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H. C. HULICK, JR
GYRATORY DEVICES

2,829,528

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2 Sheets-Sheet 1

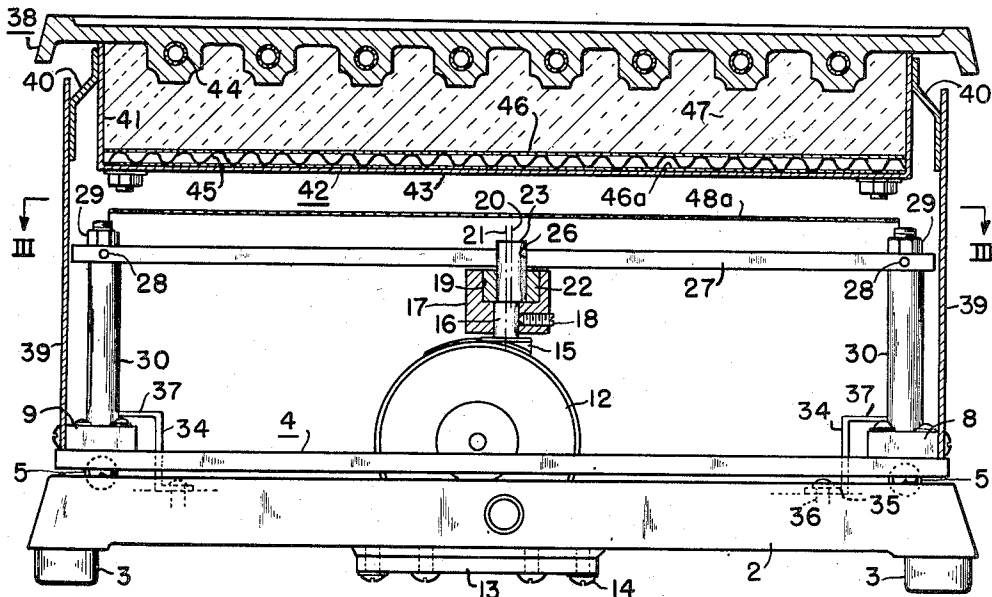


Fig. 1

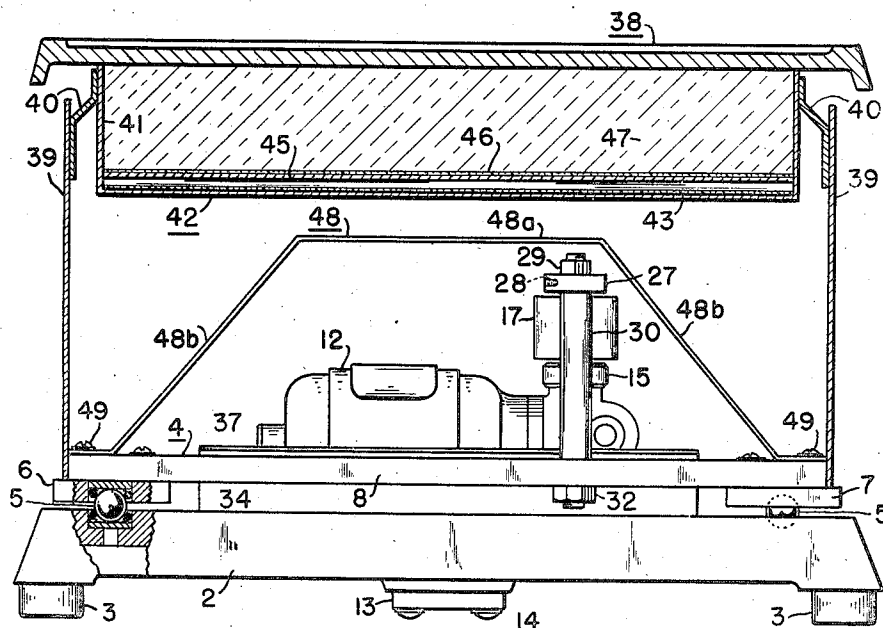


Fig. 2

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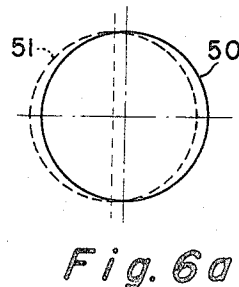
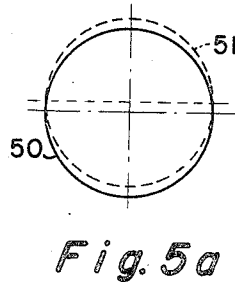
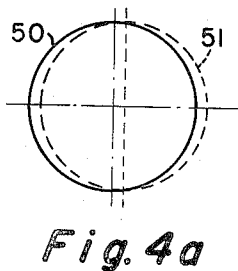
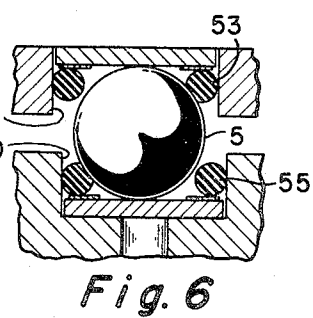
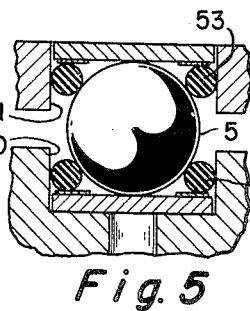
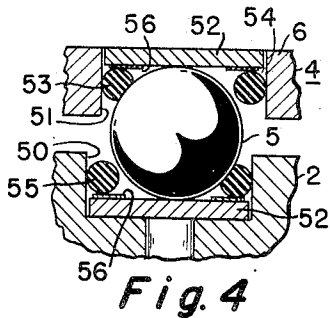
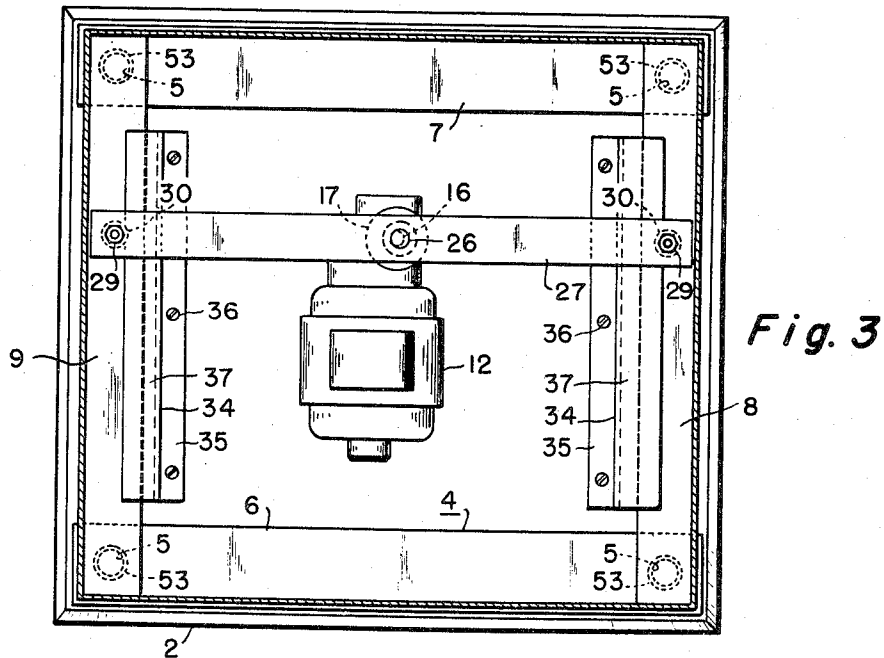
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2 Sheets-Sheet 2



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GYRATORY DEVICES

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6 Claims. (Cl. 74—86)

This invention relates to gyratory devices. It is described herein more particularly as applied to gyratory hot plates for use in laboratories or other places. It is desirable in some instances to cause a hot plate to gyrate so that the material being heated on the hot plate is agitated while it is being heated. However, certain features of the invention are applicable to causing a plate to gyrate or other support which is not heated.

In the accompanying drawings which illustrate a preferred embodiment of my invention,

Figure 1 is a front elevation of my gyratory device with the front jacket portion removed, parts being shown in vertical section;

Figure 2 is a side elevation of the device shown in Figure 1 with the side jacket portion removed, parts being shown in vertical section;

Figure 3 is a horizontal section taken on the line III—III of Figure 1 and on a scale slightly reduced from that used in Figures 1 and 2;

Figures 4, 5 and 6 are enlarged vertical sections illustrating the bearings between the base and the gyratory frame, the different figures showing the frame in different positions relative to the base; and

Figures 4a, 5a and 6a correspond respectively to Figures 4, 5 and 6 and are diagrammatic plan views in which the recess in the base and its center line are shown in full lines and the recess in the frame and its center line are shown in dotted lines.

Referring more particularly to the accompanying drawings, the gyratory device comprises a base 2 having feet 3. It is substantially rectangular in plan view. A frame designated generally by reference numeral 4 is movably supported adjacent each of the four corners of the frame by a ball bearing 5 which is described more particularly hereinafter. The frame 4 comprises a front rail 6, a rear rail 7 and two side rails 8 and 9.

The frame 4 is caused to gyrate relative to the base 2 by a motor 12 and connections between the motor and the frame. The motor is mounted on a motor base 13 which is fixed to the base 2 by screws 14. The motor operates through a gear reduction unit 15 to drive a vertical shaft 16. A bearing retainer 17 is secured to the shaft 16 by a set screw 18. The bearing retainer is provided with a recess 19, the vertical axis 20 of which is located eccentrically to the vertical axis 21 of shaft 16. A bearing 22 made of graphite or other heat resisting material is located in the bearing retainer 17 and receives a pin 23 whose vertical axis 20 is eccentrically located with respect to the vertical axis 21 of the shaft 16. The pin is received in an opening 26 in a bar 27. The pin may be rigidly connected to the bar or loosely received in the opening 26. The bar 27 extends in opposite directions from the pin 23 and its opposite ends are rigidly connected by set screws 28 and nuts 29 to upstanding posts 30 which are secured at their lower ends to the side rails 8 and 9 of the frame by nuts 32. Hold-downs 34 secured at their lower ends 35 to the base 2 by screws 36 have horizontally extending flanges 37 fitting over the side rails 8

and 9 to hold the movable frame 4 to the base but allow gyration of the frame relative to the base.

A hot plate designated generally by reference numeral 38 is located above the motor 12 and its driving connections and is spaced therefrom. It is supported from the movable frame 4 by the plates 39 which form a jacket for the device and by brackets 40 secured to the plates 39 and to plates 41 forming the side wall of a pan 42 having a bottom 43 which is spaced below the hot plate 38. The hot plate is of a known construction comprising electric resistance heating elements 44. The bottom 43 supports a corrugated metal sheet 45 placed between two sheets 46 and 46a of asbestos. The space between the sheet 46 and the hot plate 38 is filled with rock wool 47 or other heat insulation. A heat reflecting metal shield 48 having a flat top 48a and downwardly sloping front and back walls 48b is interposed between the hot plate 38 and the motor 12 and its driving connections. The shield is secured to the frame 4 by screws 49.

Referring now more particularly to Figures 4–6 and Figures 4a–6a, a ball bearing 5 supports the frame 4 from the base 2 adjacent each of the corners of the frame. The base 2 is provided adjacent each of its corners with an upwardly opening circular recess 50 and the front and rear rails 6 and 7 of the frame 4 are provided adjacent each end with a downwardly opening circular recess 51, a pair of these recesses cooperating to receive a ball bearing 5. A wear plate 52 of hard material is provided in each recess for contacting the ball bearing and supporting the weight of the movable frame 4 and the hot plate 38. The diameter of each recess 50 and 51 is somewhat greater than the diameter of the ball bearing 5. An upper O-ring 53 of rubber or other resilient material is interposed between the ball bearing 5 and the corner 54 between the side wall of the recess and the wear plate 52. A lower O-ring 55 is similarly located in the corner 54 between the side wall of the recess 50 in the base 2 and the wear plate 52. Shims 56 are provided where necessary between the wear plates and the O-rings.

The operation of the device is as follows:

When the motor 12 is started, the eccentrically mounted pin 23 gyrates in a circle. The pin 23 is connected to the posts 30 on the frame by bar 27. This tends to cause all points to gyrate on the frame but it has been found in practice that where the frame is mounted on the base by the usual form of ball bearing mounting, all points on the frame do not gyrate. Some points merely oscillate back and forth or take irregular paths giving non-uniform motion to different parts of the frame and to the hot plate mounted thereon. This is due to the fact that it is impossible to eliminate all play in the connections between the movable frame 4 and the gyratory pin 23.

In accordance with the present invention, the ball bearings 5 at the corners of the movable frame are positively guided to gyrate, thereby causing all points to gyrate on the frame and the hot plate mounted thereon in a uniform manner.

In Figures 4 and 4a, the movable frame 4, which includes the front rail 6 and the rear rail 7, has moved to its extreme right-hand position with respect to the base 2. The recess 51 in the frame has moved to its extreme right-hand position relative to the recess 50 in the base. In reaching this position, the left-hand portion of upper O-ring 53 has contacted the ball bearing 5 and has rolled it to the right and has compressed the right-hand portion of the lower O-ring 55. Assuming that the recess 51 rotates counterclockwise with respect to recess 50, as the frame 4 moves rearwardly to the position shown in Figure 5a, the front portion (not shown) of the upper O-ring 53 contacts the ball bearing 5 and moves it rearwardly. In this position, the ball bearing will be in contact with the front portion of the upper O-ring 53 and with the rear

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portion of the lower O-ring 55. As the frame moves from the position shown in Figure 5a to that shown in Figure 6a, the frame 4 moves to the left causing the right-hand portion of the upper O-ring 53 to contact the ball bearing and roll it slightly to the left into contact with the left-hand portion of the lower O-ring 55. The frame 4 will then move forwardly and then to the right into the position shown in Figure 4a. In these further movements, the O-rings act in a manner similar to that described. In each position of the frame with respect to the base, the ball bearing 5 presses against the upper O-ring 53 at one point and against the lower O-ring 55 at another point. A slight compression of the rubber keeps the unit tight and free of play. As the frame 4 gyrates, the ball bearing 5 travels around the inside diameter of each O-ring where it maintains contact and is directed in a circular path. Thus, the frame 4 is supported adjacent each corner on the base 2 by a ball bearing 5 which is positively directed in a circular path, thereby causing each of the four corners of the frame to gyrate in a uniform manner. Since the hot plate 38 is mounted on the frame 4, all parts of the hot plate gyrate in a uniform manner so that materials being heated on the hot plate are stirred uniformly throughout all portions of the material.

The invention is not limited to the preferred embodiment but may be otherwise embodied or practiced within the scope of the following claims.

I claim:

1. A gyratory device comprising a base, a frame, means for causing said frame to gyrate relative to said base, said base being provided with recesses opening toward said frame, said frame being provided with cooperating recesses opening toward said base, a ball bearing in each pair of cooperating recesses supporting said frame on said base, and resilient material interposed between each ball bearing and the side walls of said recesses.

2. A gyratory device comprising a base, a frame, means for causing said frame to gyrate relative to said base, said base being provided with recesses opening toward said frame, said frame being provided with cooperating re-

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cesses opening toward said base, a ball bearing in each pair of cooperating recesses supporting said frame on said base, and a ring of resilient material interposed between each ball bearing and the side walls of said recesses.

3. A gyratory device according to claim 1, wherein the diameter of each recess forming a pair of cooperating recesses is greater than the diameter of the ball bearing received therein so as to allow the ball bearing to roll in said recesses.

4. A gyratory device according to claim 1, wherein a ball bearing operating in a pair of cooperating recesses is provided adjacent each corner of the frame.

5. A gyratory device according to claim 1, wherein the means for causing said frame to gyrate relative to said base comprises a motor fixed to said base, an upwardly extending shaft driven by said motor, an eccentric fixed to said shaft, a pin oscillated by said eccentric, two upstanding posts secured to said frame adjacent opposite sides of said frame, and a bar fixed to each of said posts and connected to said pin.

6. A gyratory device comprising a base, a frame located above said base, means for causing said frame to gyrate relative to said base, said base being provided in its upper surface with upwardly opening recesses, said frame being provided in its lower surface with downwardly opening cooperating recesses, a ball bearing in each pair of cooperating recesses supporting said frame on said base, an upper O-ring of resilient material interposed between each of said ball bearings and the side wall of the recess in said frame, and a lower O-ring of resilient material interposed between each of said ball bearings and the side wall of the recess in said base.

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