No. 725,108. PATENTED APR. 14, 1903.

F. P. MAGOUN.

BALL CASTER.

APPLICATION FILED JUNE 4, 1900.

NO MODEL.

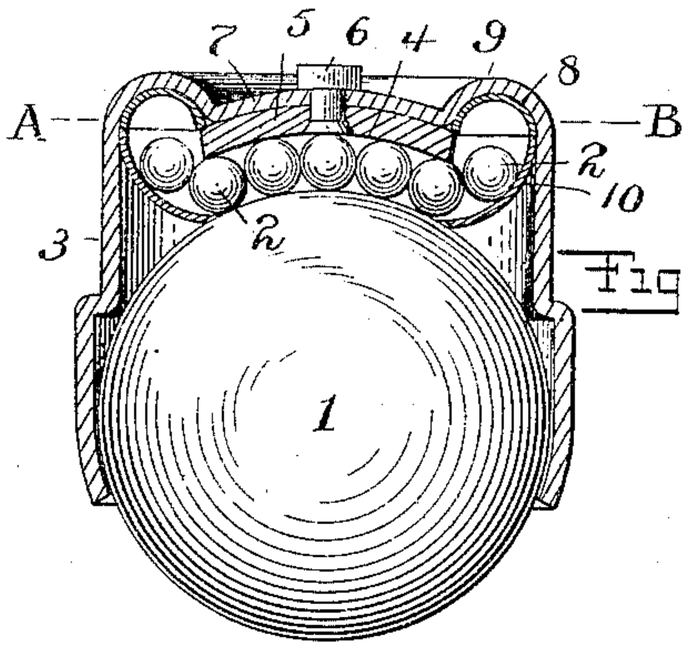

Fig. 1.

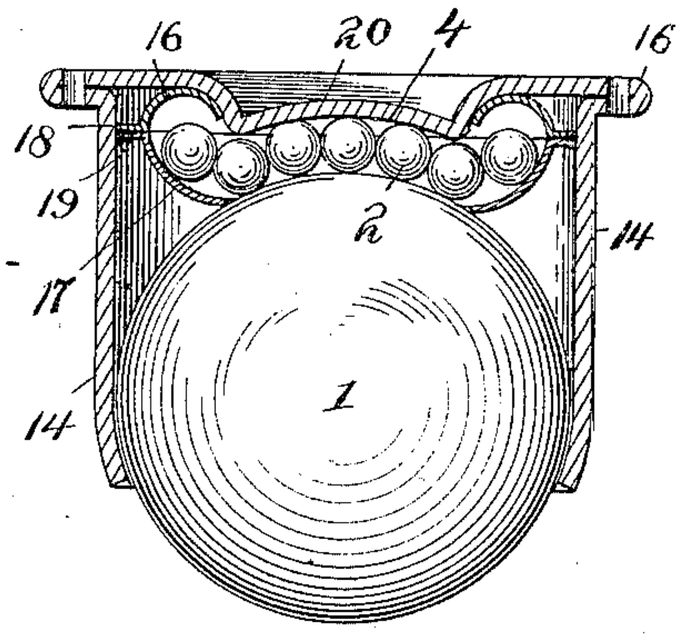

Fig. 5.

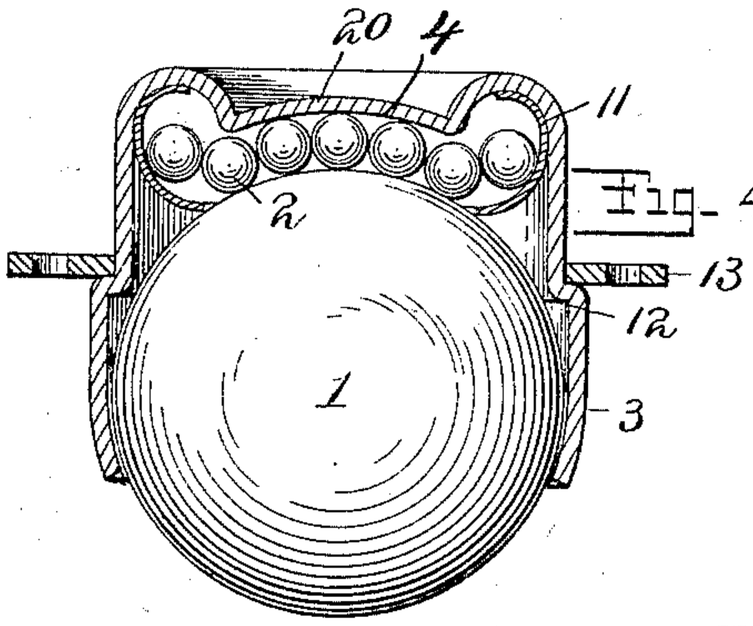

Fig. 4.

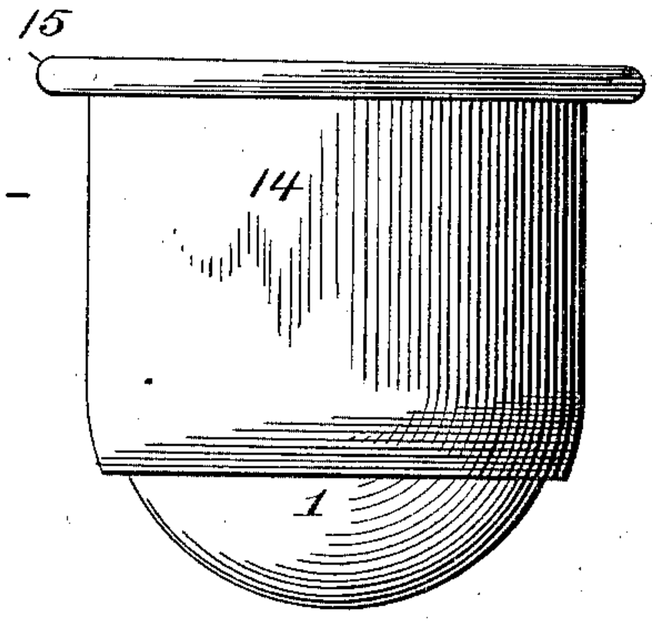

Fig. 6.

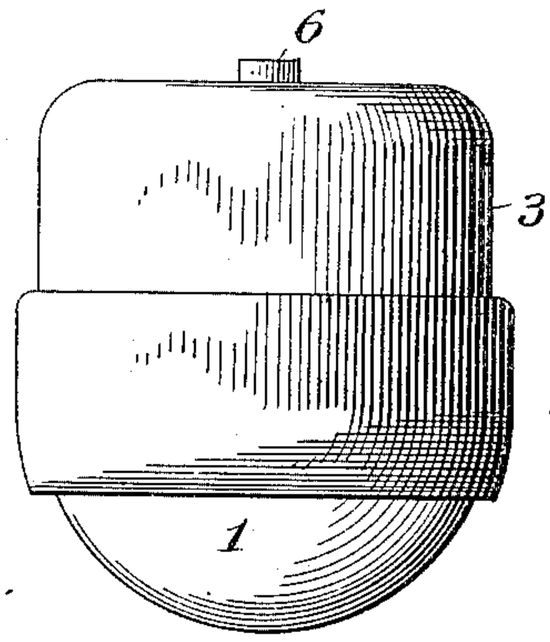

Fig. 3.

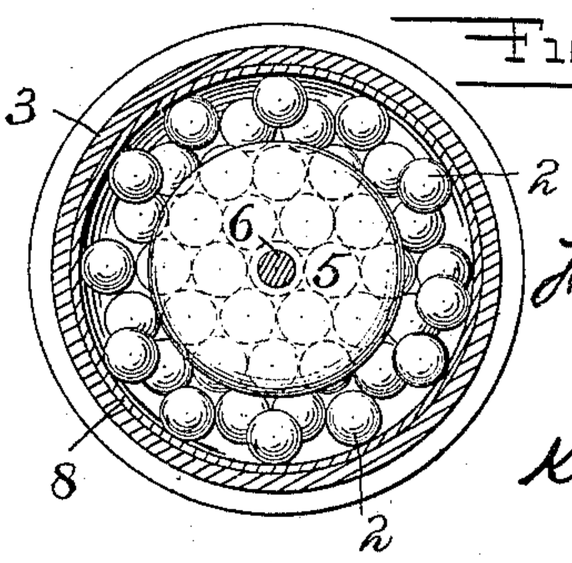

Fig. 2.

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BALL-CASTER.

SPECIFICATION forming part of Letters Patent No. 725,108, dated April 14, 1903.

Application filed June 4, 1900. Serial No. 19,009. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS PEABODY MAGOUN, a citizen of the United States, and a resident of Bernardsville, Somerset county, and State of New Jersey, have invented certain new and useful Improvements in Ball-Casters, of which the following is a specification.

My invention relates to that class of casters for furniture, &c., known as "ball-casters," and more particularly to that type of such casters in which a universal antifriction-bearing is provided for the bearing-ball. The essential operative parts of such casters are, first, a sphere of suitable size and material to adapt it to act as a support and at the same time to readily roll in any direction by contact with some supporting-surface, as a floor; second, a plurality of smaller spheres of suitable size and material to adapt them to form in connection with a suitable bearing-surface an antifriction-bearing for the larger bearing-ball, and, third, a containing-case provided with suitable chambers and guiding and bearing surfaces adapted to permanently hold said balls in proper coöperating relation. Especial difficulty has been experienced hitherto in providing suitable inclosing and guiding means to receive the antifriction-balls as they leave their operative position on the bearing-ball and direct them with the proper freedom of movement back to some other point on the bearing-ball where they are needed to maintain always a sufficient number of them in operative position between the bearing-ball and the opposed bearing-surface to form an efficient antifriction-bearing for the bearing-ball. This inclosing and guiding means or "return-ball-guiding chamber," as it is hereinafter termed, must be so constructed that there are no such recesses or projections or irregularities as will be likely to obstruct or cause binding among the antifriction-balls as they are driven along by such of their number as are at the time being advanced by the bearing-ball while rolling over a floor or other surface. The desired results would be reached with less difficulty if it were permissible to employ an unlimited number of the antifriction-balls and to make the parts which coöperate therewith with great care and regardless of expense. In order to manufacture such casters on a scale and at a cost such as will make them available for general use, however, the number of balls and the amount of fine machine-work in the caster must be reduced to a minimum. The return-ball-guiding chamber must be made as small as possible, and the casing and other parts must be pressed or stamped out of suitable material, as sheet-steel, by dies or other tools operated by machinery. By this method of manufacture, however, it has been found very difficult, if not impossible, to produce a casing which is free from the recesses, projections, irregularities, &c., above referred to and which at the same time possesses the features necessary for a ball-caster of the type described.

My invention has for an object to provide in such a caster a construction by which smooth and perfect ball-guiding surfaces of the desired dimensions and conformation may be obtained reliably and cheaply irrespective of defects or irregularities in the main casing.

My invention also has for its objects to reduce the number of antifriction-balls necessary in the construction of a caster of a given size, to provide a construction which will permit of the main casing being struck up or drawn as a whole out of suitable metal by machine-operated dies inexpensibly without the necessity of resorting to difficult operations of metal-drawing, and in any desired convenient form to adapt the caster to varying situations, and to otherwise improve and cheapen and render the manufacture of this type of caster on a commercial scale practically attainable.

With these objects in view I have conceived the idea of providing an interior or auxiliary casing of such material and construction that it may be given the desired accuracy of form and dimensions, said casing being suitably located within the main casing and constituting by itself the effective inclosing wall or

walls and guiding-surfaces of the return-ball-guiding chamber.

My invention may be embodied in widely different constructions and in widely different forms of casters, the essential feature being that an auxiliary casing is provided which constitutes the walls (or the critical parts, at least, of the walls) of the inclosure within which the antifriction-balls obtain the relief needed to enable them to pass without obstruction and under its guidance from the point where they leave contact with the bearing-ball to the points where they resume contact therewith.

My invention further consists in the novel features of construction and combinations of parts herein described.

The accompanying drawings, which are referred to herein and form a part hereof, illustrate by way of example several embodiments of my invention and, in connection with the description herein, serve to explain the principles of my invention and the best mode contemplated by me of applying those principles.

Of the drawings, in which like numerals of reference refer to like parts throughout, Figure 1 is a vertical central section of the casing of a caster constructed in accordance with my invention, the balls being shown in elevation. Fig. 2 is a transverse section taken on the line A B, Fig. 1, with certain parts shown in top plan. Fig. 3 is a side elevation of the caster shown in Fig. 1. Figs. 4 and 5 are views similar to that in Fig. 1, illustrating modifications in the construction of the auxiliary casing and illustrating also different forms of casters embodying my invention; and Fig. 6 is a side elevation of the caster shown in Fig. 5.

Referring to the drawings in detail, and particularly to Figs. 1, 2, and 3, 1 represents the bearing-ball, 2 the antifriction-balls, and 3 the main inclosing casing of the caster. The casing 3 may be of any form or construction which will enable it to retain the operative parts of the caster in proper coöperative position; but it is preferably formed by the process of drawing from suitable sheet metal, such as rolled steel. The lower end of the casing 3 is formed with an opening through which the bearing-ball projects, so as to make suitable contact with a floor or other surface. The opposite end of the casing is closed, and it is provided on its inner side with a suitable centrally-arranged concave bearing-surface 4. The bearing-surface 4 is preferably formed on a separate bearing member 5, which is secured to the inner side of the end of the casing 3 by a rivet 6, substantially as shown in Fig. 1. The bearing member 5 is preferably in the form of a concavo-convex disk, as it can be advantageously made in this shape by the process of metal-stamping, and in order that no space may be left between the bearing member and the end of the casing a concavo-convex portion 7 may be formed in the latter, in which the bearing member 5 is adapted to fit. The bearing-surface 4 and the bearing-ball 1 are separated by a plurality of the antifriction-balls 2, and the curvature of the surface 4 should be such that it is concentric with the bearing-ball when the latter is thus spaced therefrom. The bearing-surface 4 is preferably circular in outline, and in order to operate well it should be of such extent that three, and preferably as many as four, of a diametrical line of the antifriction-balls 2 may always be in contact therewith.

In order to perpetuate the supply of balls between the bearing-surface 4 and the bearing-ball irrespective of the extent or the direction of the movement of the caster, a supply of the balls 2 must be maintained on every side of the bearing-surface 4, so that there will always be some balls ready to take the place of those which are advanced between the bearing-ball 1 and the bearing-surface 4 as the bearing-ball is rolled over the floor or other surface, and in order that this supply of the balls 2 may be maintained without employing an excessive number of them means must be provided to receive the antifriction-balls 2 as they are delivered at the edge of the bearing-surface 4 and guide them or return them to the edge of the bearing-surface. It is to be observed, moreover, that in order that a minimum number of the antifriction-balls may be used the means for returning such of them as are not in operative position must have a minimum capacity for balls, and it must also be of such a nature that the balls will be returned at a maximum speed. The best means known to me for accomplishing these results consists of an annular chamber, which surrounds the bearing-surface and is adjacent to the bearing ball and which acts both as a supply-reservoir for the antifriction-balls and as a return-ball-guiding device. In order that this chamber may be of small capacity and yet perform its functions efficiently, however, it must be accurately formed, and its guiding-walls must be smooth and devoid of projections or recesses. As hereinbefore indicated, my invention is particularly directed to the provision of such a chamber which will be reliable in the performance of its functions and yet simple and cheap in construction. This is accomplished by means of an interior or auxiliary casing of such material and construction that it may be given the desired dimensions and conformation accurately and cheaply and preferably by the process of drawing or stamping. This auxiliary casing is preferably constructed of thin sheet metal such as may be formed with great accuracy by dies in a press. As shown in Fig. 1, the auxiliary casing comprises an upper part 8, annular in form and having an inner concave annular surface of suitable dimensions. The part 8 is located in a suitable recess 9, formed

in the casing 3, and its outer edge forms a shoulder against which the outer edge of the lower member 10 of the casing abuts. The member 10 is also annular in form and is provided with an inner concave annular surface, which at its outer edge is preferably tangent to and forms a continuation of the inner surface of the upper member 8. The two separate members 8 and 10 may, if desired, be secured together by suitable means, as by solder, or they may be constructed of a single piece of metal, if preferred. The casing thus constructed may be secured in place within the main casing 3 by any suitable means. Preferably the casing as a whole or the separate parts thereof are made of a material having some degree of resiliency and slightly larger in external dimensions or slightly smaller in internal dimensions than the internal or external dimensions, respectively, of the parts of the main casing with which they are to rest in contact, as by this construction the casing is held in place accurately and reliably and without liability of uneven distortion. The casing is so shaped and located that its lower inner edge is adjacent to the surface of the bearing-ball 1 and near the point where the antifriction-balls 2 enter and leave the space between the bearing-ball and the bearing-surface 4. From this point the walls forming the annular surface slope by a gradual continuous curve upwardly when the caster is in an upright position, as shown, and then over inwardly until a chamber is formed which is of such dimensions as to hold a suitable number of the antifriction-balls loosely and in such manner as to allow the balls to run freely therethrough. The auxiliary casing preferably forms substantially all of the walls of the return-ball-guiding chamber, as shown in Fig. 1, but it may form the most critical portions only of those walls—that is to say, the casing may be extended upwardly and inwardly at the top only to the extent that great accuracy and exactness are required in the conformation of the guiding-walls. In Fig. 4, for example, the walls of the casing 11, which are shown as made of a single piece of metal, are only extended to the top of the recess 9 of the casing 3, the remainder of the chamber being formed by the inner walls of said recess 9. Owing to the fact that by the use of my auxiliary casing no shoulder has to be formed in the walls of the main casing 3 against which to support the ring provided in constructions heretofore made and corresponding to the lower part of my auxiliary casing, the top portion of the casing 3 may be contracted, as indicated in Figs. 1, 3, and 4, thus forming a shoulder 12 above the bearing-ball 1, against which shoulder a securing flange or ring 13 may be seated. By this construction any special provision for securing the caster in place is rendered unnecessary and a difficult and expensive step in the process of drawing the main casing is eliminated. By means of my invention also the main casing may be made in any desired or convenient form. As shown, for example, in Figs. 5 and 6, the casing 14 may be provided with an outwardly-turned securing-flange 15 at the top and the walls then extended directly downward toward the bearing-ball 1. With this form of main casing the construction of the auxiliary casing shown in Fig. 1 may be used when the parts of that casing are secured together or when that form of casing is made in one piece, such casing in either case being retained by the engagement of the upper inner edge thereof with the interior of the casing 14 near the bearing-surface 4 or with the outer edge of the bearing member 5 when a separate bearing member is used. With this form of main casing, however, the auxiliary casing may be made of two parts 16 and 17, and one or both of said parts may be provided with an outwardly-turned flange 18 or 19, so that said parts may be accurately retained in place by the engagement of said flange or flanges with the inner walls of the casing 14. Owing to the thinness of the metal, where metal is used, the flanges 18 and 19 may be turned without forming any appreciable recess or projection on the guiding-surface where the parts of the casing meet.

Instead of forming the bearing-surface 4 on a separate piece 5, as hereinbefore described and as shown in Fig. 1, said bearing-surface 4 may be formed directly on a suitable concavo-convex portion 20 of the closed end of the main casing, as shown in Figs. 4 and 5.

The operation of the device will be readily understood from the foregoing description, and therefore no further description thereof will be necessary.

My invention is not to be limited to the precise construction shown or to the particular construction by which it is carried into effect, as many changes and modifications other than those indicated may be made therein without departing from the principles of my invention or without abridging the proper scope thereof.

What I claim as new, and desire to secure by Letters Patent, is—

1. A ball-caster comprising a casing, a concave bearing-surface in said casing, a bearing-ball held in coöperative relation with said bearing-surface, an annular auxiliary casing separate from the main casing and the bearing-surface and located wholly beyond the bearing-surface adjacent to the bearing-ball, and antifriction-balls located between the bearing-surface and the bearing-ball and also in said auxiliary casing, said auxiliary casing together with the periphery of the bearing-surface forming the return-ball-guiding chamber for the caster.

2. A ball-caster comprising a casing, a con-

cave bearing-surface in said casing, a bearing-ball held in coöperative relation with said bearing-surface, an annular auxiliary casing separate from the main casing and the bearing-surface and located wholly beyond the bearing-surface and adjacent to the bearing-ball, and antifriction-balls located between the bearing-surface and the bearing-ball and also in said auxiliary casing, the distance between the walls of said auxiliary casing and the conformation of said walls being such as to form a relief-chamber in which the return-balls are guided without binding.

3. A ball-caster comprising a casing, a concave bearing-surface in said casing, a bearing-ball located in said casing substantially concentric with but spaced from said bearing-surface, an auxiliary casing forming an annular chamber having an inner annular opening, said casing being so located that the said annular chamber communicates through said annular opening with the space between the bearing-surface and the bearing-ball and with that space only, and antifriction-balls located between said bearing-surface and said bearing-ball and also in said chamber.

4. A ball-caster comprising a casing, a concave bearing-surface in said casing, a bearing-ball located in said casing substantially concentric with but spaced from said bearing-surface, an auxiliary casing forming an annular chamber having an inner annular opening, said casing being so located that the said annular chamber communicates through said annular opening with the space between the bearing-surface and the bearing-ball and with that space only, and antifriction-balls located between said bearing-surface and said bearing-ball and also in said chamber, the distance between the walls of said annular chamber and the conformation of said walls being such as to form a relief-chamber in which the return-balls are guided without binding.

5. A ball-caster comprising a casing, a concave bearing-surface in said casing, a bearing-ball located in said casing substantially concentric but spaced from said bearing-surface, an auxiliary casing forming an annular chamber having an inner annular opening, said casing being formed of two parts so located that the said annular chamber communicates through said annular opening with the space between the bearing-surface and the bearing-ball and with that space only, and antifriction-balls located between said bearing-surface and said bearing-ball and also in said chamber, the distance between the walls of the said annular chamber being materially greater than the diameter of the antifriction-balls, whereby binding of the balls when in operation is prevented, substantially as set forth.

6. A ball-caster comprising a casing, a separate bearing member therein having a concave bearing-surface, a bearing-ball held in coöperative relation with said bearing-surface, an annular auxiliary casing separate from the main casing and the bearing-surface and located wholly beyond the bearing-surface and adjacent to the bearing-ball, and antifriction-balls located between the bearing-surface and the bearing-ball and also in said auxiliary casing, said auxiliary casing together with the periphery of the bearing-surface forming a complete return-ball-guiding chamber for the caster.

7. A ball-caster comprising a casing, a separate bearing member therein having a concave bearing-surface, a bearing-ball located in said casing substantially concentric with but spaced from said bearing-surface, an auxiliary annular casing open at its inner side and so located that the annular chamber formed thereby is in communication with the space between the bearing-surface and the bearing-ball, and antifriction-balls located between said bearing-surface and said bearing-ball and also in said chamber, said auxiliary casing forming the return-ball-guiding chamber of the caster, substantially as described.

8. A ball-caster comprising a casing, a concave bearing-surface in said casing, a bearing-ball located in said casing substantially concentric with but spaced from said bearing-surface, an annular auxiliary casing made in two parts and open at its inner side and so located that the annular chamber formed thereby is in communication with the space between the bearing-surface and the bearing-ball, and antifriction-balls located between said bearing-surface and said bearing-ball and also in said chamber, said auxiliary casing forming the return-ball-guiding chamber of the caster, substantially as described.

9. A ball-caster comprising a casing, a concave bearing-surface in said casing, a bearing-ball located in said casing substantially concentric with but spaced from said bearing-surface, an annular auxiliary casing consisting of two concavo-convex rings formed of sheet metal and adapted to meet at their outer edges and form an annular opening between their inner edges, said casing being so located that the annular chamber formed thereby is in communication with the space between the bearing-surface and the bearing-ball, and antifriction-balls located between said bearing-surface and said bearing-ball and also in said chamber, said auxiliary casing forming the return-ball-guiding chamber of the caster, substantially as described.

10. A ball-caster comprising a casing, a concave bearing-surface in said casing, a bearing-ball held in coöperative relation with said bearing-surface, an annular chamber formed in said casing around and wholly beyond the periphery of the bearing-surface and adjacent to the bearing-ball, antifriction-balls located between said bearing-surface and said bearing-ball and also in said chamber, and an auxiliary casing forming a marginal guide

for the antifriction-balls and also the critical portions of the walls of said annular chamber, the distance between the walls of said annular chamber and the conformation of said walls being such as to form the return-ball-guiding chamber of the caster and prevent binding of the balls when in operation.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

FRANCIS PEABODY MAGOUN.

Witnesses:

J. H. FREEMAN,

EDWIN SEGER.