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GLOBE SUPPORT AND ORIENTING MEANS

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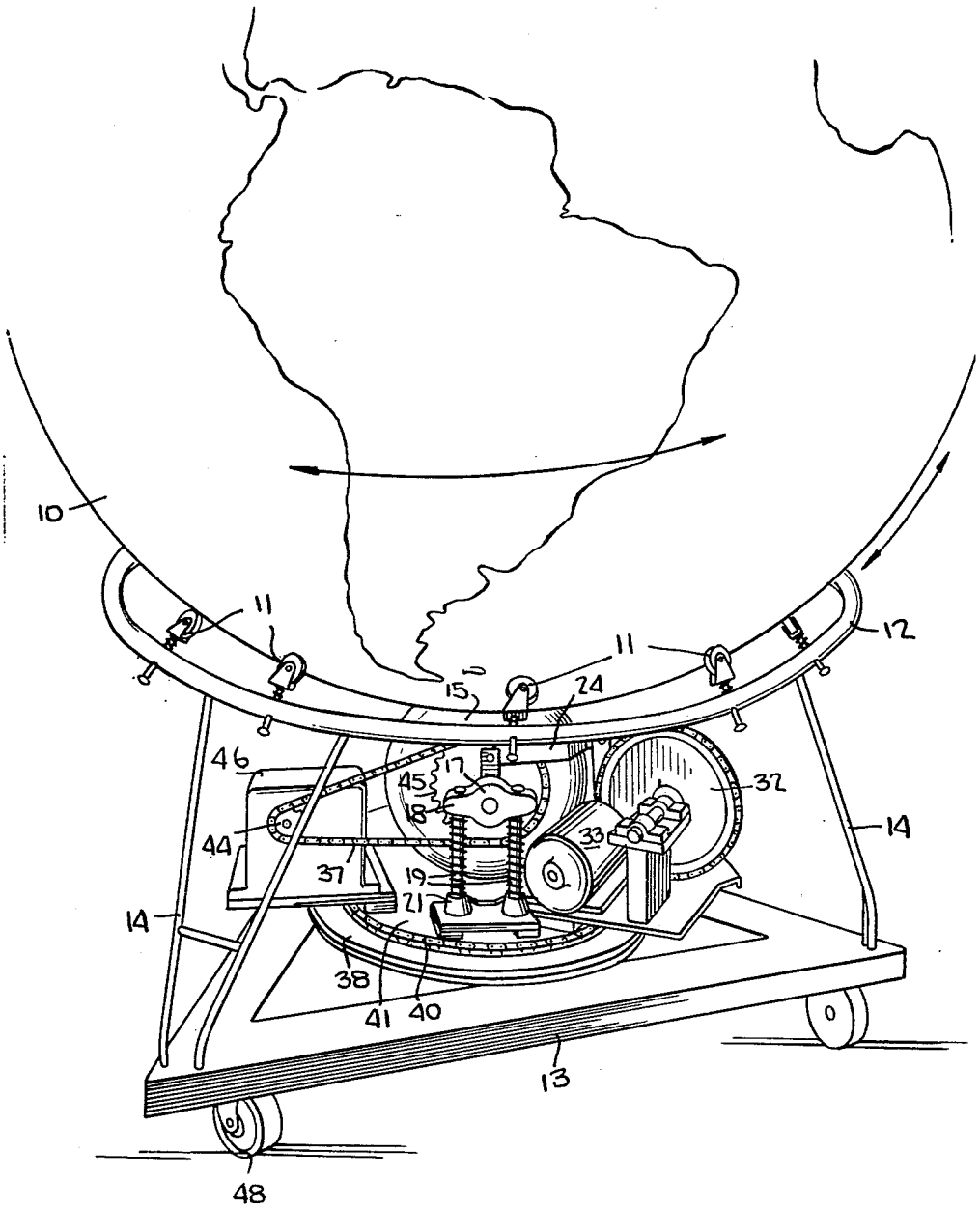

Fig. 1.

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Fig. 2.

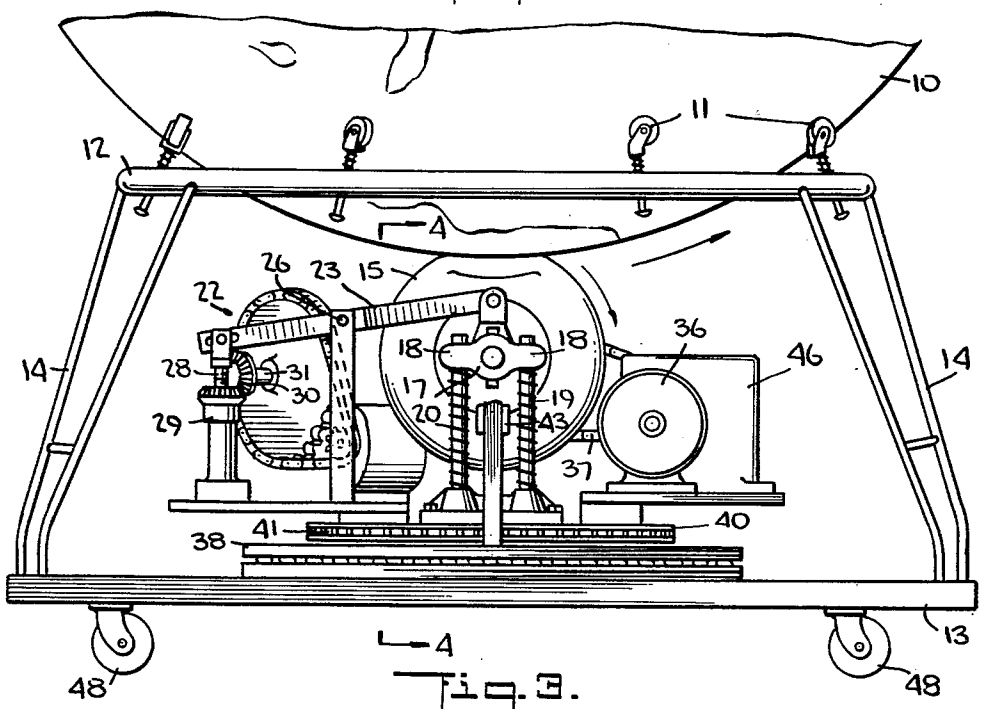

Fig. 3.

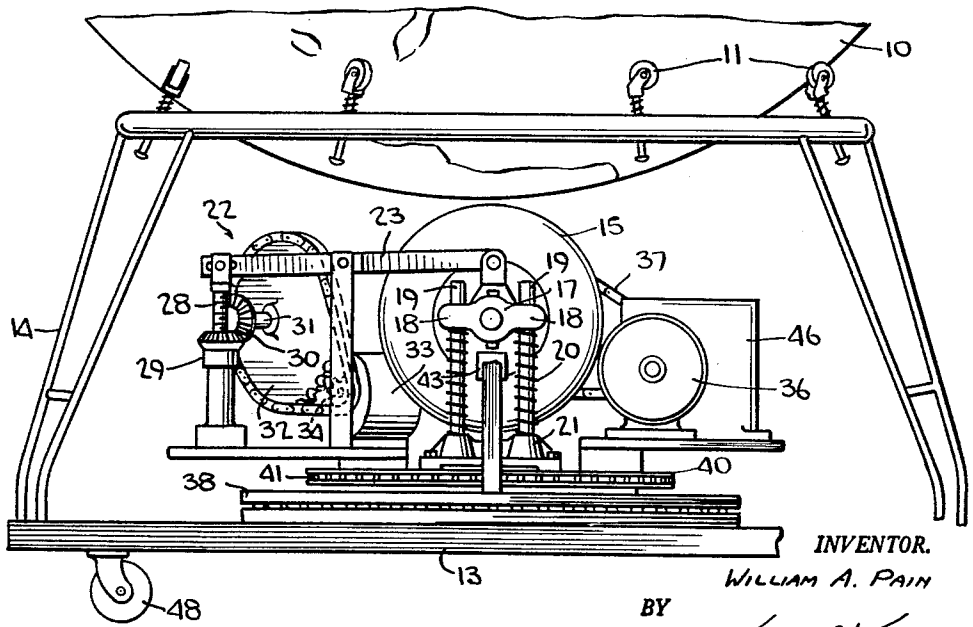

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Fig. 3.

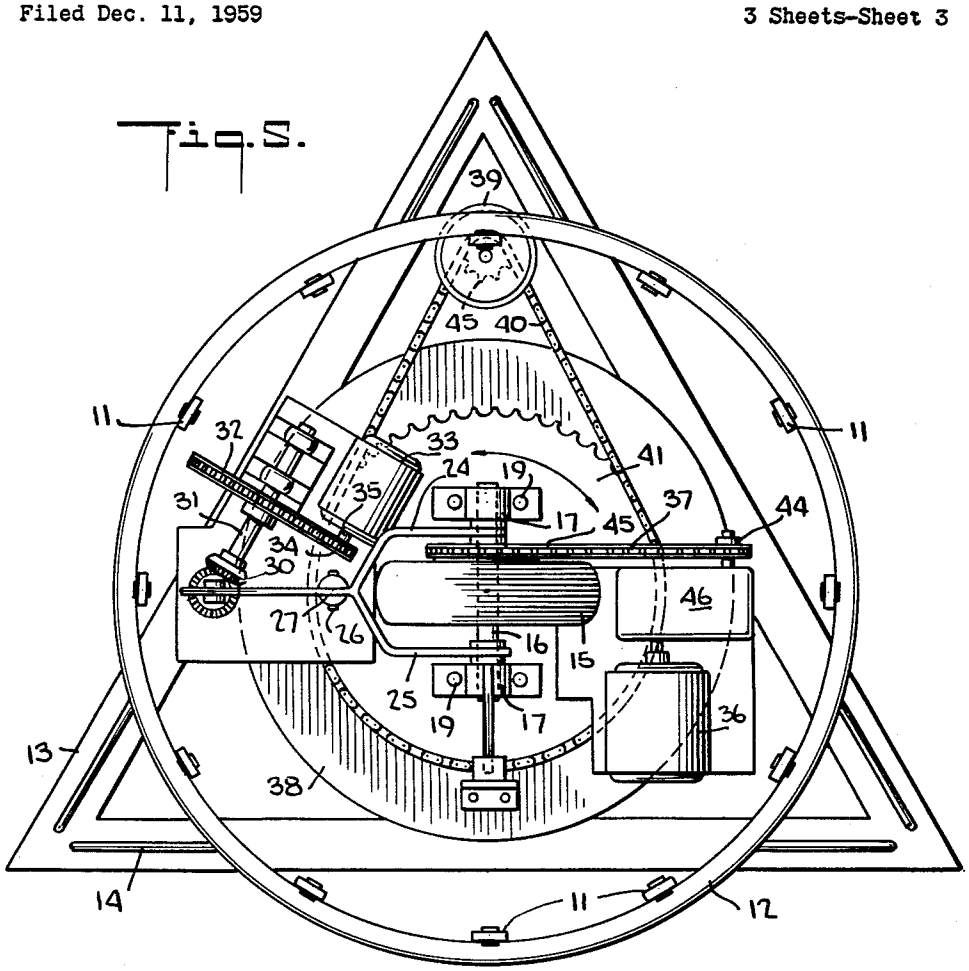
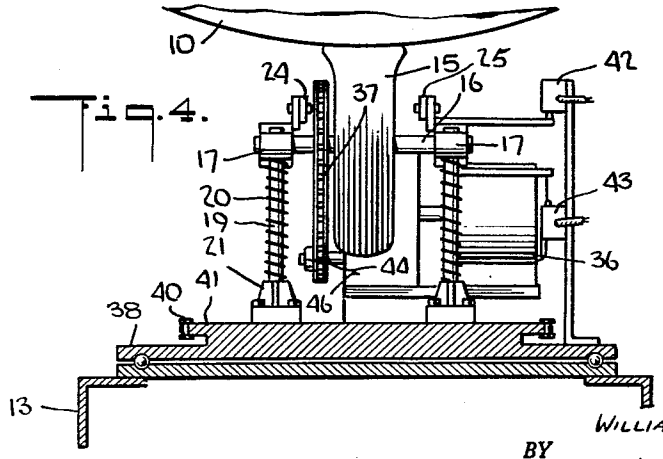


Fig. 4.



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GLOBE SUPPORT AND ORIENTING MEANS

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11 Claims. (Cl. 35—46)

This invention relates to a globe support and orienting means suitable for supporting and orienting a relatively heavy, large diameter sphere.

Spheres, in particular globes representing the earth, are advantageously employed for many different purposes. The smaller of these globes, such as are used in libraries or homes, are usually mounted so that they may be manually rotated about either a horizontal or a vertical axis in order to expose a particular portion of the earth's surface to the viewer.

The variety of globe mounts which find such widespread use in conjunction with the relatively small globes described above, usually support the sphere from two fixed points, the poles, and are eminently unsuited for use with large spheres having diameters of the order of six feet or more and weighing a few hundred pounds. Because of their large weight and diameter, special supporting and orienting devices must be designed for these large globes in order to rotate them about axes other than the polar axis.

The problem of supporting and orienting large size spheres without obstructing the polar regions, becomes even more difficult in the instance of the so-called bas-relief globes. As is well known, the surface contour of these globes is representative of the elevation above sea level of the earth's surface. Since bas-relief globes are generally fabricated from materials which do not possess relatively high compression strength, improper supporting and orienting means may result in partial distortion of the extended portions of the globe surface.

Accordingly, it is an object of the present invention to provide a globe support and orienting means which is suitable for use with relatively heavy, large diameter bas-relief globes.

A further object of the present invention is to provide a globe support and orienting means which can be automatically operated to orient the supported globe in a desired position.

Briefly stated, the device of the present invention comprises a base, supporting means attached to said base and equipped with a plurality of spring loaded universally rotatable means which collectively serve as supports upon which a globe may rest, a wheel rotatable about a substantially horizontal axis mounted below the supported globe and vertically movable into frictional engagement therewith, said wheel also being rotatable about a substantially vertical axis.

Other objects and features of this invention will be readily apparent from the following specification taken in conjunction with the accompanying drawings in which:

Fig. 1 is a perspective view of a globe support positioner in accordance with this invention with a globe mounted thereon;

Fig. 2 is a front elevational view of the globe support positioner of Fig. 1 depicting the manner in which the globe may be oriented;

Fig. 3 is a front elevational view of the globe support positioner of Fig. 1 depicting its use as a support means only;

Fig. 4 is a side elevational view partly in section of the globe support positioner of Fig. 1, and

Fig. 5 is a plan view of the globe support positioner of Fig. 1.

With reference now to the drawings, Fig. 1 depicts globe 10 supported by a plurality of spring-loaded universally rotatable means, for example spring-loaded casters 11. Casters 11 are fastened to ring 12 which in turn is rigidly connected to base 13 by structural members 14.

A wheel 15 with an easily compressible surface such as a pneumatic tire is keyed to a horizontally disposed axle 16. The journals of axle 16 are engaged in vertically movable bearings 17. Each of bearings 17 is fitted with flanges 18 adapted to receive vertical guides 19 mounted on bases 21. Compression springs 20 are disposed between the respective bearings 17 and the respective bases 21 of guides 19, to provide a biasing force in the upward direction.

Axle 16 is keyed to gear 45 which in turn is coupled to reversible rotary power means, for example electric motor 36, through chain 37, gear 44, and gear reducer 46. Thus, rotation of wheel 15 in the desired direction is accomplished by energizing motor 36 appropriately. The electrical wiring of motor 36 is conventional and is not shown in the drawings.

Lever arm assembly 22 provides the movement necessary to frictionally engage wheel 15 with globe 10. One end of lever arm 23 is in the shape of a yoke comprising members 24 and 25. Members 24 and 25 are each rotatably connected to one of the bearings 17. A point 26 intermediate the ends of lever arm 23 is pivotally connected to support 27. The other end of lever arm 23 is pivotally connected to screw 28. Screw 28 is in threaded engagement with nut 29 which is prevented by means, not shown, from moving in a vertical direction. The upper portion of nut 29 is provided with beveled gear teeth and is engaged with bevel gear 30. Gear 30 is fastened to shaft 31 which in turn is attached to gear 32. Gear 32 is coupled by a chain drive to reversible rotary power means, for example, motor 33 through gear 34 fastened to the rotor 35 thereof. The electric wiring of motor 33 is conventional and is not shown in the drawings.

Lever arm assembly 22 and wheel 15 and associated driving equipment are attached to turntable 38 which rotates independently of base 13. Turntable 38 is caused to rotate by reversible rotary energy source such as electric motor 39 attached to base 13. Electric motor 39 is coupled to turntable 38 through gear 45, chain 40 and gear 41. The electric wiring for motor 39 is conventional and is not shown.

The operation of the inventive globe support and orienting means may be readily understood from the following description. In the normal or supporting position the full weight of globe 10 is supported by the plurality of casters 11. This condition is shown in Fig. 3. To orient the globe to a new desired position, wheel 15 is raised to bring it into frictional engagement with the surface of globe 10. To this end motor 33 is energized. By virtue of the gearing arrangement depicted in Fig. 5, nut 29 is caused to rotate. The rotation of nut 29 in the appropriate direction causes screw 28 to move in a downward direction. Since the end of lever arm 23 which is attached to screw 28 is moving in a downward direction the opposite end of lever arm 23 is caused to move in an upward direction. In this manner wheel 15 may be brought into frictional engagement with the surface of sphere 10. This condition is depicted in Fig. 2 of the drawings. Compression springs 20 are preferably designed so that a minimum of force is needed to

frictionally engage wheel 15 with globe 10. This is discussed in greater detail below.

With wheel 15 in frictional engagement with globe 10, a new orientation about a horizontal axis may be attained by energizing motor 36 which is coupled to wheel 15. Clearly, the rotation of wheel 15 will produce rotation of globe 10 in the opposite direction.

It is essential for proper operation of the present globe orienting means that wheel 15 partially support globe 10. This is necessitated by consideration of two factors which are equally important. Firstly, in the normal or supporting position, the entire weight of globe 10 is supported by casters 11. Under such conditions there is a very large frictional force between the surface of globe 10 and the respective wheels of casters 11 which tend to prevent globe 10 from rotating. This situation is remedied by elevating wheel 15 until it shares with casters 11 the burden of supporting globe 10.

Secondly, in order to impart movement to globe 10 through wheel 15 without substantial slippage, it is necessary that there be sufficient frictional drag between wheel 15 and the surface of globe 10 to overcome the inertia of the heavy globe. This requirement is also met if wheel 15 partially supports globe 10.

To prevent raising wheel 15 to an excessive elevation limit switch 42, shown in Figure 4, is provided. This switch is electrically connected, by means not shown, in the energizing circuit of motor 33.

With wheel 15 in frictional engagement with the surface of globe 10, as shown in Figure 2, the globe 10 may be rotated about a horizontal axis by causing wheel 15 to rotate. In most instances, however, this type of control will be insufficient to provide the exact orientation desired. Accordingly, means have been provided to rotate wheel 15 about a vertical axis. As shown in Figure 5, motor 39 is coupled to gear 41 through chain 40. Gear 41 is in fact an integral part of turntable 38. Thus by energizing motor 39, turntable 38 and all equipment attached thereto may be caused to rotate about a vertical axis. Such rotation, of course, is independent of base 13.

The result of rotating turntable 38 simultaneously with the rotation of wheel 15 about axle 16 may be best described by reference to the operation of an automobile. As is well known, considerable difficulty is experienced in turning the front wheels of an automobile when the car is stationary. Relating this situation to the present one, it is noted that it would be difficult to cause globe 10 to rotate about a vertical axis by rotation of turntable 38 if wheel 15 is not rotating about axle 16. On the other hand, very little resistance is encountered in turning the steering wheel of a moving automobile. The rotation of the steering wheel of a moving automobile causes the car to move in a direction determined by the direction of the front wheels. Similarly globe 10 may be readily rotated about a vertical axis provided it is also rotating about a horizontal axis as a result of the rotation of wheel 15 about axle 16. Thus by a combination of rotating means, namely, turntable 38 and wheel 15, globe 10 may be simultaneously rotated about both horizontal and vertical axes.

Following orientation of the globe as described above, motor 33 is energized in a manner causing it to rotate in the opposite direction, which in turn causes screw 28 to move upwards thereby disengaging wheel 15 from the surface of globe 10. Limit switch 43 is connected in the energizing circuit of motor 33, by means not shown, to prevent excessive downward movement of wheel 15.

Base 13 may be provided with wheels or casters 44 to assist in moving the globe support positioner.

The two features of the globe support and orienting means which facilitate its use with bas-relief globes are the use of an easily compressible medium, such as a pneumatic tire, to transmit motion, and secondly the use of spring-loaded universally rotating means, such as casters or ball bearings, to support the globe. The easily compressible medium such as the pneumatic tire employed in the particular apparatus described above with yield to the elevated portions of the bas-relief globe so that contact between such portions and the tire does not tend to flatten such elevated portions. The advantages of this type of power transmission are more readily appreciated by comparison with a hard surface medium which clearly would tend to flatten the delicate elevated areas of the bas-relief globe.

Equally important as a means of protecting the elevated portions of a bas-relief globe are the spring-loaded supporting means. As the globe is rotating in the positioner the elevated portions will, from time to time, come into direct contact with one or more of the spring-loaded supports. The use of compression springs in the structure of these supports permits the one or two which are in contact with the elevated portions of the bas-relief globe to yield by retracting sufficiently to permit the elevated portions to pass thereunder. Elimination of the spring-loading feature from these supporting means would essentially place a large amount of strain on the elevated portions of the globe which are in contact with the supporting means thereby tending to flatten or distort such areas.

In connection with the use of spring-loaded supporting means, such as casters, it is noted that there is a preferred direction of orientation for the spring-loaded shafts thereof. There will be least frictional drag on the reciprocal motion of the spring-loaded casters if they are positioned so that the force tending to compress the spring is parallel with the longitudinal axis of the spring. The force vector resulting from the support of the globe by the casters will originate from the point of contact between the caster wheel and the globe surface and will be in fact an extension of the radius of the globe which intersects the surface of the globe at the point of contact between the caster wheel of the globe surface. Accordingly friction is minimized by mounting the casters so that each of the shafts and the compression spring used in conjunction therewith is an extension in space of the radius of the globe which intersects the surface of the globe at the point of contact between the caster wheel and the globe surface.

It is to be understood that the specific example described above is merely illustrative of the present invention. Component parts which have equivalent functions may be substituted for the structural and operating parts of the described apparatus by one skilled in the art without departing from the spirit and scope of this invention.

I claim:

1. A globe support and orienting means comprising a base, supporting means attached to said base and equipped with a plurality of spring-loaded universally rotatable means which collectively serve as supports upon which a globe may rest, a vertically movable wheel rotatable about a substantially horizontal axis mounted below the supported globe, said wheel also being rotatable about a substantially vertical axis, means for raising said wheel into frictional engagement with said supported globe, and means for rotating said wheel about said axes.

2. The globe support and orienting means of claim 1 in which the peripheral surface of said wheel is easily compressible.

3. A globe support and orienting means comprising a base, supporting means attached to said base and equipped with a plurality of spring-loaded casters which collectively serve as supports upon which a globe may rest, a vertically movable wheel rotatable about a substantially horizontal axis mounted below the supported globe, said wheel also being rotatable about a substantially vertical axis, means for raising said wheel into frictional engagement with said supported globe, and means for rotating said wheel about said axes.

4. In combination, a bas-relief globe and a globe support and orienting means comprising a base, supporting means attached to said base and equipped with a plu-

rality of spring-loaded casters which collectively serve as supports upon which said glove rests, a vertically movable wheel having an easily compressible peripheral surface and rotatable about a substantially horizontal axis mounted below the supported globe, said wheel also being rotatable about a substantially vertical axis, means for raising said wheel into frictional engagement with said supported globe, and means for rotating said wheel about said axes.

5. A globe support and orienting means comprising a base, supporting means attached to said base and equipped with a plurality of spring-loaded universally rotatable means which collectively serve as supports upon which a globe may rest, a turntable rotatable about a substantially vertical axis attached to said base, said turntable being below said supporting means, a vertically movable wheel rotatable about a substantially horizontal axis mounted on the said turntable, the peripheral surface of said wheel being easily compressible, means mounted on said turntable for raising said wheel into frictional engagement with said supported globe, means mounted on said turntable for rotating said wheel about said horizontal axis, and means attached to said base for rotating said turntable about said vertical axis.

6. A globe support and orienting means comprising a base, a ring attached to said base and mounted in a substantially horizontal plane, said ring being equipped with a plurality of spring-loaded casters which collectively may serve as supports for a globe, a turntable rotatable about a substantially vertical axis attached to said base, said turntable being below said ring, means attached to said base for rotating said turntable about said vertical axis, a vertically movable wheel rotatable about a substantially horiozntal axis mounted on the said turntable, means for rotating said wheel about said horizontal axis and means for raising said wheel into frictional engagement with said supported globe.

7. A globe support and orienting means comprising a base, a ring attached to said base and mounted in a substantially horizontal plane, said ring being equipped with a plurality of spring-loaded casters which collectively may serve as supports for a globe, a turntable rotatable about a substantially vertical axis attached to said base, said turntable being below said ring, means attached to said base for rotating said turntable about said vertical axis, a wheel having an easily compressible peripheral surface keyed to a horizontal axle each journal of which is engaged in a vertically movable bearing, the said vertically movable bearings each having flanges adapted to receive vertical columns which serve to guide the vertical movement of said bearings, means for rotating said axle, and means for raising said wheel into frictional engagement with said supported globe comprising a lever arm one end of which is rotatably attached to said bearings and the other end of which is rotatably attached to a jack means, said lever arm being pivotally connected to a point intermediate its ends so that vertical movement of the said jack means results in an opposite vertical movement of said bearings.

8. A globe support and orienting means comprising a base, a ring attached to said base and mounted in a substantially horizontal plane, said ring being equipped with a plurality of spring-loaded casters which collectively may serve as supports for a globe, said casters having an orientation so that each of the shafts thereof is an extension in space of the globe radius which intersects the surface of the globe at the point of contact between the caster wheel and the globe surface, a turntable rotatable about a substantially vertical axis attached to said base, said turntable being below said ring, means attached to said base for rotating said turntable about said vertical axis, a wheel keyed to a horizontal axle each journal of which is engaged in a vertically movable bearing, said vertically movable bearings each having flanges adapted to receive vertical columns which serve to guide the vertical movement of said bearings, means for rotating said axle, and means for raising said wheel into frictional engagement with said globe comprising a lever arm one end of which is rotatably attached to said bearings and the other end of which is rotatably attached to a jack means, said lever arm being pivotally connected at a point intermediate its ends so that vertical movement of the said jack means results in an opposite vertical movement of said bearings.

9. A globe support and orienting means comprising a base, a ring attached to said base and mounted in a substantially horizontal plane, said ring being equipped with a plurality of spring-loaded casters which collectively may serve as supports for a globe, said casters having an orientation so that each of the shafts thereof is an extension in space of the globe radius which intersects the surface of the globe at the point of contact between the caster wheel and the globe surface, a turntable rotatable about a substantially vertical axis attached to said base, said turntable being in a horizontal plane below said ring, a first reversible rotary power means attached to said base and coupled to said turntable so that said turntable may be rotated about said vertical axis, a pneumatic wheel keyed to a horizontal axle each journal of which is engaged in a vertical movable bearing, said vertical moving bearings each having flanges adapted to receive two vertical columns which serve to guide the vertical movement of said bearings, compression springs disposed on said vertical columns below said vertical movable bearings so that said bearings are biased in an upward direction, a second reversible rotary power means attached to said turntable and coupled to said axle so that said wheel may be rotated, and means for raising said wheel into frictional engagement with said globe comprising a lever arm one end of which is in the shape of a yoke and is rotatably attached to said bearings, the other end of said lever arm is rotatably attached to the upper end of a vertically disposed threaded shaft which is in threaded engagement with a rotatable nut coupled to a third reversible rotary power means, said lever arm being pivotally connected at a point intermediate its ends so that vertical movement of the said threaded shaft results in an opposite vertical movement of said bearings.

10. A globe support positioner comprising a base, a ring attached to said base and mounted in a substantially horizontal plane, said ring having mounted thereon at spaced intervals a plurality of spring-loaded casters which collectively may serve as supports for a globe, said casters having an orientation so that each of the shafts thereof is an extension in space of the globe radius which intersects the surface of the globe at the point of contact between the caster wheel and the globe surface, a turntable rotatable about a substantially vertical axis attached to said base, said turntable being in a horizontal plane below said ring, a first reversible electric motor attached to said base and coupled to said turntable so that said turntable may be rotated about said vertical axis, a pneumatic wheel keyed to a horizontal axle each journal of which is engaged in a vertical movable bearing, the said vertical moving bearings each having flanges adapted to receive two vertical columns which serve to guide the vertical movement of said bearings, compression springs disposed on said vertical columns below said vertical movable bearing so that said bearings are biased in an upward direction, a second reversible electric motor attached to said turntable and coupled to said axle so that said wheel may be rotated, and means for raising said wheel into frictional engagement with the globe comprising a lever arm one end of which is in the shape of a yoke and is rotatably attached to said bearings, the other end of said lever arm is rotatably attached to the upper end of a vertically disposed threaded shaft which is in threaded engagement with a rotatable nut coupled to a third reversible electric motor, said lever arm being pivotally connected at a point interme-

diate its ends so that vertical movement of the said threaded shaft results in an opposite vertical movement of said bearings, two electric lining switches being appropriately disposed to prevent excessive upward and downward movement of said bearings.

11. In combination, a bas-relief globe and a globe support positioner comprising a base, a ring attached to said base and mounted in a substantially horizontal plane, said ring having mounted thereon at spaced intervals a plurality of spring-loaded casters which collectively serve as supports for said globe, said casters having an orientation so that each of the shafts thereof is an extension in space of the globe radius which intersects the surface of the globe at the point of contact between the caster wheel and the globe surface, a turntable rotatable about a substantially vertical axis attached to said base, said turntable being in a horizontal plane below said ring, a first reversible electric motor attached to said base and coupled to said turntable so that said turntable may be rotated about said vertical axis, a pneumatic wheel keyed to a horizontal axle each journal of which is engaged in a vertical movable bearing, the said vertical moving bearings which have flanges adapted to receive two vertical columns which serve to guide the vertical movement of said bearings, compression springs disposed on said vertical columns below said vertical movable bearing so that said bearings are biased in an upward direction, a second reversible electric motor attached to said turntable and coupled to said axle so that said wheel may be rotated, and means for raising said wheel into frictional engagement with the globe comprising a lever arm one end of which is in the shape of a yoke and is rotatably attached to said bearings, the other end of said lever arm is rotatably attached to the upper end of a vertically disposed threaded shaft which is in threaded engagement with a rotatable nut coupled to a third reversible electric motor, said lever arm being pivotally connected at a point intermediate its ends so that vertical movement of the said threaded shaft results in an opposite vertical movement of said bearings, two electric lining switches being appropriately disposed to prevent excessive upward and downward movement of said bearings.

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