

[54] **CASTORS**

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[30] **Foreign Application Priority Data**

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[51] Int. Cl. **B60b 33/08**

[58] Field of Search..... 16/26, 24

[56] **References Cited**

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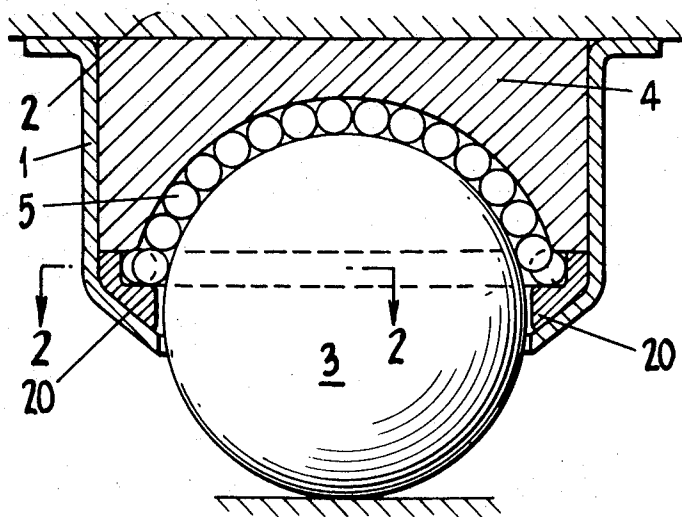
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[57]

ABSTRACT

The invention provides an improved castor of the type having a plurality of small balls disposed in a space for dual rolling contact between a load supporting large ball and a housing skirting and retaining the large ball and the housing is constructed to allow free movement of the small balls in the space whereby clustering and resultant jamming of the small balls is prevented.

5 Claims, 5 Drawing Figures



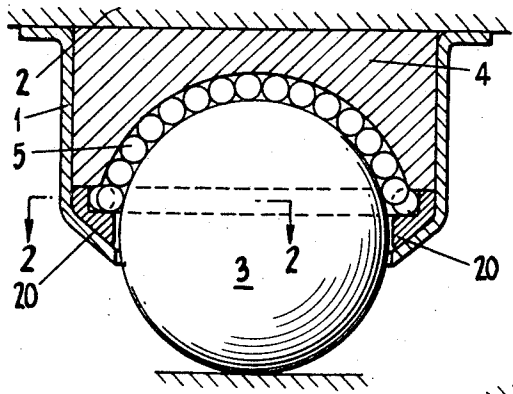


FIG. 1

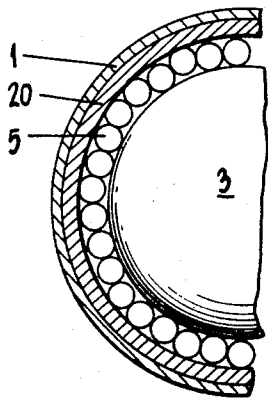


FIG. 2

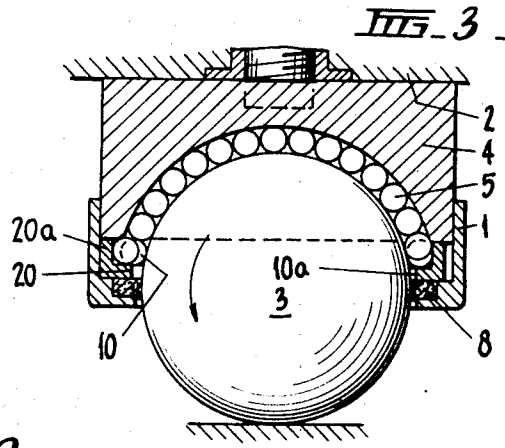


FIG. 3

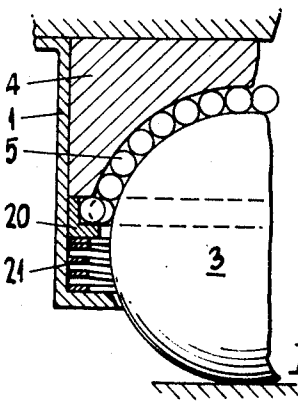


FIG. 4

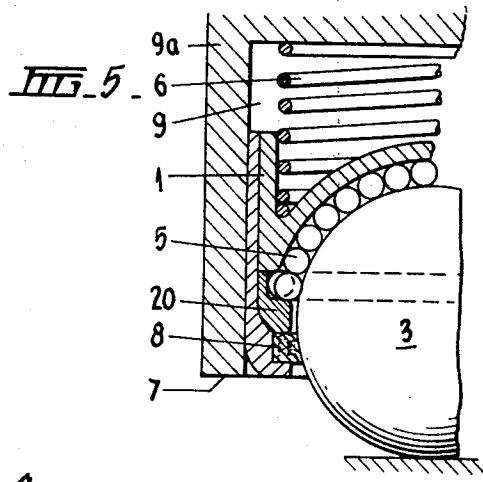


FIG. 5

CASTORS

This invention relates to ball type castors which facilitate movement of a supported object. The present application is a division of applicant's co-pending U.S. Pat. application Ser. No. 708,371 filed 2/26/68 now U.S. Pat. No. 3,557,401.

At present, widely used castors have a first vertical axis through the point of contact with the article which is offset from a second vertical axis passing through the point of contact of the castor with the floor. These can be described as offset castors, and are commonly applied to furniture to facilitate movement of the furniture across a floor or other surface.

This construction has an inherent disadvantage which is revealed at the outset of movement of the supported article. The castor must assume an operating position before rolling commences, and the position is dictated by the offset configuration of the two above-mentioned axes.

Specifically, the operating position requires that the two axes be approximately aligned in the direction of travel and consequently, when the article is initially moved, each castor must swivel about the first vertical axis to the operating position.

Consequently, there is a time delay before smooth rolling is achieved, and the swiveling movement causes wear at the point of contact between castor and floor.

A further disadvantage of this construction is the overturning movement which is inherent in the horizontal displacement of the first and second vertical axes.

Ball type castors presently in use overcome to a large extent the basic disadvantages of the offset castor in providing a load bearing large ball entrained in a support housing and having a plurality of small balls therebetween intended to cause rolling contact between the large ball and the bed of the support housing. However, it is apparent that this fundamental construction is not entirely satisfactory in use, being rough in operation. It has been found that this objectionable condition is brought about by sliding contact between the large ball and the small balls rather than rolling contact therebetween. Sliding contact is caused by the tendency of the small balls to crowd and jam together after movement in any given direction for a short distance and accordingly friction between the housing and the large ball is substantially increased and variable thus giving rise to the rough operation. Attempts are known wherein the small balls are prevented from jamming together; however, the resulting construction is apparently of a relatively complex nature which could lead to high manufacturing costs.

The present invention seeks to provide a smooth running ball type castor which is relatively simple and economical to manufacture, and effective in use.

The present castor overcomes the aforesaid disadvantages of an offset castor whilst being free from the poor action accruing in ball type castors.

According to the present invention, a ball castor comprises a plurality of small balls disposed in a space for dual rolling contact between a load-supporting large ball and support means skirting and retaining the large ball, the space between the support means and the large ball being radially enlarged at least near the mouth of the support means skirting the large ball so that the small balls at the termination of their travel over the large ball lose dual contact with the large ball

and the support means and are forced by succeeding small balls to move in the enlarged space to a position where said dual contact can be regained by the small balls, said support means including a housing having a hemispherical inlet skirting the large ball, and a ring fitted on the housing at or near the mouth of the skirt, said ring being shaped to form said radial enlargement.

In its application to the support of furniture, the large ball projects from the mouth of the housing to contact the floor. The large ball can rotate in any direction within the housing, and dual rolling contact between the top of the large ball and the housing is provided by the small balls. These small balls allow free rotation of the large ball while the furniture is being moved even though considerable vertical load may be transmitted between the large ball and the housing.

In its application to the movement of an article over a stationary point such as in a conveyor system, the ball castor according to the invention is simply inverted to present the exposed surface of the large ball to the underside of the supported article, and the small balls operate in the same way to effect rolling contact as above described.

There may be further provided according to the invention, a castor as above described and including spring means allowing movement of the housing against the resilient urging of the spring into a recess whereby the housing can recede within a housing support under predetermined load conditions whereupon the housing support engages the floor. In more detail, a spring is interposed in the recess between the housing skirting the top of the ball and the said housing support.

When such a resiliently mounted castor is employed on furniture, the housing support is conveniently provided with an extensive floor contacting surface so that recession of the ball under load allows the housing support to contact the floor, consequently the wear on the floor is considerably less than would be caused by point contact of the stationary ball. For use in moving an article above an inverted stationary ball castor there need be no such extensive surface but the spring affords relief to shock induced by obstacles such as ridges on the moving article.

In the following description, the practical arrangement and operation of several castors will be described, with reference to the accompanying drawings, in which:

FIG. 1 is a side sectional view of one arrangement of a ball type castor constructed in accordance with the invention.

FIG. 2 is a partial sectional plan view taken on section line 2-2 of FIG. 1.

FIGS. 3-5 are side sectional views of three further arrangements of ball type castor constructed in accordance with the invention.

The description is directed to arrangements, whereby the castor is used to support furniture or similar articles. It is to be noted that a similar construction is applicable to use in an inverted position for moving an article over an inverted stationary ball castor, and facilitating movement of the article over that point.

There is provided a support housing 1 having a top surface adapted for fixing to the underside of an article 2 such as furniture. The lower part of the housing is adapted to embrace or skirt a large ball 3 below the midpoint thereof, and thus retain the large ball 3 within the housing 1 with the lower portion of the large ball

projecting from the housing 1 to contact the floor. Fixed within the housing 1 or forming a part thereof is a shroud or skirt 4 having a hemispherical inlet which skirts the top of the large ball 3. In an alternative, the skirt 4 may be attached to the article 2 while the housing 1 attaches to the skirt 4. Between the large ball 3 and the skirt 4 is a plurality of small balls 5 which roll on the surfaces of both the ball 3 and the housing skirt 4 and permit the large ball 3 to rotate freely within the housing skirt 4. Due to the rolling contact of the small balls 5 against both surfaces, the transmission of the load of the article 2 is effected with a minimum of friction.

A radial enlargement 10 is formed at or near the mouth of the housing skirt 1 to permit recirculation of the small balls 5, and prevent them from jamming together at one side of the housing 1 when the castor is operating. Recirculation is necessary, since the mechanics of rolling contact require that the small balls 5 move over the surface of the skirt and the large ball 3 and do not simply rotate on one spot. When the supported article 2 is moved across a floor, the large ball 3 rolls across the floor, and the small balls 5 rotate in the load transmitting area between the large ball 3 and housing skirt 4. The small balls 5 also move circumferentially in the direction of movement of the article and tend to cluster against the forward section, i.e., in the direction of movement of the skirt 4. The enlargement 10 allows relief of the tendency to cluster and jam at this section by permitting each small ball 5 to pass out of dual contact with the ball 3 and skirt 4, into the enlargement 10, and hence to be forced rearward along the enlargement by the force of other small balls 5 following it. At a point near the rear section of the skirt 4, the movement of a small ball 5 travelling rearward along the enlargement 10 from the front section will meet resistance from other small balls moving around the other side of the enlargement 10 and will be forced back into the confined space between the large ball 3 and housing skirt 4. In this region, dual contact allowing rolling and load transmission by the small ball 5 between large ball 3 and skirt 4 will be regained, and the cycle will be repeated.

The design of the enlargement 10 assists the return of the small balls 5 into dual rolling contact with large ball 3 and skirt 4.

The enlargement 10 is formed by a ring 20 which embraces the large ball 3 immediately below the mouth of the skirt 4, and is of slightly larger inside diameter than the mouth. In operation, the small balls leave the front section of the housing and become entrained between the ring 20 and the large ball 3. Since the ring 20 is of slightly larger diameter than the mouth of the skirt 4, it tends to move forward, see FIG. 3, under the pressure influence of small balls 5 clustering to create the enlargement 10 at the front section, and the ring-to-ball association presents a converging track to the small balls whereby the enlargement 10 thus formed is gradually restricted at 10a from the forward section to the rear section of the entrainment path, at which point the ring 20 is complementary to the mouth of the skirt 4. Consequently, the rearward movement of the small balls 5 within this region is positively guided, and the return to recirculation over the top of the ball at this point is assisted. Also, pressure tending to produce clustering is relieved by movement of the ring. Further assistance may be achieved by providing the ring 20

with an internal upwardly diverging taper 20a. Alternatively, clustering of the small balls 5 may be relieved by biasing the ring 20 upwards by spring means 21 to allow a rocking motion of the ring about an imaginary horizontal axis relative to the large ball 3 and the housing 4 responsive to the force imposed by movement of the small balls 5 out of dual contact and into engagement with the ring. (See FIG. 4).

In another practical arrangement referring to FIG. 5, the small balls 5 recirculate within the housing skirt 4 as above described, and the housing skirt 4 is formed from a pressing as shown shaped to locate a spring 6. The entire unit is adapted to be disposed in a recess 9 in a furniture leg and to recede therein when load is applied to the article of furniture. The lower part of a body 9a defining the recess 9 is provided with a flat floor-contacting surface 7.

In operation, the spring 6 is designed to support an unloaded article of furniture with the ball 3 projecting from the housing for rolling motion on the floor. When the article is loaded, such as by persons using the article, the spring 6 is compressed and the castor recedes within the recess and the surface 7 contacts the floor. The loaded article is consequently supported on the floor by a larger area than the ball 3 would present to the floor, with attendant reduction in wear on the floor. Also, with rolling contact no longer existing between the floor and the article, accidental movement of the article is impeded.

When the article is unloaded, the spring 6 resumes its initial position and the castor projects from the recess 9 and resumes sole contact with the floor to allow movement of the article. The provision of a spring 6 as described also permits shock relief when obstacles to movement, such as ridges on a floor, are encountered by the rolling ball.

As a further constructional feature of the abovementioned castors, a dust seal 8 (see FIGS. 3 and 5) may be provided between the housing and the ball, so that entry of foreign particles will be inhibited.

The above description provides a device which overcomes the disadvantages of present castors, and may be employed to support an article and facilitate its movement. In a particular application, the device is suited to use on beds, trolleys, couches, chairs, tables, trays and the like, which require movement over floor surfaces. In a further application, the device is suitable for attachment to a point in an inverted position to support an article, such as a flat slab, which is free to move over that point.

What I claim is:

1. A ball castor comprising a large load supporting ball, a support means including a housing having a substantially hemispherical inlet partially enclosing and retaining the large ball in rotatable relation with the enclosed portion of the large ball being spaced from said inlet, a plurality of small balls disposed in the space between said large ball and said inlet for dual rolling contact between the large ball and the housing upon movement of said large ball, and a ring fitted on the housing at or near the mouth of the inlet being shaped and adapted to form a space at said mouth adjacent the large ball, said space being radially larger than said space between said large ball and said inlet and providing thereby an annular channel so that the small balls are adapted to move out of dual contact with the large ball and the housing into said annular channel which

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lies adjacent the large ball, said small balls being forced by succeeding balls to move in said annular channel adjacent the large ball to a position where said dual rolling contact can be regained by the small balls during movement of said large ball, said annular channel constituting the only path for said small balls to travel while out of dual rolling contact to said position where said dual rolling contact is regained.

2. A ball castor comprising, a large load supporting ball, a support including a housing having a substantially hemispherical inlet partially enclosing and retaining the large ball in rotatable relation with the enclosed portion of the large ball being spaced from said inlet,

a plurality of small balls disposed in the space between said large ball and said inlet for dual rolling contact between the large ball and the housing upon movement of said large ball, and a ring fitted on the housing at or near the mouth of the inlet, said ring having a slack fit on the housing so that at the onset of movement of the castor the ring moves in response to pressure by the small balls to take up a position relative to said large ball and said inlet to form a space at or near said mouth radially larger than said space between said large ball and said inlet, said enlarged space being restricted in

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convergent manner between the bounds of said large ball and ring so that the small balls are adapted to move out of dual contact with the large ball and the housing and into the enlarged space and to be forced by succeeding balls to move in the enlarged space into said convergent restriction where said dual rolling contact can be regained by the small balls during movement of the large ball.

3. A castor as claimed in claim 2 wherein said ring is recessed adjacent the large ball and the wall of the ring so formed is inclined away from the large ball to assist the movement of the small balls back into said dual contact.

4. A ball type castor as claimed in claim 1 wherein the ring is resiliently mounted in the mouth of the housing and adapted to rock about an horizontal axis relative to the large ball and the housing responsive to the action of the small balls moving out of said dual contact whereby said radially enlarged space is formed to receive said small balls.

5. The castor as claimed in claim 1 which further includes spring means for resiliently mounting said housing in a recess in the load which slidably receives said housing whereby upon the application of a predetermined load to said article the castor recedes within said recess and said load engages the floor.

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