July 14, 1964 H. ARENSON 3,140,506

FURNITURE SUPPORT ROLLER

Filed Dec. 4, 1961 2 Sheets-Sheet 1

Fig. 1.

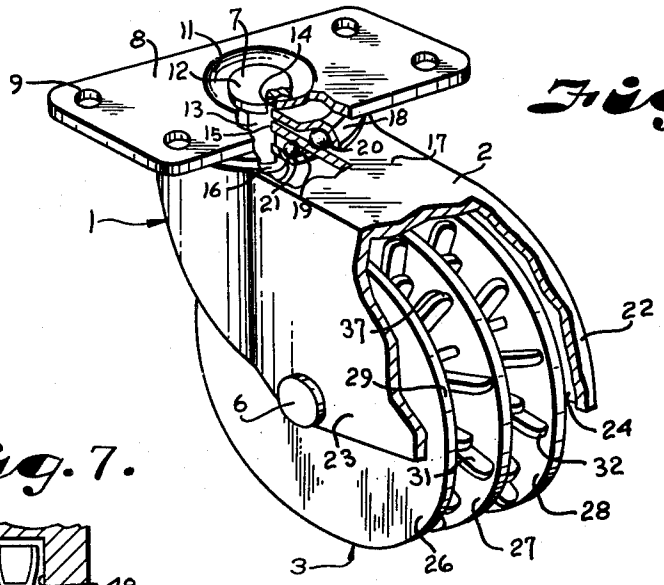


Fig. 7.

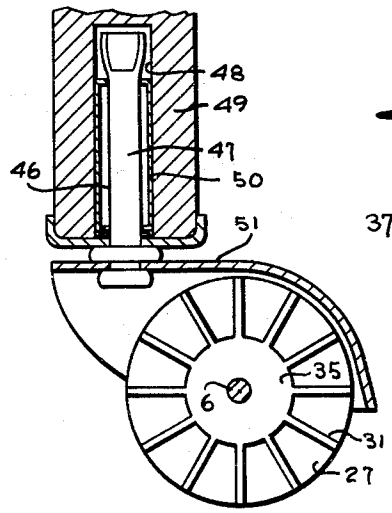


Fig. 6.

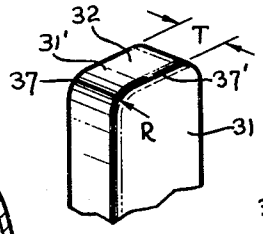


Fig. 2.

INVENTOR.
HERBERT ARENSON
BY
Fishburn and Gold
ATTORNEYS

July 14, 1964 H. ARENSON 3,140,506

FURNITURE SUPPORT ROLLER

Filed Dec. 4, 1961 2 Sheets-Sheet 2

Fig. 3.

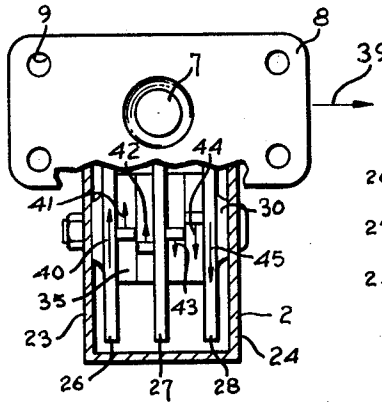


Fig. 4.

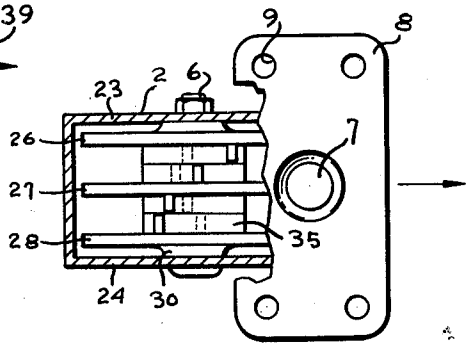


Fig. 5.

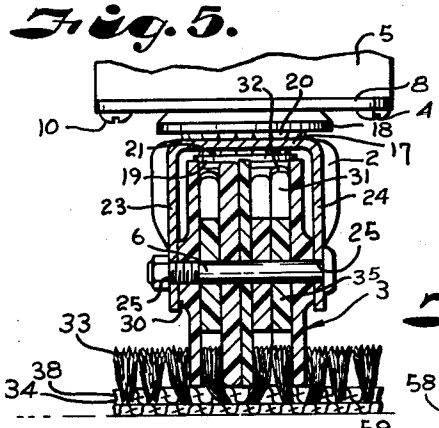


Fig. 8.

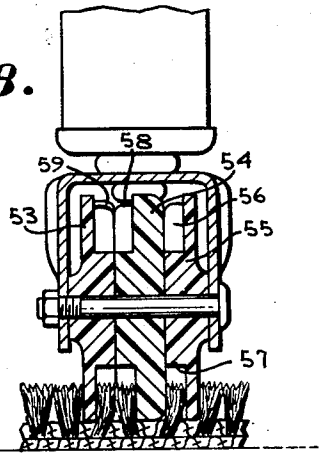


Fig. 10.

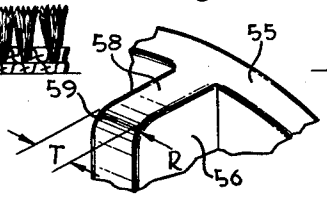


Fig. 9.

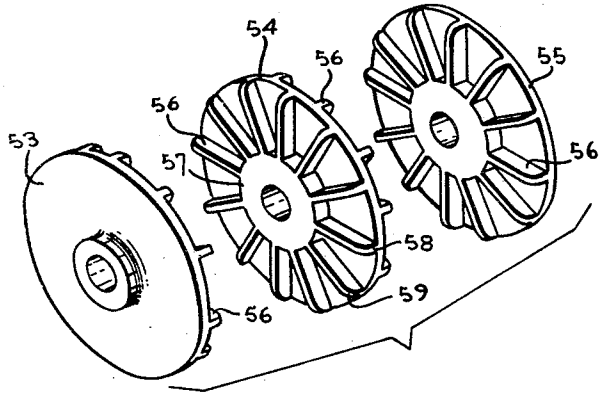
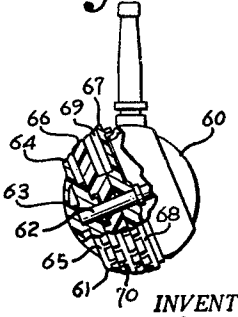


Fig. 11.



INVENTOR.
HERBERT ARENSON
BY
Fishburn and Gold
ATTORNEYS

United States Patent Office 3,140,506 Patented July 14, 1964

3,140,506

FURNITURE SUPPORT ROLLER

Herbert Arenson, 1630 Oakland, Overland Park, Kans.

Filed Dec. 4, 1961, Ser. No. 156,897
9 Claims. (Cl. 16—47)

This invention relates to furniture supports interposed between the legs or other bottom surfaces of furniture and the furniture-supporting floor surfaces, and more particularly to a roller structure for movably supporting furniture and like articles.

It is common practice in movable furniture and the like articles to provide rollers or casters between legs or other bottom surfaces of the articles and the supporting floor surfaces. Such rollers have been made of rubber, plastic or metal and usually have a generally cylindrical periphery. Also, such rollers are usually of substantial width in order to meet general requirements pertaining to distribution of the load to an area of floor material engaged thereby. When such rollers support furniture and like articles on pile-surfaced floor covering and remain stationary for a period of time and are then moved, the pile fibers of the pile-surfaced floor covering that were engaged by the rollers remain depressed, causing an unsightly condition. When the furniture article is frequently moved, and particularly with casters, movement causing swiveling or turning of the casters causes portions of the periphery of the roller engaging the pile fibers to slide thereon, resulting in wear and, in some instances, pulling or severing of such pile fibers.

The principal objects of the present invention are to provide a roller structure adapted to support furniture or other articles on either pile-surfaced floor covering or smooth surfaces that eliminates the forming of large depressed areas of pile fibers and damage to such fibers upon movement of the furniture; to provide such a roller structure with spaced floor covering engaging portions which cooperate to support loads on pile-surfaced floor covering and that are movable over smooth surfaced floor covering without marking same; to provide such a structure having relatively rotatable portions adapted to engage floor covering surfaces; to provide a supporting structure such as a caster having a roller with a plurality of spaced relatively thin cylindrical portions independently rotatable with a plurality of circumferentially spaced projections between the discs and having rounded generally blunt-tipped ends substantially at the peripheries of the discs with the projections adapted to separate and pass between the pile fibers of a pile-surfaced floor covering and bear upon the backing thereof; to provide such a structure with spaced projections having ends shaped to release any engagement with loops of carpet pile as the roller moves relative thereto; to provide such a structure wherein the roller portions are each independently rotatable for rolling and turning movement without sliding thereof on the pile fibers of the floor covering; to provide such a structure wherein the roller has independently rotatable members with peripheral portions which have differential motion upon turning of the roller about a vertical axis; and to provide a roller and/or caster structure for supporting furniture and the like on floor surfaces and covering that is economical to manufacture, durable in use, providing adequate load distribution with a minimum of depression and wear of pile fibers of pile-surfaced floor coverings.

Other objects and advantages of this invention will become apparent from the following description taken in connection with the accompanying drawings wherein are set forth by way of illustration and example certain embodiments of this invention.

FIG. 1 is a perspective view of a caster structure embodying the features of the present invention with portions broken away to illustrate the roller sections.

FIG. 2 is a disassembled perspective view of the roller sections.

FIG. 3 is a plan view of the caster with portions of the housing broken away and single projections of the projection members illustrating the relative position thereof.

FIG. 4 is a plan view similar to FIG. 3 showing the relative position of the projection members therein after the caster is swiveled through 90 degrees.

FIG. 5 is a vertical sectional view through the axis of the caster roller structure in furniture-supporting relation on a pile-surfaced floor covering.

FIG. 6 is an enlarged perspective view of a free end portion of a projection member.

FIG. 7 is a transverse sectional view through the caster roller with a modified form of swivel mounting on a furniture leg.

FIG. 8 is a vertical sectional view through a caster having a modified form of roller sections.

FIG. 9 is a disassembled perspective view of said modified form of roller sections.

FIG. 10 is an enlarged partial perspective view of a projection member.

FIG. 11 is an elevational view of a further modified form of caster with portions broken away to show the roller mounting.

Referring more in detail to the drawings:

The reference numeral **1** generally designates a support for movably supporting an article such as furniture and the like and transfer the load thereof over a given area to a floor or floor covering. In the form of the invention illustrated in FIGS. 1 to 6 inclusive, there is a body member or carrier **2** in the form of an open bottom housing on which is mounted a roller structure **3** with the lower portion thereof extending below the carrier and adapted to engage a floor or floor covering with portions of the roller structure having circumferentially spaced portions for spaced engagement with the floor or floor covering. The carrier **2** is adapted to be secured to the leg or bottom surface **4** of an article of furniture **5** and the like.

In the structure illustrated, the support **1** is in the form of a caster wherein the roller structure **3** is rotatably mounted on the carrier by an axle **6**, the axis of which extends transversely of the carrier, with the carrier adapted to be secured to the bottom surface **4** of an article of furniture **5** by a swivel connection **7**, the axis of which is spaced laterally from the axis of the axle **6** to provide caster action. The axis of the swivel connection **7** in the form of the invention illustrated in FIGS. 1 to 6 is generally perpendicular thereto, as for example, the axle **6** is on a horizontal axis and the axis of the swivel connection **7** is on a vertical axis. The swivel connection **7** may take any conventional form and, in the structure illustrated in FIGS. 1 to 6 inclusive, there is a base plate **8** having spaced apertures **9** for receiving fastening devices **10** such as screws for securing said plate to an

article of furniture 5. The plate 8 is preferably recessed as at 11 to receive the head 12 of a spindle 13 which extends through aligned bores 14 and 15 in the plate and carrier respectively and has an abutment 16 on its lower end. The bore 15 is in a top wall 17 of the carrier, and there are washers 18 between the wall 17 and the plate 8, and a washer 19 between the carrier wall 17 and the lower abutment 16, with bearing members 20 and 21 between the washer 18 and the wall 17 and the wall 17 and the washer 21 respectively to provide a load-supporting bearing structure wherein the carrier will swivel relative to the furniture leg.

In the structure illustrated, the carrier housing 2 has the top wall 17 with a downwardly curved portion 22 extending around the periphery of the roller structure in spaced relation thereto and on the opposite side to the swivel mounting 7. There are laterally spaced depending flanges or legs 23 and 24 on the carrier which have aligned apertures 25 for receiving the axle 6.

The roller structure 3, in the illustrated structure, includes a plurality of spaced apart discs 26, 27 and 28, each of which is independently rotatable and preferably each is mounted on the axle for rotation thereon, said discs being relatively thin and having substantially cylindrical peripheries 29. The discs correspond in diameter and preferably the outermost discs 26 and 28 have outwardly extending bosses 30 which engage the inner surfaces of the flanges 23 and 24 respectively whereby the disc portions are spaced therefrom. Arranged adjacent, as for example, between discs are projections 31 which have tips 32 spaced from the axle a distance corresponding to the radius of the peripheries of the discs. The projections 31 are spaced circumferentially and are adapted to separate and pass between pile fibers 33 of a pile-surfaced floor covering 34 and to move relative thereto without snagging or pulling pile loops or the like.

In the structure illustrated in FIGS. 1 to 6 inclusive, there are a plurality of hub members 35 between adjacent discs with each of said hub members independently rotatable and preferably mounted on the axle 6. Each of the hub members have a plurality of circumferentially spaced portions terminating at the disc peripheries, as for example, said hub members have a plurality of radially extending closely spaced rigid projections 31 terminating in specially shaped tips 31' at the disc peripheries. While the cross-section of the projections may be of any geometric shape, in the illustrated structure they are rectangular, and an important feature is a definite radius provided on the free or exposed corners of the projection tips as at 37 for elimination of any sharp edges that could cut, snag or damage the pile fibers of a rug, carpet or the like, especially in the popular loop type loomings. While other radii can be utilized, it has been determined that an optimum radius of

$$r=\frac{t}{2}$$

where r is the radius and t is the thickness of the projection as illustrated in FIG. 6, will provide a tip shape which will exactly release all loops which would otherwise pick up on the exposed edges. Also, the edges 37' are rounded to eliminate any sharp corners.

It is preferred that the discs 26, 27 and 28 be relatively thin whereby they will tend to separate and pass between pile fibers of a rug, as for example, in a roller structure of approximately 2 inches in diameter and a 1-inch overall width, the discs would be of a width in the nature of 1/16-inch and the cross-section of the projections 31 adjacent the free ends thereof are such that they also will tend to separate and pass between the pile fibers of a rug, and it is preferred that in such a roller structure the circumferential spacing of said free ends be in the nature of 3/8-inch or less and substantially in accordance with the spacing of the projections on the support disclosed in Letters Patent of the United States No. 2,301,385. The discs, however, may be varied in thickness according to the specified static load-bearing qualities of any particular application.

In use of such a roller in a supporting structure such as a caster, with the caster secured to the bottom surface 4 or leg of an article of furniture 5, the discs and projections extend between the pile fibers 33 and engage the backing 38 of a rug or carpet whereby when the furniture is moved the former location of the wheel is unnoticed as any portion of the fibers that remain depressed is relatively small as substantially all of the fibers are separated and remain upright. Also, in moving the furniture, the roller structure tends to turn on a vertical axis extending through the axis of the roller until the roller is in a trailing position to the direction the furniture is being moved with the parts of the roller moving to give a differential caster action. With the roller positioned as illustrated in FIG. 3, and with the projection carrying members positioned with a projection on each in the relative position shown therein, if force is applied to the furniture tending to move same in the direction indicated by the arrow 39, FIG. 3, the movement of the furniture effects the swiveling action to the point where the roller is in trailing position relative to the direction of movement, as illustrated in FIG. 4, the independent rotative mounting of the discs and projection carrying members or hubs 35 results in a relative or differential movement whereby the projections illustrated in FIG. 3 take a position substantially as illustrated in FIG. 4. In making such transition, the disc 26 moves in the direction indicated by the arrow 40, the hub member adjacent thereto moves less by radian calculated amounts in the direction indicated by the arrow 41, the next adjacent hub member moves less again by calculated radian amounts, remaining practically static, in the direction indicated by the arrow 42, the disc 27 remain stationary, the next hub member moving to the right (FIG. 3) moves in radian proportion in the direction indicated by the arrow 43, the hub member adjacent the disc 28 moves in greater radian proportion the direction indicated by the arrow 44, and the disc 28 moves substantially more by calculated radian amounts in the direction indicated by the arrow 45. This relative movement will remain constant on pure turning torque and, with application of lateral pushing forces, will magnify, but all segments of the differential will always act in exact proportional peripheral movement according to radian degree displacement. Due, however, to each section of the roller being exactly relatively rotatable, there is only rolling movement across the floor covering with no sliding action either circumferentially or laterally. The circumferential spacing of the projections on each hub member permit the projections to move downwardly and separate the pile fibers as the hub members rotate so as not to materially depress any of the fibers and, when the projections and the discs engage the backing of a rug or carpet, they provide adequate load-supporting areas for any specified load so that a caster structure arranged on a chair, as for example an office chair, may be used directly on a rug or carpet and said carpet maintain its appearance over a long period of service such as would be comparable to the service provided by other portions in the general area having traffic thereover.

In the form of the invention illustrated in FIG. 7, the caster structure is the same as described relative to the form shown in FIGS. 1 to 6 inclusive except the swivel connection 46 is of a type having a pintle 47 mounted in a bore 48 of a furniture leg 49 with a bearing member 50 providing the rotative or swiveling action of the caster carrier 51.

In the form of the invention illustrated in FIGS. 8, 9 and 10, the disc members 53, 54 and 55 have the projections 56 of adjacent hub members 57 integral therewith. The intermediate disc 54 has the projections 56 arranged on both sides thereof with the ends 58 rounded on the

sides remote from the disc as illustrated at 59, the radius being

$$r=\frac{t}{2}$$

as illustrated in FIG. 10. The outermost discs 53 and 55 have the projections 56 arranged on their inner surfaces with the specially designed tip ends being rounded in the portion remote from the respective discs. It is to be understood that the roller structure may consist of only the disc 54 and projections thereon particularly where the load requirements are low. Also, the invention contemplates combinations of different discs and projections for various load requirements, the roller structure being such that it presents a discontinuous surface to the floor or covering thereon. The operation of such a structure is substantially the same as described relative to the form of the invention illustrated in FIGS. 1 to 6 inclusive.

In the form of the invention illustrated in FIG. 11, the caster 60 is generally of a ball type with a roller structure 61 mounted on a spindle 62. The roller structure includes an end member 63 having an annular floor-engaging rib 64 having a preferably continuous periphery 65. Also rotatably mounted relative to the spindle are spaced members 66 and 67 having preferably continuous peripheries 68 with projection members 69 therebetween. The projection members have circumferentially spaced end portions 70 forming discontinuous portions for engaging a floor simultaneously with the peripheries 65 and 68 of the other members. The shapes of the peripheral portions and the projections are such that they will tend to separate and pass between pile fibers of rugs and the like and allow rolling over hard surfaces between carpeted areas without marking the surfaces and the independently rotatable members will provide the differential caster action in substantially the manner as described relative to the structure illustrated in FIGS. 1 to 6 inclusive.

It is to be understood that while I have illustrated and described certain forms of my invention, it is not to be limited to the specific forms or arrangement of parts herein described and shown except insofar as such limitations are included in the claims.

What I claim and desire to secure by Letters Patent is:

1. A furniture support adapted to be interposed between a supporting surface and a portion of an article of furniture to movably support same comprising, a body member adapted for connection to an under side of an article of furniture, laterally spaced depending legs on said body member, and a roller structure rotatably mounted on said legs for rotation on an axis parallel to a supporting surface, said roller having a plurality of discs axially spaced and having cylindrical peripheries, said discs being rotatable relative to each other, said roller having means extending radially thereof between said discs and terminating in tip portions having ends in a circle of substantially the same diameter as the disc peripheries for engaging said supporting surface, said radially extending means being a plurality of close circumferentially spaced rigid projections with said tip portions thereof adapted to separate and pass between pile fibers of a pile-surfaced floor covering and bear upon the backing thereof, said discs being relatively thin to separate and extend between fibers of the pile-surfaced floor covering and bear upon the backing thereof.

2. A furniture support as set forth in claim 1 in which the radially extending means are on inner sides of outermost discs and both sides of intermediate discs.

3. A furniture support as set forth in claim 1 in which the radially extending means are fixed relative to the next adjacent disc.

4. A furniture support as set forth in claim 1 in which the body member has a pivotal connection to the article of furniture that permits caster movement of the body member and roller structure.

5. Furniture support means adapted to be interposed between a furniture leg and the like and a supporting surface to movably support furniture thereon comprising, a body member adapted for connection to a furniture leg, a plurality of flanges depending from said body member in substantially parallel laterally spaced apart relation, an axle supported on said flanges and extending therebetween, a plurality of spaced apart discs on said axle and rotatable thereon independently of each other, said discs having corresponding diameters and cylindrical peripheries, and a plurality of independently rotatable members on the axle between adjacent discs, said members each having a plurality of radially extending close circumferentially spaced projections terminating in rounded tips in a circle of substantially the same diameter as the disc peripheries, said discs being thin whereby said discs and projections are adapted to separate and pass between pile fibers of a pile-surfaced floor covering with the tips of the projections and the lower peripheries of the discs bearing upon the backing of same.

6. A furniture support adapted to be interposed between a supporting surface and a portion of an article of furniture to movably support same comprising, a body member adapted for connection to an under side of an article of furniture, and a roller structure rotatably mounted on said body, said roller including an annular portion with a continuous periphery and circumferentially spaced portions with surfaces at said periphery for engaging a supporting surface, said circumferentially spaced portions being relatively thin and adapted to separate and pass between pile fibers of a pile surfaced floor covering with the surfaces of said portions bearing upon the upon the backing thereof, said annular portion being relatively thin to separate and extend between fibers of the pile surface floor covering and bear upon the backing thereof, said annular portion and spaced portions providing combined bearing areas permitting movement of the roller over smooth surfaced floors and coverings with an absence of marking thereby.

7. A furniture support adapted to be interposed between a supporting surface and a portion of an article of furniture to movably support same comprising, a body member adapted for connection to an under side of an article of furniture, and a roller structure rotatably mounted on said body, said roller having a plurality of disc portions axially spaced and having substantially cylindrical peripheries, said roller having means extending radially thereof between said disc portions and terminating in tips at the disc peripheries for engaging said supporting surface, said radially extending means being a plurality of close circumferentially spaced projections having rounded tips adapted to separate and pass between pile fibers of a pile-surfaced floor covering with the tips thereof bearing upon the backing thereof, said disc portions being relatively thin to separate and extend between fibers of the pile surface floor covering and bear upon the backing thereof.

8. In a caster adapted to provide mobility in moving furniture and the like over a surface: at least one circular disc adapted to carry a load on an area of contact between the periphery thereof and said surface, means rotatably mounting said disc for rotation on an axis extending through the circular center thereof and substantially normal thereto, at least one support member mounted for independent rotation coaxially of said disc, said support member having a plurality of projections having ends terminating in a circle substantially equal in diameter to the diameter of said disc, said projection ends being circumferentially spaced apart and adapted to sequentially support a portion of said load when contiguous with said area of contact, and means for supporting said above-named means for rotation about a substantially vertically extending axis which is spaced from said area of contact, whereby said support member is permitted to rotate with respect to said disc for minimizing the

generation of sliding friction between said surface and said caster.

9. A caster adapted to provide mobility in moving furniture and the like over a surface having a fabric pile extending upwardly therefrom comprising: at least two load-carrying members, means rotatably mounting said members for independent rotation on a common axis, said members having a plurality of projections, said projections being circumferentially spaced apart for receiving fabric pile therebetween and adapted to sequentially support a load when contacting said surface, and means for supporting said above-named means for rotation about a substantially vertically extending axis which is spaced

from the area of said contact with said surface, whereby said members are permitted to rotate with respect to each other for minimizing the generation of sliding friction between said surface and said caster.

References Cited in the file of this patent

UNITED STATES PATENTS

D. 99,912	Herold	June 10, 1936
1,073,460	Anderson	Sept. 16, 1913
1,160,121	Allen	Nov. 16, 1915
1,341,630	Chesnutt	June 1, 1920
2,301,385	Ehrgott	Nov. 10, 1942