position to a substantially inclined rest position in a continuous manner, without any steps and without any special separate adjusting means.

Still a further object of the present invention is to provide a chair which can be tilted from a substantially upright position to any inclined rest position in a continuous manner and raised again to said upright position, when the user shifts the weight of his body in the chair, backwardly and forwardly, respectively.

In pursuance of the foregoing objects, and others which will become apparent hereafter, a novel adjustable chair has been developed which, briefly stated, comprises a chair body including a back rest portion, a leg portion and a seat portion connecting the back rest portion and the leg portion, and support means to support the chair body for continuous adjustment of the back rest, seat and leg portions relative to one another and relative to the support means. The back rest portion and the leg portion can be made nonyielding and stiff while the seat portion is made flexible according to one currently preferred embodiment of the present invention.

The design of the novel chair, its chair body and its support means allows the user to adjust the chair from a substantially upright position to a more or less inclined rest position in a continuous stepless manner and vice versa, without any separate adjustment means and without any levers, rods or bar or the like. He only shifts or displaces his body weight forwardly or backwardly, e.g. by bending or stretching his legs or bending the upper portion of his body forward. He thus is able to select any stable intermediate position between the substantially upright and an extreme inclined rest position.

The back rest portion and the leg portion are preferably substantially tubular or trough-shaped, whereas the transverse cross-section of the seat portion is substantially flat. However, the shape of the seat portion in a direction intermediate the back rest portion and the leg portion preferably is part circular at least when the chair is not used. The length of the part-circular outline in this direction preferably is between approximately 2 and 8 cm.

RE EMBODIMENTS

The cimbodinents in the drawing will now be discussed. It will be seen that the adjustable arm chair

1. The chair body is preferably supported by the support means in one area between the seat portion and the leg portion and in another area in that region of the back portion which is adjacent the seat portion.

2. The chair body and the support means are preferably connected in the first-mentioned area by means of two brackets fastened to said area under the chair body, rotatable on a transversely extending shaft held by two forwardly disposed legs of the support means; and in the second area by means of a strap extending transversely under the chair body and normal to a line intermediate the back rest portion and the leg portion, and two arm rests, suspended from two studs, which are transversely spaced parts of the strap, and from two hand supports, which are integral parts of two rearwardly placed legs of the support means.

The arm rests are preferably made of a flexible material, leather, artificial leather, a textile fabric or the like. They preferably consist of endless, loop-shaped bands, suspended from the studs of the strap and from studs on the hand supports, respectively.

The brackets of the forwardly disposed connecting means may each consist of two angularly spaced bars and spacing means, such as a screw, extending through two bars, so that the frictional forces between the brackets and the shaft hold by the two forwardly disposed legs of the support means can be adjusted.

The contact points between the chair body and the two brackets, rotatable on the shaft, preferably are located rearwardly of a vertical plane which includes the axis of the shaft, so that the two brackets can pivot rearwardly about the shaft, when the chair is used and the user shifts his body weight forwardly.

The shaft holding the brackets may be secured on the two forwardly disposed legs of the support means by means of adapter bushes, and the brackets may be held in place by spacer sleeves on the shaft.

The chair body can be made of an ABS-polymerization product of the like. The thickness of the body chair can amount to between approximately 2.5 and 5 mm.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a side-elevational view of a chair according to the present invention;

FIG. 2 is a part-sectional exploded view of a detail of the chair in FIG. 1;

FIG. 3 is a cross-section of a detail of the chair in FIG. 1;

FIG. 4 is a cross-section of a further detail, taken on the line IV—IV of FIG. 1;

FIG. 5 is a fragmentary top view of a portion of the chair in FIG. 1;

FIG. 6 is a cross-section taken on line VI—VI of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The embodiments in the drawing will now be discussed. It will be seen that the adjustable arm chair

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(FIG. 1) comprises a support means 12 which is made of metal, such as extruded aluminum, or of other suitable materials, such as synthetic plastic materials or wood. The support means 12 can comprise a base 22, two forwardly disposed but rearwardly inclined legs 16 and two rearwardly disposed but forwardly inclined legs 18. Legs 18 are, as is evident from the drawing, longer than legs 16 and are provided with horizontally and forwardly disposed hand supports 20 which are integral parts of legs 18. The forward ends of hand supports 20 are shaped as two rings 24 (see especially FIG. 4), through which studs 26 are inserted. Arm rests 28 and 34 (FIGS. 1 and 5) run around studs 26 and between the two rings 24 respectively. The arm rests 28 and 34 preferably are flexibly, endless, loop-shaped bands, made of leather, artificial leather, a plastic material, a textile fabric, or the like. The free end of each leg 16 of support means 12 is shaped as a ring 42 with bore 44, in which bores 44 legs 16 hold end portions 46 of a tube-shaped shaft 48 (FIG. 2).

The chair of the present invention comprises, in addition to the support means, the chair body and the upholstering, two foot portions 22, two forward legs 16, two rear legs 18 and two hand supports 20, which elements are laterally disposed in relation to each other, respectively, along lines and planes normal to the drawing plane of FIG. 1. The chair body 14 is disposed between and supported by these element pairs, which will be discussed in more detail in the following.

Shaft 48 (FIG. 3) connects the end portions of the two legs 16. End portions 52 (FIG. 2) of shaft 48 are inserted in bores 44 of rings 42 and held by the legs 16 (FIG. 1). End portions 46 can for example be provided with two axially extending slits 50 (FIG. 2), so that end portions 46 can be expanded outwardly and pressed against the inner walls of bore 44. Adapter bushes 52 for each end portion 46 of shaft 48 are provided for this purpose. Adapter bushes 52 can for example have four axially extending equiangularly arranged slits 54. Adapter bushes 52 also have an inner bore with an inner thread 58 and a conical enlargement 59. When supporting means 12 and the connecting means between supporting means 12 and chair body 14 are assembled, adapter bushes 52 are inserted in the end portions 46 of shaft 48, and two screws 56 having conical heads are screwed into the threads 58 of adapter bushes 52, whereby portions 51 of the adapter bushes 52 are pressed outwardly and radially against the inner walls of end portions 46 of shaft 48, so that portions 55 of end portions 46 are pressed outwardly and substantially radially against the inner walls of bore 44, and so that shaft 48 is firmly held in the rings 42 of legs 16.

Chair body 14 can be made of an ABS-polymerization product, e.g., by a vacuum process within the skill of those conversant with the art. Other synthetic plastic materials, e.g., polyamides, can also be used for the production of the chair body, and other manufacturing or production processes, e.g., extrusion processes, can be resorted to. Suitable upholstering can be provided, fastened if so desired, to the chair body 14, as is indicated by a dotted line in FIG. 1. It extends along substantially the whole length of chair body 14. A support for the back of the neck can also be provided, which can be fastened to or suspended from the chair body itself, or to or from the upholstery.

Chair body 14 consists of one substantially nonyielding and stiff back rest portion 82, and one flexible, elastic seat portion 84. The three portions form the integral chair body 14. Seat portion 84 is the connecting link between back rest portion 80 and leg portion 82. Back rest portion 80 and leg portion 82 have, as is illustrated in FIG. 6, schematically and in cross-section, substantially the shape of a tub or trough with an arcuate shaped main part 81, laterally disposed ribs 83, and edge portions 85, which latter extend in a plane which is substantially normal to the plane of lateral ribs 83. The nonyielding and stiffness properties of back rest portion 80 and leg portion 82 are obtained mainly as a consequence of the arcuate or tub-shape of main part 81 of these portions 80 and 82. However, lateral ribs 83 contribute of course also to these properties. The upholstery can also contribute substantially to such properties of the chair body.

Seat portion 84 is shaped substantially as a part of a cylinder. A cross-section of seat portion 84 in a plane normal to the drawing plane of FIG. 1 will show that seat portion 84 is substantially flat along a line normal to a line intermediate the back rest portion 80 and leg portion 82. The stiff back rest portion 80 and the stiff leg portion 82 change into the flexible seat portion 84 in the areas 86 and 88 respectively, and seat portion 84 thus constitutes an elastic or flexible joint or link between the back rest and the leg portions. A slight arching of seat portion 84 in transverse direction is admissible in order to better hold the upholstery. The flexibility and elasticity is not substantially impaired by such a measure.

Chair body 14 is held by support means 12 in two areas. Strap 36 is arranged in the lower third region of back rest portion 80 (FIG. 5). It is extended along a substantially horizontal line normal to a line intermediate back rest portion 80 and leg portion 82 and encircles tub-shaped part 81 of back rest portion 80. Strap 36 can, as is illustrated in FIG. 5, be provided with projections 38 facing and fastened to part 81 on the outer wall of back rest portion 80, for instance with screws. Strap 36 is also provided with studs 30 on each of its lateral portions, as is depicted in FIG. 5. Studs 30 can be integral parts of strap 36 and be extended along a line normal to a line intermediate the back rest portion 80 and the leg portion 82.

The flexible arm rests 28 and 34, described above, which consist of endless loop-shaped bands, the forward end portions of which run around studs 26 and are held by these studs, also run around and held by studs 30 of strap 36 (the rearward end portions of the bands). Thus, arm rests 28 and 34 are holding the strap. Studs 30 are suspended or inserted in the rearwardly extended loops of arm rests 28 and 34 for this purpose. To prevent the loops from sliding off studs 30, the latter can be provided with heads having a larger diameter than the diameter of the rest of the stud body and being placed on the front end portions of the studs. Other means, e.g., suitable stops, can of course be used for this purpose.

The second support area for chair body 14 is located in the region between seat portion 84 and leg portion 82. Body portion 70 of chair body 14 (FIG. 3) is provided with a downwardly directed tub-shaped cavity 72 in this area. Shaft 48 holds two laterally disposed brackets 60, which preferably can be made of an elastic synthetic material, although other materials such as metals and wood can be used.
FIG. 3 is a cross-section of one of brackets 60 showing a bore 68 extending in the same direction as the direction of shaft 48. Bore 68 surrounds shaft 48. Bracket 60 consists of two bars 62 and 64, angularly separated from each other by a slit 65. A bore 66 extends in a direction normal to the direction of bore 68 and through the two bars 62 and 64. The two brackets 60 are, as illustrated in FIGS. 1 and 3, fastened by screws to chair body 14 or rather to the downwardly directed tub-shaped cavity 72 of chair body 14. Triangular blocks 74 are used to fasten brackets 60 to the inner wall of cavity 72. Blocks 74 can preferably be made of the same material as brackets 60 and have a width which is the same as the width of brackets 60, e.g. between approximately 4 and 6 cm. This is of course not a necessary dimensional limitation; brackets 60 and blocks 74 can have any desired width in lateral direction.

FIG. 3 shows how block 74 is fastened to legs 62 and 64 of bracket 60 by means of screws 76 and 78 through the body of cavity 72. The profile of block 74 preferably is the same as the profile of cavity 72 to conform to the latter so that as large as possible bearing area between block 74 and the body of cavity 72 can be obtained.

FIG. 1 shows that the center line of brackets 60 is tilted rearwardly and counterclockwise at an angle \( \alpha \) relative to a vertical line through the axis of shaft 48. This angle varies as the position of the chair body varies. The arrangement is however so balanced that the center line of brackets 60 is always tilted rearwardly, never forwardly, for all possible positions of the chair body. Angle \( \alpha \) can for instance be 30° when the chair is not used.

The mode of operation of the novel chair is as follows: If a person positions himself in the chair in a normal sitting position, leg portion 82 of the chair body will extend forwardly in a substantial horizontal direction, whereas back rest portion 80 will be inclined rearwardly, but only to a small degree (FIG. 1) and support the back of the user. The arms of the user are supported by flexible arm rests 28 and 34. The steeper the sitting position is, the larger is the angle \( \alpha \).

If the user now leans rearwardly and/or more or less straightens out his legs at the same time, the back rest portion 80 will tilt in a rearward direction, and the brackets will turn in a clockwise manner. The angle \( \alpha \) between the center line of brackets 60 and the vertical line through the axis of shaft 48 will grow smaller. Leg portion 82 will be tilted more or less downwardly from its previous substantially horizontal position. Seat portion 84 which has a part-circular outline in the upright position will be flatter when the chair body is thus tilted rearwardly and counterclockwise. Studs 30 of strap 36 which supports back rest portion 80 follow, when back rest portion 80 is tilted rearwardly and downwardly, a circular line around a point 90, which is the point of intersection between legs 18 and hand supports 20, respectively. Arm rests 28 and 34 remain stretched but are now stretched downwardly from point 90.

When the user raises his body forwardly and/or bends his legs, back rest portion 80 returns to a more or less upright or steep position, whereas leg portion 82 returns to a more or less horizontal position from its downwardly inclined position. When the user raises his body from a tilted rest position to an upright sitting position, brackets 60 rotate rearwardly and downwardly around shaft 48, namely counterclockwise, in FIG. 1.

All positions of the chair body 14, between an extreme upright position and an extreme rest position are stable. The tub-shaped design of back rest portion 80 and leg portion 82 gives the portions the necessary stiffness and nonyielding characteristics, whereas seat portion 84 functions as a flexible joint or link between the two stiff and nonyielding portions 80 and 82 due to its substantially flat cross-section in a plane normal to a line intermediate back rest portion 80 and leg portion 82.

The various possible upright, rest and lying positions can be reached by a simple shifting or displacement of the body weight of the user, e.g. by straightening out, pulling up or bending his legs and/or by more or less strong bending or inclination of the upper portion of his body.

The following dimensions for the various elements of the support means of the chair of the present invention have proven to be suitable for a well-balanced arrangement, although they are to be considered as being exemplary only. The center of shaft 48 has been taken as a reference point.

The point of intersection between leg 18 and hand support 20, namely point 90, around which arm rests 28 and 34 can rotate, located for instance between approximately 30 and 35 cm over the reference point and between approximately 5 and 8 cm behind the reference point. The center point of stands 30 of strap 36 is located, when the chair is not used, between approximately 23 and 28 cm over the reference point, whereas the length of arm rests 28 and 34 between point 90 and the center point of studs 30 is between approximately 30 and 33 cm. The length of the flexible seat portion 84 along its outer curvature, is between approximately 12 and 18 cm, preferably 15 cm, when the chair is used, whereas it is between 12 and 15 cm, when the chair is not used.

The larger the angle between the bars 62 and 64 of brackets 60 is, the more braking action between the chair body and the shaft of the support means can be achieved. Thus, the ease or difficulty with which the chair body can be tilted or lifted into various positions can be readily adjusted by increasing or decreasing the angle between bars 62 and 64 of brackets 60 by means of screws in bores 66.

The chair of the present invention can be tilted or lifted in a continuous stepless manner into any of the rest or upright positions if the user shifts or displaces his body weight in various ways and no separate adjustment means of any sort are required.

While the invention has been illustrated and described as embodied in an adjustable arm chair with upholstery, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that from the standpoint of prior art fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims.
1. A chair, especially an armchair, comprising a chair body including a rigid backrest portion, a rigid leg portion, and a flexible seat portion connecting said backrest portion and said leg portion so that said backrest portion and said leg portion are pivotable forward and backward about and with reference to said seat portion, and support means including rearward legs and supporting said chair body for continuous adjustment of the position of said portions relative to one another and to said support means, at the will of a user, said support means comprising connecting means between said chair body and said support means, in one area between said seat portion and said leg portion and in another area in that region of said back rest portion which is adjacent said seat portion, said connecting means in said other area comprising a strap extending in a direction substantially normal to a line intermediate said back rest and leg portion, two laterally disposed studs on said strap extending in a direction substantially normal to said line, and two arm rests, said arm rests connecting said rearward legs and said studs, respectively.

2. A chair as defined in claim 1, wherein said rearward legs are provided with hand supports, to which said arm rests are connected.

3. A chair as defined in claim 1, wherein said arm rests consist of flexible, endless, loop-shaped bands, made of a material selected from the group composed of leather, artificial leather, and textile fabrics.

4. A chair as defined in claim 3, wherein said bands are suspended from said studs of said strap and said hand supports of said rearward legs, respectively.