

No. 725,076.

PATENTED APR. 14, 1903.

R. M. GROVE.
BALL CASTER.

APPLICATION FILED SEPT. 29, 1900.

NO MODEL.

Fig. 1.

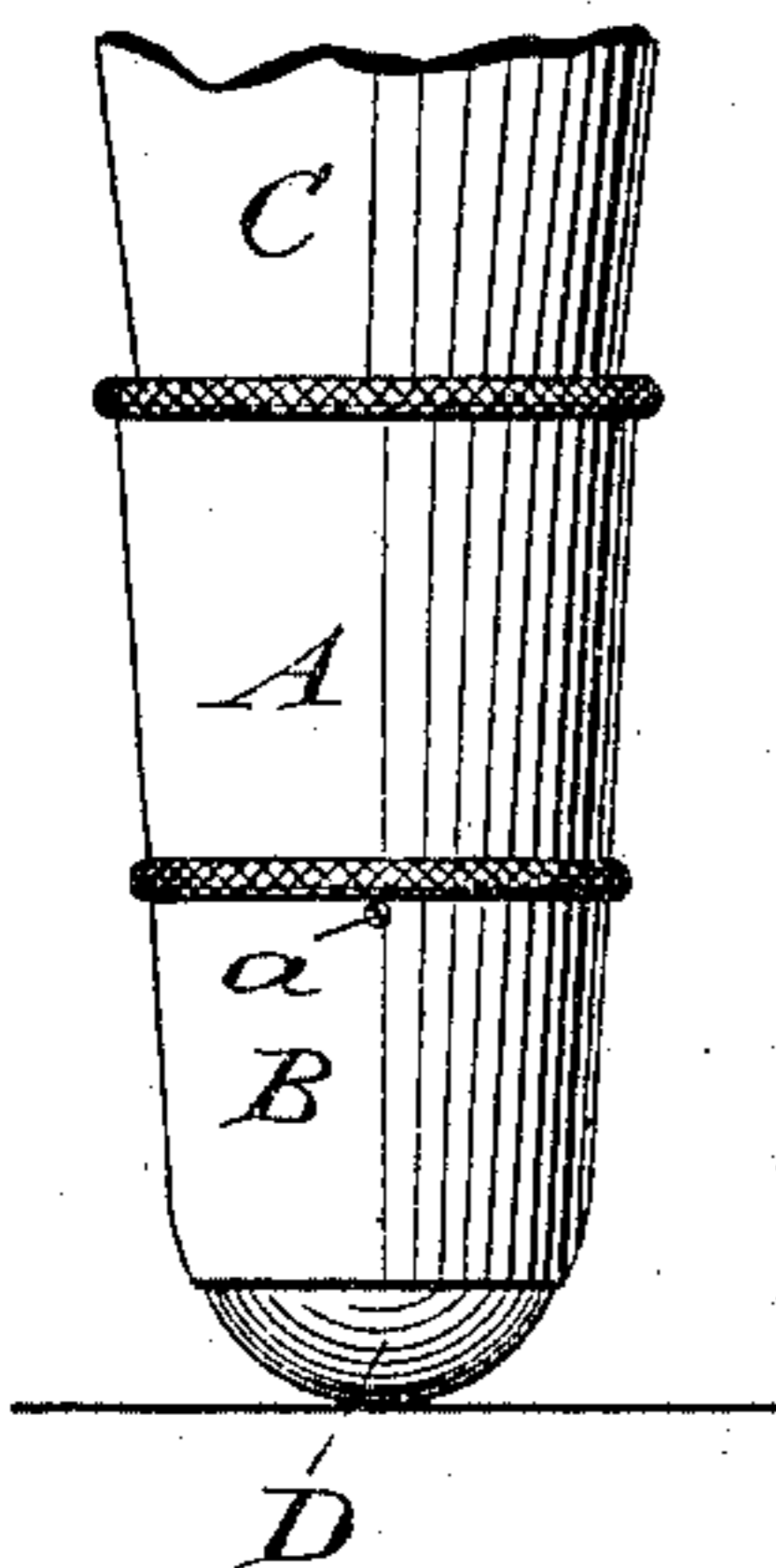


Fig. 2.

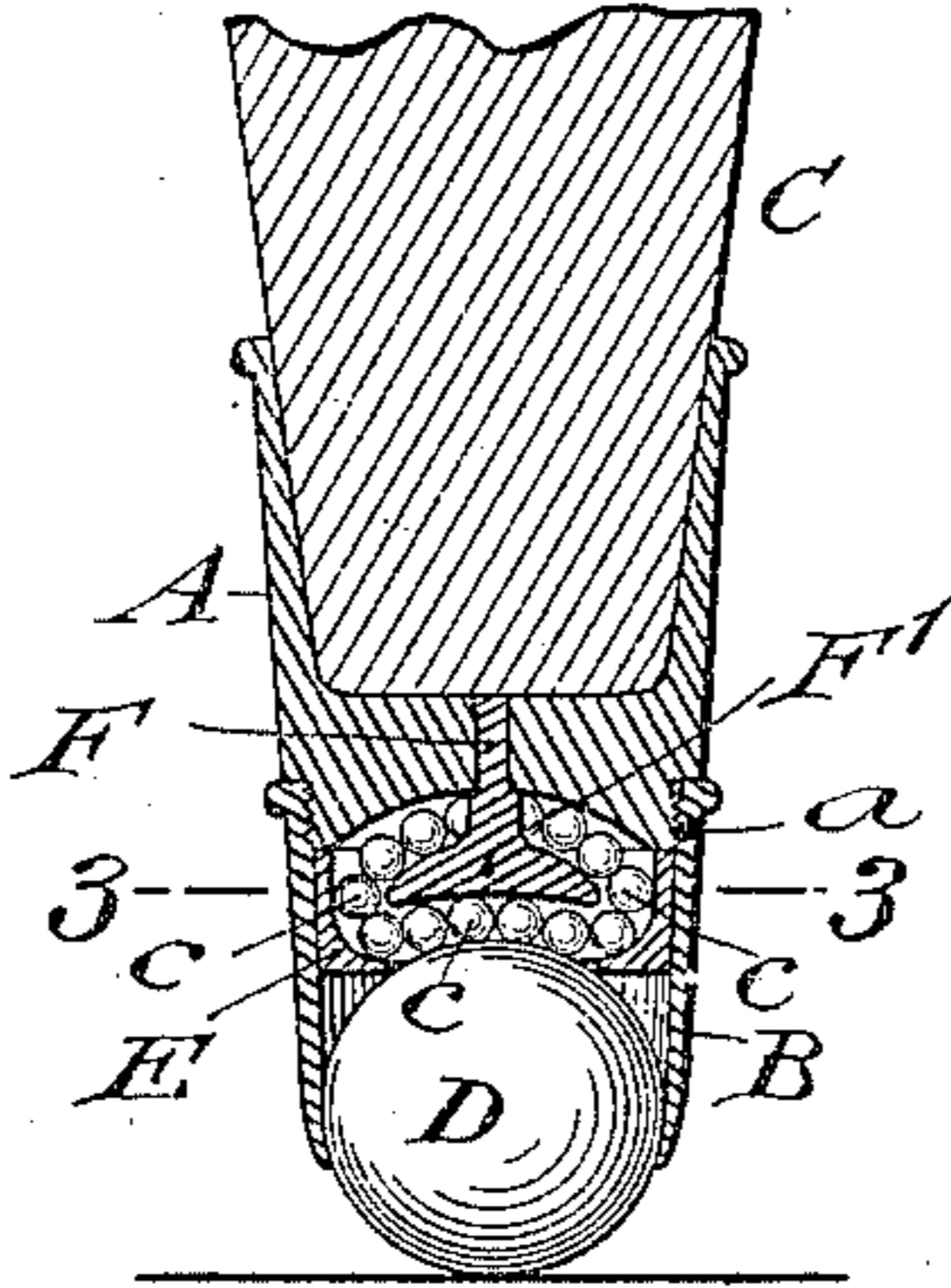


Fig. 7.

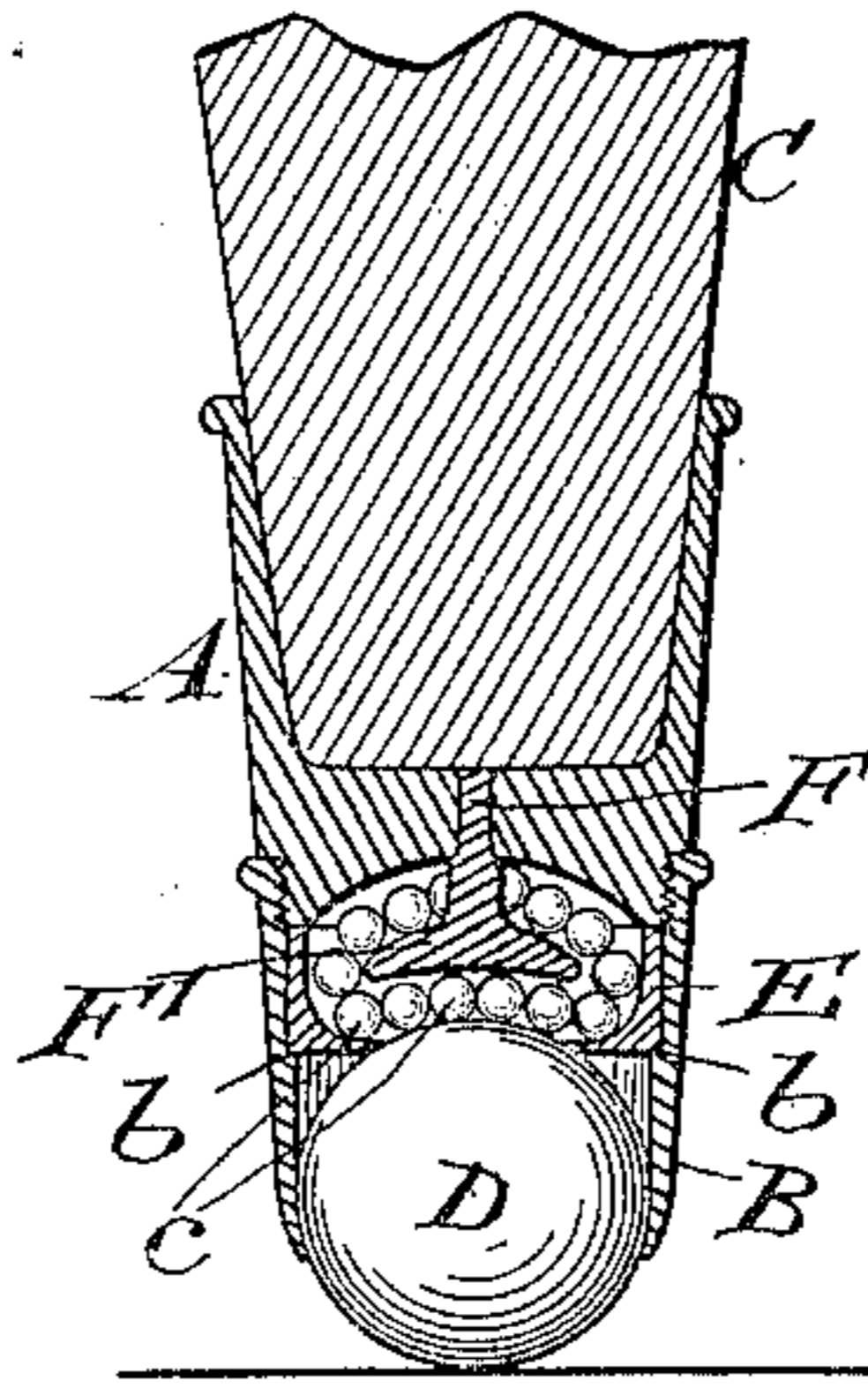


Fig. 3.

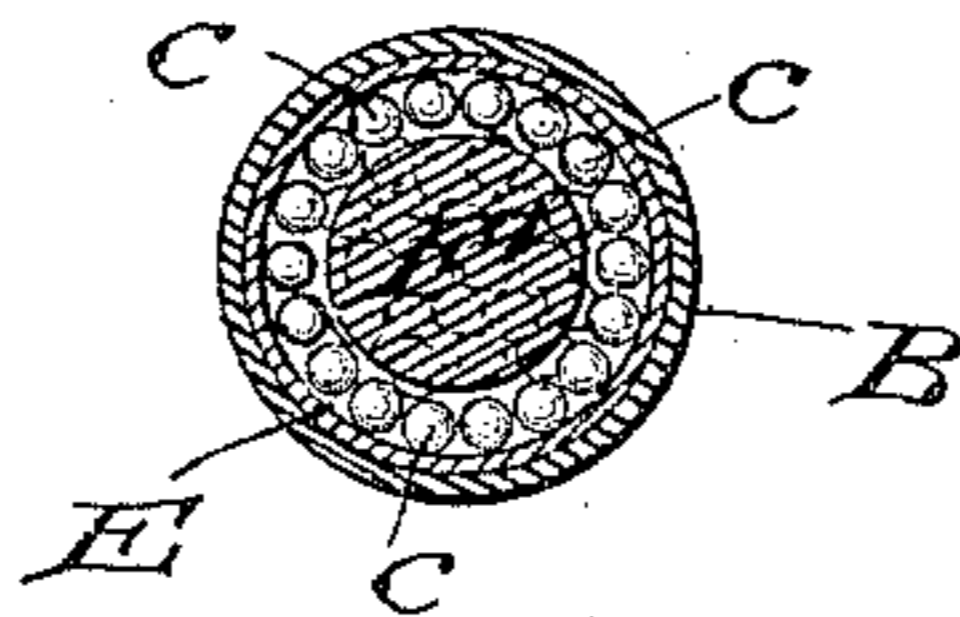


Fig. 4.

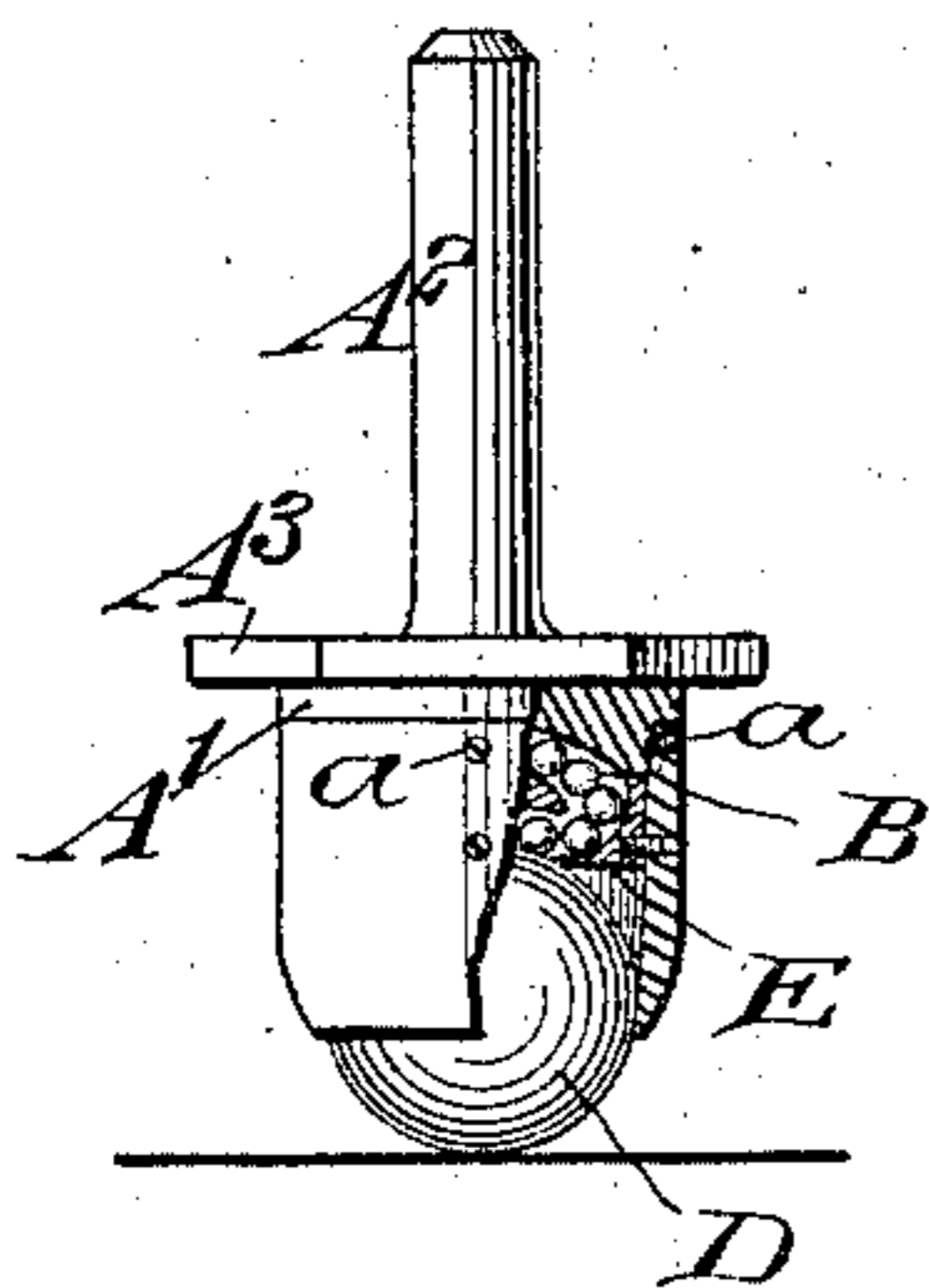


Fig. 5.

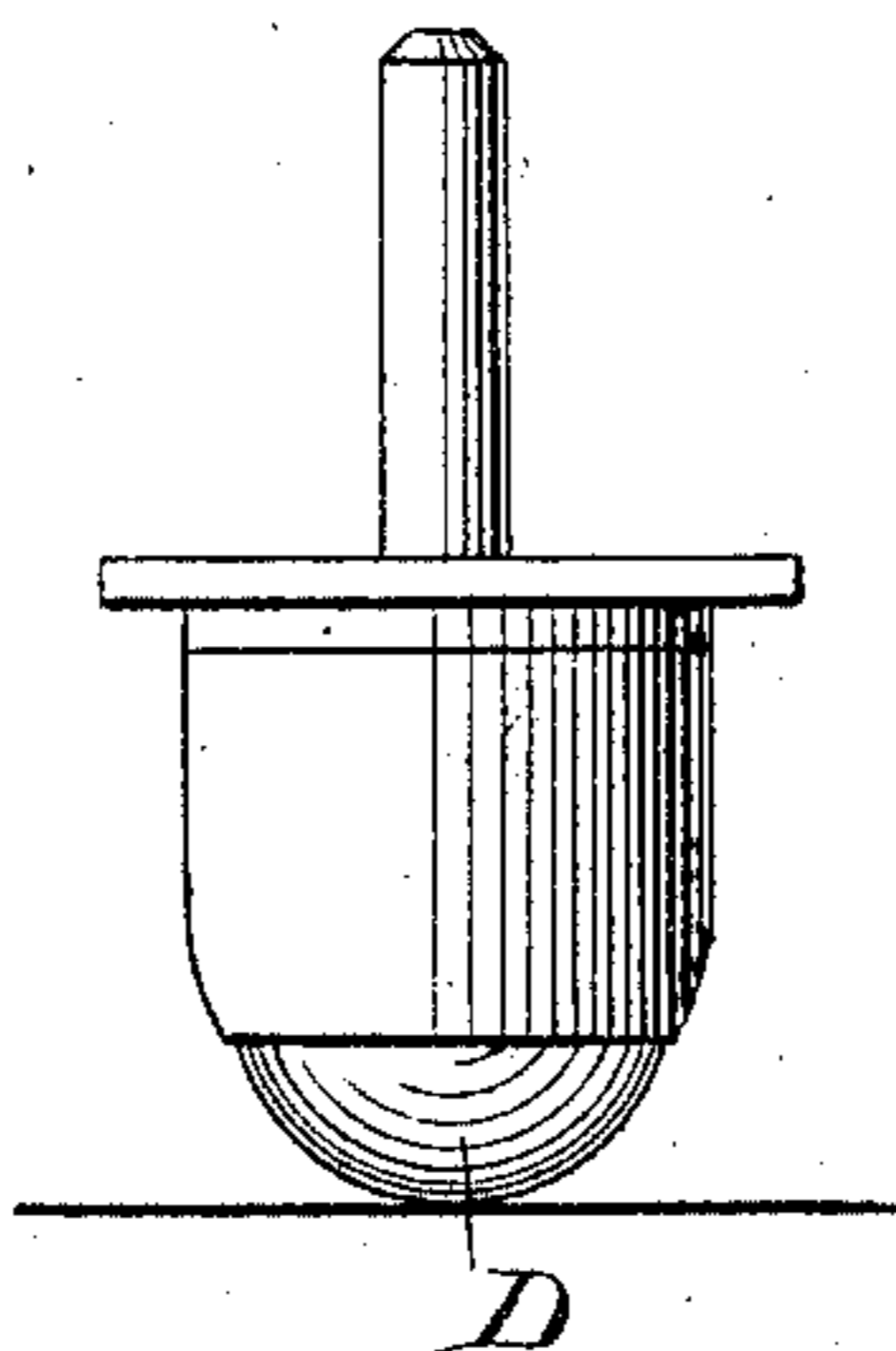
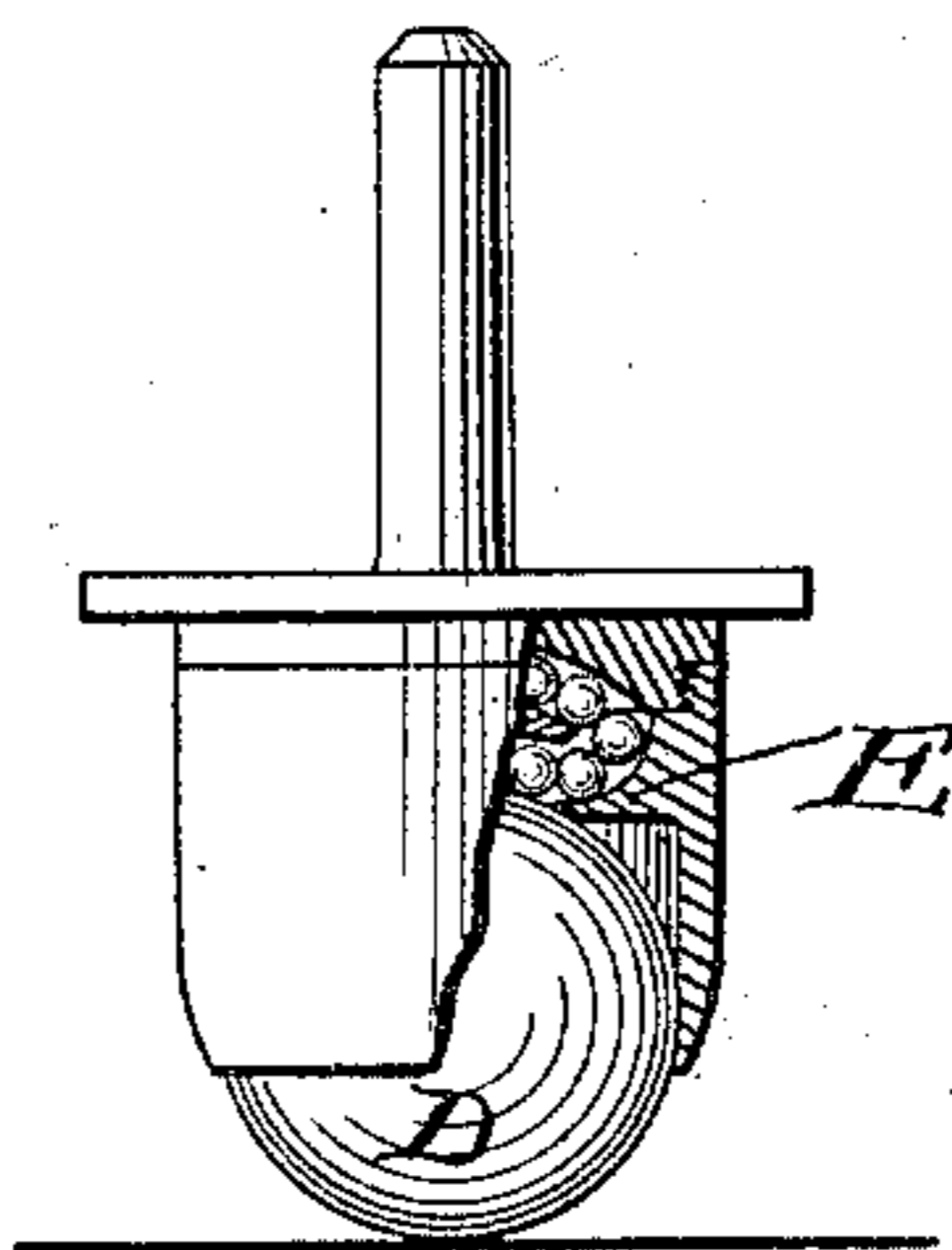


Fig. 6.



Witnesses:
George Barry Jr.
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Inventor:
Ralph M. Grove
By Brown & Howard
his Attorneys

UNITED STATES PATENT OFFICE.

RALPH M. GROVE, OF BROOKLYN, NEW YORK, ASSIGNOR TO THE ACME BALL BEARING CASTER COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY.

BALL-CASTER.

SPECIFICATION forming part of Letters Patent No. 725,076, dated April 14, 1903.

Application filed September 29, 1900. Serial No. 31,516. (No model.)

To all whom it may concern:

Be it known that I, RALPH M. GROVE, a citizen of the United States, and a resident of the borough of Brooklyn, in the city and State of New York, have invented a new and useful Improvement in Ball-Casters, of which the following is a specification.

My invention relates to that class of casters known as "ball-casters," within the casing of which a larger bearing-ball constituting the foot of the caster supports its load through the intervention of a number of relatively smaller antifriction-balls, and more particularly to that type of ball-casters in which a chamber is provided for antifriction-balls that are not at the instant supporting the load. In casters of this special type this ball-chamber has heretofore been constructed of a depth corresponding to the depth of the passage-way between the bearing-ball and the bearing-surface adjacent to it—that is, corresponding to the diameter of the antifriction-balls—leaving only just sufficient room for said balls to pass through said chamber. Such a construction is radically defective and gives rise to a binding action which serves to seriously impair the proper operation of the balls and render the caster imperfect and substantially useless in operation.

My present invention is directed to a structure which provides a relief or reserve ball-chamber of such character and size relatively to the diameter of the antifriction-balls as is adapted to secure a suitable amount of relief space for said balls.

My invention further contemplates means for locking the two parts of the caster-casing against unintentional separation when in action.

In the accompanying drawings, Figure 1 represents an elevation of a portion of a leg of a piece of furniture having applied to it a caster embodying my invention. Fig. 2 is a central vertical section of the same. Fig. 3 is a horizontal section on the line 3-3 of Fig. 2. Figs. 4 and 5 are elevations of casters, illustrating modifications of the invention, Fig. 4 being shown partly in section. Fig. 6 is a central vertical section of the caster shown in Fig. 5. Fig. 7 is a central vertical section of

still another form of caster embodying my invention.

Referring to Figs. 1, 2, and 3, A B designate the body of the caster, which is represented as for convenience of construction consisting of the upper member A in the form of a socket for the reception of the furniture-leg C, and the lower member B also in the form of a socket, which receives in its lower part the larger bearing-ball D, and the open bottom of which is contracted to retain the said bearing-ball. These sockets are shown in the illustration Fig. 2 as fitted with screw-threads for uniting them, and they are locked against any liability of separation by means of a stud pin or screw *a*, inserted through the body of one section into the other section. Instead of screwing these sockets together they may be telescoped one within the other, as is shown in the modified form Fig. 4, and two or more locking devices *a* may be inserted to hold them against displacement. Above the said bearing-ball D, Fig. 2, there is situated within the lower member B of the casing an internally-flanged marginal guide or ring E, which in the form of the device here shown consists of a removable ring held in position in a downward direction with its inner edge adjacent to but not in contact with the bearing-ball D by the taper of the interior of the body member B and in an upward direction by the lower end of the upper socket A. The upper part of the ball D protrudes centrally a little distance through this marginal guide E. The marginal guide E serves to properly support and direct the antifriction-balls as they approach and leave the surface of the bearing-ball, thus insuring the coöperation with the bearing-ball and the bearing-surface adjacent thereto of a number of smaller antifriction-balls in the operation of supporting the load. From the upper part of the casing, Fig. 2, there projects downward a rigid stem F, terminating in a bearing member or disk F', which has a lower concave bearing-face, preferably concentric with the bearing-ball D and adjacent thereto. The space or cavity formed between the marginal guide E, the disk F', and the bottom of the socket A forms a relief ball-chamber for

containing antifriction-balls *c c*, which are all of uniform size and are placed promiscuously within the said chamber in sufficient number to form a complete or nearly complete layer of balls between the upper and lower sides of the bearing-disk *F'* and the surrounding walls of the reserve ball-chamber and the top of the larger bearing-ball *D*.

The depth of the space between the larger ball *D* and the bearing-disk *F'* will be determined by the antifriction-balls *c*, which as they roll across the concave face of the disk *F'* form bearings for the larger ball *D* and sustain on the top of said larger ball *D* the weight of the article to which the caster is applied.

The upper face of the disk *F'* surrounding its stem is rounded off downward, and the space between it and the top of the ball-chamber is materially deeper than the diameter of a ball, preferably having a depth equal to or greater than one and a half times the diameter of an antifriction-ball, in order to permit a line of balls whenever from any cause they become cramped to find relief by the one rolling a short distance up and partially over its neighbor. Between the edge of the disk and the interior of the marginal guide *E* the space is sufficient for the balls to pass freely, and the edges of the disk and the interior of the ring are rounded to facilitate the rolling of the balls up and down between the portion of the chamber above the disk and the portion below.

The curved surface of the upper member *A* should join the inner surface of the ring *E*, and the conformation of the walls of the relief-chamber in other respects should be such as not to obstruct the movement of the antifriction-balls, so as to cause binding thereof in operation.

The number of antifriction-balls in the chamber should be more than sufficient to fill the whole of the space between the disk *F'* and the bearing-ball and may be many times more, but should not be sufficient to pack the space above the disk.

The balls may be inserted in any convenient way; but the most convenient way in the example represented is to place them in the marginal guide or ring *E* above the ball *D* while the upper and lower members *A B* are separated and then to put the two members together, in doing which the number of balls in excess of what are sufficient to fill the space between the disk *F'* and the ball *D*, and which may be termed "spare" balls, will easily pass into the space above the disk.

The load supported by the caster is transmitted to the bearing-ball *D* by the disk *F'* through the antifriction-balls immediately between the concave face of the disk *F'* and the top of the bearing-ball *D*. In operation the movement of the bearing-ball *D* across the floor in any direction will cause the antifriction-balls between the disk and the bearing-

ball to roll across the concave face of the disk till they pass the edge thereof. Thence they pass freely upward between the disk and the guide *E*. At the same time some of the spare antifriction-balls pass downward from the relief-chamber over the opposite side of the disk to the space between the face of the disk and the bearing-ball, which is thus always kept supplied with a sufficient number of bearing-balls. In this operation the antifriction-balls are all automatically interchangeable, those which are between the disk and the bearing-ball and which are the only ones at any time in operation being constantly changed by reason of the number of spare balls provided and the free and roomy passage afforded between the walls of the relief or reserve ball chamber. In this operation no binding will occur, because rubbing friction is almost entirely suppressed, and whenever there is a tendency to bind it will be instantly overcome by the relief which will take place in the relief-chamber by one ball partially mounting for the instant the neighboring ball. By reason of the space afforded in the relief-chamber, moreover, any dust or particles of grit or other substances which may be deposited among the antifriction-balls by the bearing-ball will not clog or bind the antifriction-balls, but will be carried through the relief-chamber and permitted to escape through the space between the inner edge of the guiding-ring and the surface of the bearing-ball.

The modified caster shown in Fig. 4 differs from the form shown in Figs. 1 and 2 in that the upper member *A'* of the caster-body, instead of being in the form of a socket to receive the furniture-leg, is made with a stem *A²* to enter the leg and with a flange *A³* to be fastened to the bottom of the leg, and the two parts of the body are secured by screws or pins *a*, instead of by threading the exterior of the part *A* and the interior of the part *B*, and the internal ring *E* is secured by screws or pins through the body portion *B*, instead of resting on an interior shoulder.

Fig. 6, which gives a central sectional view of Fig. 5, shows the marginal guide *E* as made solid—that is, in one piece with the casing. It will be seen that the larger bearing-ball *D* in this specific construction must be inserted from the bottom, after which the lower edge of the casing is bent or spun in against the bearing-ball below its center to help keep it in place. There is present, moreover, in this form of my invention, which indeed preceded the forms shown in the other figures, the relief-chamber in which, as in all the other forms, there should be over and above what space is actually needed to merely afford room for the antifriction-balls sufficient space to enable them, especially where likely to bind, to pass upward against or beyond a neighboring ball or balls, and so avert binding action and at the same time keep the pas-

sage-way between the bearing-ball D and the bearing-surface F' suitably supplied with balls.

5 The particular embodiment of my invention shown in Fig. 7, in which the marginal guide or ring E rests upon a shoulder b and is removable and in which the operative parts including the bearing-ball D are preferably inserted from the top, is a later improvement
10 upon the broad principle or invention herein described and claimed, and forms the specific matter of Letters Patent of the United States already granted to me, No. 621,605, dated March 21, 1899, in which Letters Patent the
15 broad invention of this present application was specifically reserved to form a part of the subject-matter of application Serial No. 706,348, filed February 21, 1899, of which this present application is a continuation.

20 In the use of expressions which imply the situation of the bearing-ball as at the foot of the caster the structure is looked upon as applied to, say, a piece of furniture resting on the floor or other similar situation; but my
25 new caster is suited to be made use of in a reverse or any other position—such, for example, as when the caster forms an element of an antifriction-track.

30 My invention in its broader aspects is not limited to the precise construction shown and described nor to the precise construction by which it may be carried into effect, as many changes other than those herein suggested may be made in such construction without
35 departing from the main principles of my invention and without sacrificing its chief advantages.

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

40 1. A ball-caster comprising a casing having a cavity formed therein, a bearing-ball held in coöperative relation with the casing, a concave bearing-surface located within said cavity and adjacent to the bearing-ball, a
45 chamber formed in said cavity adjacent to the bearing-surface and to the bearing-ball, and antifriction-balls located between the bearing-ball and the bearing-surface and also in said chamber, the distance between the
50 walls of the said chamber being materially greater than the diameter of the antifriction-balls and the location of said chamber and the conformation of the walls thereof being such as to make said chamber a relief-chamber and prevent binding of the balls when in
55 operation.

2. A ball-caster comprising a casing having a cavity formed therein, a bearing-ball in said cavity, a concave bearing-surface located
60 within said cavity and adjacent to the bearing-ball, a chamber formed in said cavity adjacent to the bearing-surface and the bearing-ball, antifriction-balls located between the bearing-ball and the bearing-surface and
65 also in said chamber, and means forming a suitable marginal guide for said antifriction-balls, the distance between the walls of the

said chamber being materially greater than the diameter of the antifriction-balls, whereby binding of the balls when in operation is
70 prevented, substantially as described.

3. A ball-caster comprising a casing having a cavity formed therein, a bearing-ball in said cavity, a concave bearing-surface located within said cavity and adjacent to the
75 bearing-ball, a chamber formed in said cavity adjacent to the bearing-surface and the bearing-ball, antifriction-balls located between the bearing-ball and the bearing-surface and also in said chamber, and a ring
80 forming a suitable marginal guide for said antifriction-balls, the distance between the walls of the said chamber being materially greater than the diameter of the antifriction-balls, whereby binding of the balls when in
85 operation is prevented, substantially as described.

4. A ball-caster comprising a casing having a cavity formed therein, a bearing-ball in said cavity, a concave bearing-surface located within said cavity and adjacent to the
90 bearing-ball, a chamber formed in said cavity adjacent to the bearing-surface and the bearing-ball, antifriction-balls located between the bearing-ball and the bearing-surface and also
95 in said chamber, a ring forming a suitable marginal guide for said antifriction-balls, and means for fixing the position of said ring with relation to both the bearing-ball and the bearing-surface, the distance between
100 the walls of the said chamber being materially greater than the diameter of the antifriction-balls, whereby binding of the balls when in operation is prevented, substantially as described.
105

5. A ball-caster comprising a casing having a cavity formed therein, a bearing-ball held in coöperative relation with the casing, a bearing member located within said cavity and adjacent to the bearing-ball, said bearing
110 member being spaced from the walls of the cavity to form a chamber and antifriction-balls located between the bearing-ball and the bearing member and also in said chamber, the distance between the walls of
115 the said chamber being materially greater than the diameter of the antifriction-balls and the conformation of the walls of said chamber being such as to make the same a relief-chamber and prevent binding of the
120 balls when in operation, substantially as described.

6. A ball-caster comprising a casing having a cavity formed therein, a bearing-ball held in coöperative relation with the casing,
125 a bearing member located within said cavity and having a concave bearing-surface facing said bearing-ball, said bearing member being spaced from the walls of the cavity to form a chamber, antifriction-balls located
130 between the bearing-ball and the bearing-surface and also in said chamber, a ring forming a suitable marginal guide for said antifriction-balls, and means for fixing the

position of said ring with relation to both the bearing-ball and the bearing member, the distance between the walls of the said chamber and the conformation of said walls being such as to make said chamber a relief-chamber and prevent binding of the balls when in operation, substantially as described.

7. A ball-caster comprising a hollow body, means forming a marginal support for anti-friction-balls, a central bearing-ball, a supporting-disk located within said hollow body above the central bearing-ball and provided with a concave face directed toward the top of the said central bearing-ball, the said disk being spaced from its support to form a reserve-chamber for antifriction-balls and a number of antifriction-balls located in said reserve-chamber and between the top of the central bearing-ball and the concave face of the disk, the space between the top of said bearing-disk and its support having a depth materially greater than the diameter of an antifriction-ball whereby one ball is permitted to roll up and partially over the side of an adjacent ball to prevent the binding of the balls when in operation, substantially as described.

8. A ball-caster comprising a hollow body, a central bearing-ball, a supporting-disk located within the hollow body above the central bearing-ball and provided with a concave face directed toward the top of the said central bearing-ball, the said disk being spaced

from its support to form a reserve-chamber for antifriction-balls, an annular ring separate from and located within the hollow body and forming a marginal support for antifriction-balls, means for supporting the said annular ring out of contact with the central bearing-ball, antifriction-balls located in the reserve-chamber and between the said disk and central bearing-ball and a closure for the top of the hollow body, substantially as described.

9. A ball-caster comprising a two-part hollow body, the lower part having an internal taper, means for holding the parts of the hollow body engaged with each other, a central bearing-ball held within the lower part of the hollow body, an internal ring through which the top of the central bearing-ball protrudes, said ring being tapered exteriorly to correspond with internal taper of the lower part of the body, a nest of antifriction-balls resting on said central bearing-ball and ring and a bearing-disk fixed to the upper part of the hollow body and surrounded by said antifriction-balls, substantially as described.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 4th day of August, 1900.

RALPH M. GROVE.

Witnesses:

FREDK. HAYNES,
C. S. SUNDGREN.