METHOD OF MAKING A CHAIR GLIDE

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ABSTRACT OF THE DISCLOSURE

A chair glide in which the swivel retainer has outwardly-flared legs which are fully embedded in a rubber cushion, the outer diameter of the retainer at the leg ends being greater than the inner diameter of the preformed base of the glide, whereby the user may not remove the base from the retainer. The disclosure further relates to a method of manufacturing the glide by pressing the swivel retainer downwardly into the rubber cushion to provide a cushion-cutting and leg-flaring operation which is followed by a surprising rebound action as soon as the pressure is relieved.

BACKGROUND OF THE INVENTION

Field of the invention

This invention relates to the field of chair glides adapted to be mounted on the tubular lower ends of chairs such as are employed in school classrooms, restaurants and numerous other places. More particularly, the field relates to such chair glides of the swivel type and incorporating preformed bases which receive rubber cushioning means.

Description of the prior art

In numerous areas, for example in school classrooms, the problem of noise generation by the moving of chairs is a major one. This noise generation has been minimized by providing a rubber cushion between the preformed base of each chair glide and the portion of the glide which mounts on the chair leg. Although such rubber cushions have minimized the sound problem, they have created an additional problem in that they have not been sufficiently effective in maintaining the preformed base and the mounting element in assembled relationship relative to each other. It is common for a student, for example, to accidentally or intentionally cause the base to separate from the mounting means which attaches the glide to the leg. This may be done by placing one or both feet on the peripheral regions of the base and then lifting or tilting the chair in such manner that a downward pressure is created on the base to separate the same from the cushion therefor. Another manner in which the chair glides become disassembled is that they are left supported on floor surfaces whereon liquid wax has been applied and then allowed to dry. The wax provides an adhesive action which results in separation of the bases when the chairs are moved subsequent to drying of the wax.

The above discussion relates to glides incorporating preformed bases, by which is meant bases which are completely manufactured prior to assembly thereof with the other components of the glide. Such bases are heavy-gauge, polished, strong, and otherwise highly satisfactory in every respect. In some prior-art glides, the bases are not preformed but instead are bent over the cushion and over a washer during the assembly operation. Such bases are far less satisfactory than are the preformed bases of the type employed herein.

SUMMARY OF THE INVENTION

Applicants have discovered that an economical, competitively-priced and commercially satisfactory chair glide may be manufactured in such manner that a student or other person may not remove the preformed base from the remainder of the glide. This is accomplished by relating the swivel retainer and the preformed base in such manner that extreme downward pressure on the retainer will result in outward flaring of the lower regions thereof until the diameter of the retainer is sufficiently great to preclude removal of the base. In addition, the downward pressure is adapted to effect cutting of portions of the rubber cushion, and to compress the rubber in such manner that the swivel retainer is shifted upwardly into isolated relationship relative to the base after completion of the forming operation. The result is the manufacture, in a short period of time, of a fully-cushioned, high-quality chair glide which is not subject to inadvertent disassembly or even intentional disassembly by a student or other person.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a perspective view of a chair glide constructed in accordance with the present invention, an associated chair leg being indicated in phantom lines;

FIGURE 2 is a side elevation of the glide;

FIGURE 3 is an exploded side elevation thereof, showing the components as they exist prior to the assembly operation;

FIGURE 4 is a sectional view on line 4—4 of FIGURE 2, showing the fully completed and assembled glide;

FIGURE 5 is an enlarged sectional view corresponding to the lower portion of FIGURE 4 but illustrating the shapes and positions of the parts at the beginning of the assembly operation;

FIGURE 6 corresponds to FIGURE 5 but shows the shapes and positions of the parts during an intermediate portion of the assembly operation;

FIGURE 7 illustrates the shapes and positions of the parts at the end of the assembly operation, after rebound of the cushion has occurred; and

FIGURE 8 is a fragmentary transverse sectional view on line 8—8 of FIGURE 6.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Stated generally, the chair glide of the invention comprises a swivel element, in the form of a cup or ferrule 10, adapted to be mounted on a tubular chair leg which is indicated at 11. Element 10 seats in swivel relationship upon a swivel retainer 12, the latter in turn resting upon and being cushioned by a rubber cushion element 13. The rubber cushion, and the lower regions of the swivel retainer 12, are mounted in a preformed base 14 adapted to rest upon the underlying floor, the relationship being such that the swivel retainer and cushion may not be disassembled from the base except by use of tools such as a hacksaw, etc. A rivet or other fastener element 15 extends through the central region of cushion 13 and up into the ferrule 10, thereby cooperating with the cushion and the swivel retainer 12 in maintaining the entire glide assembly in assembled relationship.

Swivel element 10 may be conventional, being indicated as having a cylindrical or tubular body and a re-entrant spherical bottom, the latter seating rotatably upon the corresponding spherical upper end of the swivel retainer 12. The bottom wall of element 10 is provided with a central opening or port to receive the upper end of rivet 15. Suitable spring means are provided to associate the swivel element or ferrule 10 with chair leg 11. In the illustrated embodiment, the spring means is a tubular...
spring 17 having suitable toothed portions adapted to bite into the chair leg. In another common construction, a generally rectangular spring is mounted at the upper end of the rivet 15.

The swivel retainer 12 is an extremely important feature of the present invention. It is an open-bottomed hollow element having a generally cylindrical neck portion 18 which extends downwardly from the above-indicated spherical seat for the bottom wall of ferrule 10. Neck portion 18 is of relatively large diameter of which substantially larger than that of the shank of rivet 15, merges at its lower end with a downwardly-divergent conical body portion 19 which seats on rubber cushion 13.

Formed integrally at the large-diameter lower end of conical body portion 19 is a generally cylindrical skirt portion 20, such portion having a diameter substantially smaller than that of the radially adjacent region of base 14. A plurality of short legs or feet 21 are formed about the lower edge of skirt portion 20, preferably in equally-spaced relationship as indicated in FIGURES 3 and 8.

The swivel retainer 12 is initially formed in such manner that, as best shown in FIGURE 5, the legs or feet 21 incline or flare outwardly (that is to say, diverge downwardly) relative to skirt 20 but at a relatively small angle. Such angle of divergence is sufficiently small that there is ample room for the legs or feet 21 to be inserted downwardly into base 14. The angle is also sufficiently small that the rubber cushion 13 will be cut by each leg as the swivel retainer is pressed downwardly.

The initial divergence of the legs is sufficiently great that downward shifting of the swivel retainer 12 into contact with base 14 will result in outward bending of the legs as shown in FIGURE 6. Such outward bending occurs despite the fact that, in the illustrated embodiment, the lower interior surface of base 14 is horizontal and flat (radial to the axis of the glide). It is emphasized, however, that it is within the scope of the invention to provide suitable cam means at the lower interior surface of base such as the rubber cushion 13 for gear arrangement whether or not such legs are initially flared or divergent. It is pointed out that the section 20 need not be absolutely cylindrical but can have a downwardly-divergent flare, for example.

The rubber cushion element 13 is illustrated in FIGURES 3 and 5 in its molded condition, prior to application of pressure thereto. As is there illustrated, cushion 13 has a generally frusto-conical body portion at the upper region thereof and which is disposed beneath the conical portion 19 of swivel retainer 12. Preferably, the conical wall of the cushion body is parallel to the conical portion 19 and is lower region a radially outwardly extending flange 22 which corresponds to and seats within a peripheral groove in the preformed base 14.

At the junction of the frusto-conical body with the radial flange, cushion 13 is formed with an upwardly extending annular bead 23 the outer surface of which rests against the inner edge surface of an upper portion of base 14. Defined between bead 23 and the adjacent region of the cushion, at the junction between the frustoconical cushion portion and the flange portion 22, in an annular groove 24 the diameter of which is such that the legs or feet 21 may be received therein as illustrated in FIGURE 5.

Cushion 13 has a central passage 26 formed axially herein for reception of the shank of rivet 15. The diameters of such passage and of the rivet shank correspond to each other. In addition, cushion 13 is provided at the lower portion thereof with a recess or opening adapted to receive the head of rivet 15.

The distance between the adjacent surfaces of conical retainer portion 19 and the frustoconical portion of cushion 13, when the parts are in the initial positions of FIGURE 5, is substantially less than the distance between legs 21 and the adjacent radial or bottom surface 12 of base 14. It follows that during downward shifting of the swivel retainer 12 from the position of FIGURE 5 to that of FIGURE 6, and farther, a very substantial compressive force will be exerted against the cushion 13 to cause extrusion and flow of rubber as will be described hereinafter.

The base element 14 is a disc which lies in a plane perpendicular to the common axis of elements 12 and 13. Such disc is preformed to have an upturned and inwardly-bent edge portion 27 which terminates in an interior edge 28. The edge portion 27 is rounded, and defines the above-mentioned annular groove, which receives cushion flange 22. The interior edge 28 has a diameter which is substantially greater than the distance between diametrically-opposite legs 21 when such legs are in their initial conditions illustrated in FIGURE 5. As indicated above, the diameter of interior edge 28 corresponds to the outer diameter of base 23.

The rivet 15 extends upwardly through passage 26 in cushion 13 and through the bottom wall of swivel element or ferrule 10. The upper end of the rivet is flared over such bottom swivel wall as indicated at 29 in FIGURE 4.

As a specific example, and which is given by way of illustration only and not limitation, let it be assumed that a particular glide assembly has a base 14 which is 1/4 inches in diameter. Such a base may be preformed of steel the thickness of which is 0.050 inch, and which is nickel plated and case hardened. Each of the elements 10 and 12 may be formed of nickel-plated steel 0.025 inch in thickness. The diameter of the rivet may be 3/8 inch, and the distance from the upper edge of ferrule 10 to the lower surface of base 15 may be 1/8 inches.

DESCRIPTION OF THE METHOD OF ASSEMBLY

As the first step in the method of assembly, the rivet 15 is inserted upwardly through the central passage 26 in rubber cushion 13. Thereafter, the flange 22 of the cushion is inserted downwardly into the groove formed by the upturned edge 27 of preformed base 14. Such insertion of flange 22 into the base is achieved easily, by inserting one side thereof and then progressively introducing the remainder thereof throughout the circumference of the circle.

The legs 21 of swivel retainer 12 are then positioned, as shown in FIGURE 5, in the annular groove 24 in cushion 13. The assembly is then placed in a press, such press having a moving element which is indicated schematically at 31 in FIGURES 5 and 6. The element 31 is adapted to press downwardly against the swivel retainer 12 to force such retainer 12 into base 14, the latter resting on a stationary support surface (not shown). The pressure exerted by element 31 is high, on the order of thousands of pounds per square inch.

The press element 31 is then shifted downwardly to force swivel retainer 12 from the position of FIGURE 5 to that of FIGURE 6. This causes legs 21 of the retainer 12 to cut through the rubber cushion 13 and thereby come into contact with the upper or interior surface 32 of the radial bottom base wall. As soon as the surface 32 is engaged by the lower ends of legs 21, and due to the above-indicated initial outward flaring of such legs, continued downward movement of retainer 12 bends the legs 21 outwardly. FIGURE 6 denotes the condition of bend at an intermediate portion shown FIGURE 5. Such outward bend will fail. The distance between the lower ends of diametrically-opposite legs 21 is, as shown in FIGURE 7, caused to be greater than the diameter of interior edge 28 of base 14.

The rubber cushion 13 remains intact or uncut at the notches (numbered 33 in FIGURES 3 and 8) which are present between the circumferentially-spaced legs 21.
The flow or extrusion of rubber 13 resulting from downward shifting of swivel retainer 12 causes upward flow of rubber through the space between the edge 28 and the adjacent skirt of retainer 12. The rubber thus extruded, and which is indicated at 34 in FIGURE 6, has a somewhat fluted pattern. The point of greatest flow of rubber is above the notches 33.

After the press element 31 has moved downwardly sufficiently far to bend the legs outwardly to the positions shown in FIGURE 7, the element 31 is lifted upwardly to relieve the pressure. The compressed rubber 13 beneath retainer 12 then rebounds or expands, and forces the retainer upwardly to the position shown in FIGURES 4 and 7. This causes the legs 21 to be pulled part of the way out of the cuts formed thereby in the rubber 13, two of such cuts being indicated at 35 in FIGURE 7. As above noted, the cuts 35 are registered with the legs 21, there being no cuts at the rubber portions within notches 33.

The rebound or expansion of the rubber beneath retainer 12 not only lifts such retainer but also operates to draw the portion 34 (FIGURE 6) of the rubber downwardly into the radial gap between edge 28 and retainer skirt 20, the annular bead 23 then being re-formed generally as indicated in FIGURES 5 and 7. Such bead, as shown in FIGURE 7 between parallel solid surfaces, and effectively separates the retainer from the base.

It is one of the surprising features of the invention that the rubber flows beneath the lower (outer) ends of legs 21 and, as shown in FIGURE 7, upon removal of the press pressure. Accordingly, the cuts 35 are spaced radially inwardly from the extreme outer ends of the legs. Therefore, the swivel retainer 12 is fully supported by means of the rubber which, in turn, is supported by the base 14. The rubber isolation of element 12 from base 14 is thus maintained despite the fact that relatively heavy loads may be imposed on the chair leg 11 with which the glide is associated.

The flow (during rebound) of rubber beneath the leg ends, to isolate such legs from the base, is aided by the unsevered rubber regions which are present within and adjacent notches 33.

During rebound of the rubber after release of the pressure exerted by the press, the compressed cushion rubber lifts the swivel retainer 12 upwardly as previously noted, but cannot lift such retainer upwardly to the initial position shown in FIGURE 5. Instead, the retainer is only lifted to the position of FIGURE 7, further lifting being prevented by the interaction between the outwardly-bent legs 21, the base portion 27 and the cushion flange material 22 interposed therebetween. Because of the resulting confined relationship, the rubber cushion remains under a substantial amount of compression even after the press pressure is released.

The described pressing step is discontinued while the retainer edges or walls defining notches 33 are spaced from base bottom wall 32, so that cutting of the rubber between such notches and wall 32 is prevented as indicated above. The legs 21, when in the final bent positions of FIGURE 7, are inclined downwardly and downwardly divergent.

The result of the above-indicated method is a fully-cushioned chair glide assembly wherein all portions of the swivel retainer 12 are separated from the preformed base 14 by portions of the rubber 13. The requisite sound deadening is thereby achieved, yet the problem of separation of the base from the mounting elements therefore is fully solved.

After completion of the press-assembly operation, it is a simple matter to mount the swivel element or ferrule 10 over the upwardly-extending shank of rivet 15, and then complete the riveting operation by forcing the end region 29 as shown in FIGURE 4.

The resulting construction will pivot through a large angle, in excess of 30 degrees, and as required by the inclined condition of a particular leg 11 on which the chair glide is mounted. It is to be understood that the chair glide is readily mounted on the tubular leg 11 by merely inserting the leg downwardly into the toothed spring 17.

The term "rubber," as employed in the specification and claims, comprehends various natural and synthetic rubbers as well as equivalent plastic substances. The rubber is sufficiently soft to flow and extrude as stated above.

The foregoing detailed description is to be clearly understood as given by way of illustration and example only, the spirit and scope of this invention being limited solely by the appended claims.

We claim:

1. A method of manufacturing a chair glide, which comprises:
   providing a preformed base having a bottom wall and also having an upturned and inwardly-extending edge portion,
   mounting a rubber cushion in said base, disposing on said cushion a retainer having a lower portion adapted in response to downward pressing on said retainer to engage said bottom wall and bend outwardly to thereby increase the diameter of said lower portion,
   pressing said retainer downwardly into said base to cause said lower portion to pierce and compress a portion of said cushion and then engage said bottom wall and bend outwardly to thereby substantially increase the diameter of said lower portion and minimize the likelihood of removal of said base from said retainer, and
   releasing the pressure on said retainer to thereby permit said compressed cushion to lift said retainer until said lower portion thereof is out of contact with said bottom wall and thereby effect isolation of said base from said retainer by said cushion.

2. The invention as claimed in claim 1, in which said cushion is provided in said base including between said edge portion and said bottom wall, in which said lower retainer portion is shaped to cut through said cushion in response to said downward pressing, and in which said bending step is continued until the chamber of said lower portion is at least on the order of the inner diameter of said edge portion.

3. The invention as claimed in claim 1, in which said method further comprises the step of providing said retainer in the form of an open-bottomed element the capacity of which is much less than the adjacent volume of said cushion, whereby said cushion is compressed and partially extruded by said retainer when said retainer is pressed downwardly into said base.

4. The invention as claimed in claim 1, in which said method further comprises providing a retainer which is sufficiently large in diameter, and pressing said retainer downwardly sufficiently far, that said lower retainer portion is bent outwardly until the diameter thereof is greater than the inner diameter of said inwardly-extending edge portion of said base.

5. The invention as claimed in claim 1, in which said method further comprises providing said retainer in the form of an open-bottomed hollow element the lower portion of which is formed by a plurality of circumferentially-spaced legs separated by notches, and in which said pressing step is discontinued while the edge walls of said retainer at said notches are spaced from said bottom wall of said base whereby to prevent cutting of the cushion regions between said notches and said bottom wall, said uncushion regions aiding in causing flow of rubber under the ends of said legs after the pressing pressure is removed.

6. The invention as claimed in claim 5, in which said method further comprises continuing the pressing step until the ends of diametrically-opposite ones of said legs are spaced from each other a distance greater than the inner diameter of said inwardly-extending edge portion of said base, said leg ends being between said inwardly-
extending edge portion and said bottom wall, said legs and said edge portion cooperating in maintaining said cushion under compression after the pressing step is discontinued.

7. The invention as claimed in claim 1, in which said method further comprises providing said retainer in the form of an open-bottomed hollow element the lower portion of which is formed by a plurality of circumferentially-spaced legs, said legs being initially outwardly flared a small amount such that downward pressing of said legs against said bottom wall of said base will result in further outward flaring of said legs.

8. The invention as claimed in claim 1, in which said method comprises providing said cushion in a shape and size which substantially completely fills said base prior to initiation of said pressing step.

9. The invention as claimed in claim 1, in which said method further comprises mounting a swivel element in swivel relationship on said retainer and adapted to connect the glide to a chair leg, said mounting being effected by extending a rivet upwardly through said cushion and through said retainer.

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