

Sept. 1, 1942.

C. E. ALLEN ET AL
TILTING HEAD DEVICE

2,294,437

Filed April 21, 1941

2 Sheets-Sheet 1

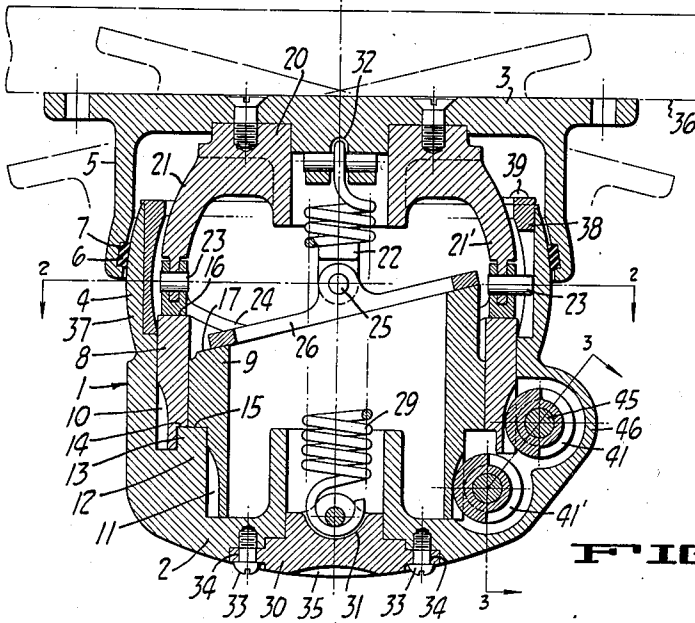


FIG. 1.

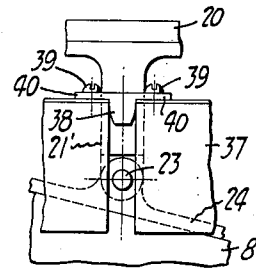


FIG. 4.

FIG. 2.

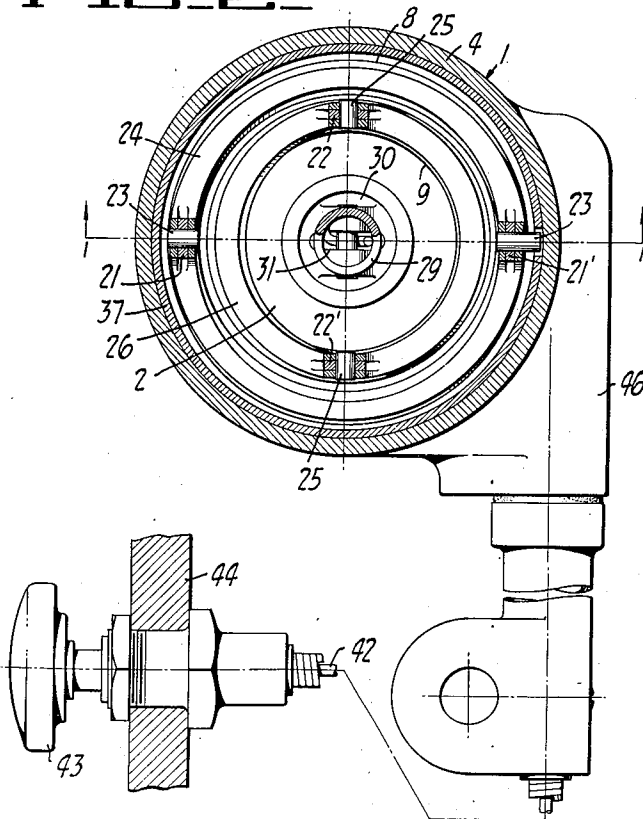
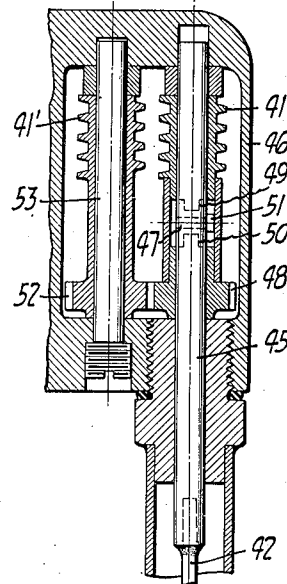


FIG. 3.



INVENTOR
CLARENCE E. ALLEN
JOHN F. PAGENDARM

BY *Boyer & Moller*
ATTORNEYS

Sept. 1, 1942.

C. E. ALLEN ET AL
TILTING HEAD DEVICE

2,294,437

Filed April 21, 1941

2 Sheets-Sheet 2

FIG. 5

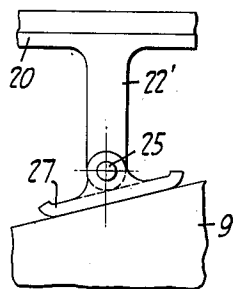


FIG. 6

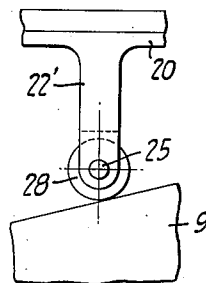
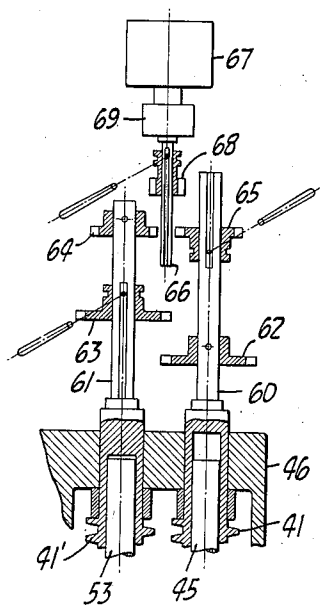


FIG. 7



INVENTOR
CLARENCE E. ALLEN
JOHN F. PAGENDARM
BY *Rayken Mohler*
ATTORNEY

UNITED STATES PATENT OFFICE

2,294,437

TILTING HEAD DEVICE

Clarence E. Allen and John F. Pagendarm, San Francisco, Calif.; said Pagendarm assignor to said Allen

Application April 21, 1941, Serial No. 389,494

17 Claims. (Cl. 248—184)

This invention relates to a tilting head device for a rear view mirror, spotlight, camera, transit platform, or for any use where it is desirable to provide a tilting support.

One of the objects of the invention is such a device for tilting a supporting head to a plurality of different positions about substantially a single center, by a single actuating means, and which device is compact, rugged, and when the head is tilted to any desired position, it will automatically remain substantially rigid in said position free from objectionable vibration or play.

Another object of the invention is a tilting head device having a tilting head supported on and forming part of a housing that encloses the actuated elements that function to produce the tilting of the head when the said elements are actuated, and which elements are actuated by a single means projecting from the housing.

Other objects and advantages will appear in the specification and drawings.

In the drawings, Fig. 1 is a vertical sectional view through our device taken along line 1—1 of Fig. 2.

Fig. 2 is a horizontal sectional view taken along line 2—2 of Fig. 1.

Fig. 3 is a sectional view taken along line 3—3 of Fig. 1.

Fig. 4 is a fragmentary elevational view of a locking means that is incorporated in Fig. 1.

Fig. 5 is a fragmentary elevational view of a modified form of support for the tilting head that may be used in the device of Fig. 1.

Fig. 6 is a still further form of support that may be used in the device of Fig. 1.

Fig. 7 illustrates, semi-diagrammatically a means for causing various movements of the tilting head.

Briefly described, heretofore, one of the objections to tilting head devices has been that the tilting head must be locked in adjusted position and then unlocked for movement to a different position. Where automatic locks have been attempted, there has been excessive vibration or play, that both tends to defeat the purpose of the device and to set up objectionable wear. Also, in devices where a support or head is to be tilted in various directions, ordinarily the above objections are more noticeable, and different elements must be actuated by the operator to obtain the different movements.

In our invention, only a single means is actuated by an operator to cause the supporting head to tilt in different directions, and the head

is automatically locked against vibration and play whenever the operator ceases to actuate the single means that causes the head to tilt.

In detail, our invention, as illustrated in the drawings, comprises a housing having generally cylindrical walls 1, and end wall 2 and a head 3 opposite end wall 2.

The portion of the cylindrical wall adjacent the head 3, and designated 4, is exteriorly of spherical contour. The spherical contour of said portion may be most aptly described as being the central band of a sphere the diameter of which corresponds to the outside diameter of the portion 4, the center of which is on the axis of the cylindrical wall of the housing.

The head 3 is formed with a generally cylindrical flange coaxial with the axis of the housing and extending perpendicularly therefrom and over the portion 4. The contour of the inner side of said flange that embraces or extends around portion 4, substantially corresponds to the outer contour of the portion 4 and a sealing strip 6 of felt or other suitable material is carried in a groove 7 on the inner side of said flange, which strip engages the spherical outer surface of portion 4.

Thus it will be seen that, independently of other considerations, the head 3, as described to this point, would be free for universal movement on the spherical surface of portion 4, and could also rotate about the central axis of the housing 1. It will also be apparent that head 3 forms one end of the cylindrical housing 1 and that no moisture or impurities may enter said housing by reason of said sealing strip 6.

Within said housing 1, and coaxial therewith are a pair of concentrically disposed cylindrical cam-members 8, 9, the member 9 rotatably fitting within member 8, and member 8 rotatably fitting within the housing 1. These cam-members 8, 9 carry an annular row of gear teeth 10, 11 around their outer sides at their lower ends, which teeth may be either cut in the sides of the cam-members or secured thereto by any suitable means.

The housing 1 is of increased thickness at the juncture between wall 1 and end wall 2, as indicated at 12, and the inner side of this thickened portion is cylindrical, and coaxial with the inner side of wall 1. The upper side of said portion, or its axially facing side, is formed with an upstanding annular flange 13. The radially inner and radially outer sides of the members 8, 9 at their lower ends are turned down to provide axially downwardly facing shoulders 14, 15

on each of said members spaced above their lower ends, which shoulders rest on the axially facing side of the said flange 13.

The member 8 is shorter than the member 9 and the lower end portion of member 8 is supported a distance above the lower member 9 about the width of one of the rows of teeth 10 or 11.

The upper annular edges 16, 17 of the members 8, 9 respectively, are in a flat plane extending slantingly relative to the axis of each member, at say an angle of about 15° relative to a line at right angles to the axis of said members. If the members 8, 9 are rotated to bring the inclined edges of each to the same relative position, the said edges are co-planar. In Fig. 1, the members are in a position in which two opposite points on annular inclined edge 16 and two opposite points on annular edge 17 are equally spaced 90° apart and all of which points are in a single plane that extends transversely of the central axis of the housing at right angles thereto. These upper edges 16, 17 provide cam-surfaces for a purpose that will become clear from a further description.

Secured to head 3 on its under side, and depending therefrom, is a generally annular element 20 from which depend four legs 21, 21', 22, 22' on radii spaced 90° apart. The legs 21, 21' are connected by horizontal aligned pivots 23 to a generally annular ring 24 at two opposite points on said ring, and which ring is disposed on its side on the cam-surface 16 of member 8, while legs 22, 22' are connected by horizontal, aligned pivots 25 to a generally annular ring 26, at two opposite points on said ring 26. The ends of the arms to which the pivots are attached are disposed between pairs of ears on said rings through which the pivots extend. The said ring 26 is disposed on its side on the cam-surface 17 of member 9. The axes of pivots 23 and pivots 25 intersect each other at a point on the axis that is common to wall 1, and to members 8, 9 and said point is the center of the spherical contour of portion 4. Thus, upon turning either one or the other of the members 8, 9 on their common axis, the head 3 will be tilted according to which of the members is rotated and the relative positions of said members. In the drawings (Fig. 1) the head 3 is in a plane at right angles to said axis, but if member 9, which is below ring 26 (Fig. 2) is rotated counter-clockwise, the head 3 will be gradually tilted to one side to its maximum degree of inclination relative to said axis and upon continuation of said rotation the head will again move back to the position as shown in Fig. 1 and will then gradually tilt in the opposite direction until its maximum degree of inclination is reached and then back again to the position shown in Fig. 1, at which last position, the member 9 will have made complete revolution about its axis.

The same result occurs in rotating the member 8, except that the head will tilt in a plane at right angles to the plane in which said head is tilted by rotation of member 9.

From the foregoing, it is obvious that the head may be partially or fully tilted in one plane by rotation of member 9, and may then be tilted in a plane at right angles to the said one plane, by rotation of member 8, the last mentioned tilting movement being accomplished while the head is maintained tilted in said one plane. The maximum degree of inclination of head 3 in 75

either one of said planes is the same as the degree of inclination of the plane of the upper annular edges of member 8, or 9 relative to the central axis common to both of said members.

It is pertinent to note that each of the legs 21, 21', 22, 22' may be provided with a shoe 27, as indicated in Fig. 5, instead of the rings 24, 26, or rollers 28 may be used instead of the rings or shoes as best shown in Fig. 6.

The head 3 is held slidably seated on portion 4, and the rings, shoes or rollers, as the case may be, that are carried by the legs 21, 21', 22, 22', are tightly held against the cam-surfaces 16, 17 by means of a relatively strong coil spring 29 that is secured at one of its ends to a plate 30 that is in turn secured to end 2, and at its opposite end to head 3. The end 2, and head 3, at the respective points of connection between the ends of the springs therewith, are respectively recessed as at 31, 32 to receive the opposite ends of the spring, and to prevent rotation of the spring on its axis. The plate 30 is secured to end 2 by a screw 33 that extend through arcuate slots 34 in the plate 30, the arcs of said slots being concentric with the central axis of the spring and of members. These slots are in margins of plate 30, which plate is circular, and the recess 31 is in a boss on said plate that extends into a central opening in head 2. Thus upon loosening screws 33, and inserting a screw driver, or other suitable member in slot 35 in the outer side of plate 30, the said plate may be rotated to cause rotation of spring 29 and head 3 to any desired degree, after which the screws may be tightened. This adjustment provides a means for adjusting the angle of a mirror, or other device carried by head 3, such mirror being indicated in dotted line at 36.

To positively lock the head in any position of adjustment effected by the movement of the head, as described in the preceding paragraph, we use a split ring 37 that is embraced by portion 4 of the housing. A wedge member 38 (Fig. 4) is positioned between the ends of the ring at the split, causing the ring to expand and tightly grip the inside of the housing at portion 4, this expansion being effected by screws 39 that screw into the ends of the ring, and which screws pass through openings in flanges 40 that overlie the edges of the ring at opposite sides of the slit in the latter. One of the pivots 23 projects into the space between the ends of the ring 37, as seen in Figs. 1, 4. Thus when the ring is clamped in portion 4, there can be no rotation of the head 3 and legs 21, 21', 22, 22' about the central axis of the housing. However, when wedge 38 is loosened, the head may be so rotated to a different position and locked in the new position.

In the case of a rear-view mirror being carried by head 3, and particularly where such mirror is on the right hand side of a bus, we provide a pair of worm gears 41, 41' in the housing, which gears are respectively in mesh with the teeth 10, 11 of members 8, 9. Single means is provided for rotating either of the gears 41, 41', as desired in opposite directions.

This single means comprises a shaft 42 having a push-pull button or handle 43 (Fig. 2) at one end, which button may be mounted on the dash board 44 of the bus, in front of the driver. The shaft 42 may be a flexible shaft, as indicated, terminating in an enlarged rigid end portion 45 (Fig. 3) that slidably extends through the worm gear 41. The ends of portion 45 are journaled in

a gear case 46 formed integrally with the walls 1 of the housing. A pin 47 extends through shaft portion 45 at one end of gear 41, between said gear and a spur gear 48, on said shaft, that is also in case 46. The gears 41, 48 are rotatable on shaft 45, but their adjacent sides are respectively provided with axially, outwardly projecting dogs or lugs 49, 50. The pin carried by shaft 45 between the gears 41, 48 and between lugs 49, 50, carries a head 51 that projects radially outwardly of said shaft. Thus when shaft 45 is pushed in direction from gear 48 toward gear 41, the head 51 will engage one of lugs 49, and as the shaft is rotated, the gear 41 will be positively rotated, but gear 48 will be idle. However, when shaft 45 is moved in an opposite direction by pulling on handle 43, the head 51 will be released from lugs 49 and will engage lugs 50, thus establishing a positive drive between the shaft 45 and gear 48.

The gear 48 is always in mesh with a spur gear 52 that is secured to the worm gear 41'. The worm gear 41' and spur gear 52 are supported for rotation on a shaft 53 that is carried at its opposite ends in opposite walls of case 46.

It will be apparent from the above, that when gear 48 is positively driven by shaft 45 in one direction or the other, the worm gear 41' will be positively driven, while gear 41 is idle. When shaft 45 is moved to carry head 51 to a point intermediate the gears 41, 48, there will be no movement of any of the gears 41, 41', 48, 52, even when the shaft 45 is rotated.

As gears 41, 41', respectively, mesh with teeth 10, 11 on members 8, 9, the said members may selectively be rotated in either direction about their common axis, thus causing the head 3 to be tilted about one or the other of two perpendicularly extending axes, the said axes extending through pairs of pivots 23, 25 and intersecting each other at the center of the spherical outer contour of portion 4. In whatever position the head is tilted by rotation of either of gears 41, 41', the head will automatically be locked in such position since any force applied to the head to change its inclination is applied longitudinally of the members 8, 9, and not circumferentially thereof, and the members 8, 9 are prevented from rotating on their common axis by worm gears 41, 41'.

Fig. 7 semi-diagrammatically illustrates a means that may be employed to produce any desired tilting movement of the head 3, in which any point on the head may be continuously or intermittently caused to move in practically any predetermined path about the center of the spherical surface of portion 4 within the limits permitted by the degree of tilt of the cam-surfaces 16, 17. For example, where a search light is carried on head 3, it sometimes is desirable to cause the light to move so as to follow an unusual path of travel to successively illuminate objects that may be irregularly arranged.

To accomplish this result, axial extensions 60, 61 may be provided on gears 41, 41' respectively. A spur gear 62 may be fixedly secured on extension 60 and a gear 63 adapted to be moved into and out of mesh with gear 62 may be splined on extension 61.

Also a spur gear 64 may be fixedly secured on extension 61 spaced from gear 63, and a spur gear 65 may be splined on extension 60 for movement into and out of planar relation to gear 64. Between the gears 64, 65 is the drive shaft 66 of a reversible motor 67 and a spur gear 68 splined on shaft 66 is adapted to be moved to mesh with

gear 64 alone or to mesh with both gears 64, 65 when the latter is moved to planar relation with gear 64. The speed of shaft 66 may be constant or may be varied, as desired, through a variable transmission 69.

When the pin head 51 is in neutral position, and the gears 62, 63, 64, 65, 68 are all disengaged from each other, it is obvious that shaft 45 may be actuated to cause movement of the head 3 in the manner described. However, when head 51 is in neutral position, by engaging gears 68, 64, the worm gear 41' only will be actuated, or by engaging gears 68, 65, only the worm gear 41 will be actuated. By engaging gears 68, 64, 65 the worm gears 41, 41' will be rotated simultaneously in the same directions about their respective axes, or by engaging gears 68, 64, 63, and 62, the worm gears 41, 41' will be rotated in opposite directions about their axes, and by reversing the motor when any of the above designated combinations of gears are engaged, there will be a reversal of movement of the worm gears 41, 41', about each of their axes. The relative sizes of the gears may be changed to change the relative speeds of gears 41, 41'. The number of different paths that any point on head 3 may be made to follow on an imaginary sphere are too numerous to mention here, but it is clear that the slightest change in the relative positions of members 8, 9 on their axes in each of the various manners in which the members 8, 9 are rotated will result in a different path of travel of a point on head 3, and by adjusting the head relative to housing to different positions, independently of the rotation of the members 8, 9, still different paths will be followed by a point on said head, or by a point on any object carried on said head.

Having described our invention, we claim:

1. A tilting head device of the character described comprising; a head; means supporting said head for revoluble movement about a common center in two planes disposed perpendicularly to each other; and means for so moving said head.
2. A tilting head device of the character described, comprising; a head; means supporting said head for revoluble movement about a single center in two planes disposed perpendicularly to each other and intersecting each other at said center; and means for so moving said head in one of said planes superposed on the other.
3. In a construction as defined in claim 2, said latter means including a manually actuatable, single, push-pull member supported for reciprocation and for rotation in opposite directions at opposite ends of its stroke, separate elements actuated by said member at said opposite ends of said stroke connecting between said member and said head; said elements, respectively, being arranged and adapted to cause said movement of said head in one of said planes or the other when said member is rotated at one or the other of the ends of said stroke.
4. A tilting head device of the character described comprising; a housing formed with an annular surface of spherical contour; a head supported on said surface for movement thereon about the center of said contour; means within said housing for so moving said head on said surface in planes disposed perpendicularly to each other and intersecting each other at said center.
5. In a construction as defined in claim 4, said means including cams and cam-followers

movable relative to each other and operatively connected with said head.

6. A tilting head device of the character described, comprising; a housing; a head slidably supported on said housing for movement in planes extending perpendicularly to each other and intersecting each other at a point within said housing; two pairs of cam-followers carried by said head; the followers of each of said pairs being in axial alignment; the axes of said pairs of followers intersecting each other at said point; and a pair of rotary cams in said housing each of which supports one of said pairs of followers; said cams being arranged and adapted to cause relative movement of said followers in said planes upon rotating said cams relatively; and means for rotating said cams relative to each other.

7. A tilting head device of the character described, comprising; a housing formed with an opening in one side thereof; a head slidably supported on such housing for movement in planes extending perpendicularly to each other and intersecting each other at a point and along a line within said housing; means for causing said movement of said head successively in said planes to tilted positions at angles superposed one on the other; said last mentioned means being enclosed within said housing; and said head being disposed over said opening in said one side of said housing.

8. In a construction as defined in claim 7, said head being rotatable about an axis extending through said point when said head is tilted to any one of said positions, and means for locking said head against such rotation about said axis while permitting movement of said head in said planes when said head is so locked.

9. In a construction as defined in claim 7, said head including a female member of spherical inner contour and said housing including a male member of spherical outer contour generally corresponding to said inner contour disposed within said female member and supporting the latter for universal movement about the center of said contours.

10. A tilting head device of the character described comprising; a housing; a pair of coaxial, cylindrical members disposed within said housing, one member being positioned within the other, and said members being rotatable relatively about their common axis; adjacent ends of said members being formed with axially outwardly facing cam-surfaces; a head; a pair of cam-followers pivotally secured to said head and respectively supported on the cam surface of each of said members; means for rotating said members relatively about said axis for causing movement of said followers axially of said members whereby corresponding movement of said head will be effected; the axes of the pivots securing said followers to said head intersecting each other at right angles to each other on the axis about which said members are rotatable.

11. In a construction as defined in claim 10, the said means for rotating said members relatively including a pair of worm gears arranged and adapted to cause said relative rotation upon rotation of one or the other of said gears; and means exterior of said housing for rotating said gears as desired.

12. A tilting head device of the character de-

scribed comprising; a cylindrical housing provided with a head at one end supported on said housing for revolving about a point on the central axis of said housing, and provided with an end wall at the opposite end of said housing; a pair of generally tubular, cylindrical cam-members concentric with each other and with the cylindrical walls of said housing, supported in said housing for rotation relatively about said axis; said members being disposed between said end wall and said head and the edges of said members adjacent said head being longitudinally of a varying contour relative to a plane transversely intersecting said axis at right angles thereto; cam-followers connected with said head frictionally engaging said edges; means for revolving said members relative to each other about said axis and for automatically locking said members against rotation relatively upon cessation of actuation of said means for so revolving said members.

13. In a construction as defined in claim 12, said last mentioned means being coacting worm and helical gears associated with each of said members respectively in which the helical gears are concentric with said axis and are rigidly secured to said members.

14. In a device of the character described a pair of cams rotatable about a common axis each provided with axially facing cam surfaces; cam-followers engaging the cam surface on each of said members; means holding said cam-followers in frictional engagement with each of said surfaces and also holding said cam-followers against revolving about said axis; means securing said cam-followers in positions spaced 90° apart relative to said axis whereby upon revolving either of said members about said axis said followers will move relative to each generally axially of said members in accordance with the variations in the linear contour of said surfaces relative to a plane intersecting said axis transversely thereof and perpendicularly thereto.

15. In a construction as defined in claim 14, means securing said followers rigidly together and supporting said followers for movement in circular paths about a common center on said axis in planes extending longitudinally of said axis and intersecting each other at said axis.

16. In a device of the character described a pair of cam-followers secured together in positions spaced apart substantially 90° at points disposed radially outwardly of a single axis; means supporting said followers for movement in circular paths about a single point on said axis in planes extending longitudinally of said axis that intersect each other at said axis; a pair of cam members coaxial with said axis provided with cam surfaces facing axially of said axis and revolvable about said axis; means releasably securing said cam followers against revolving about said axis while permitting movement of said followers in said intersecting planes about said point.

17. In a construction as defined in claim 16 means for selectively revolving said members together or separately in the same or in opposite directions about said axis.

CLARENCE E. ALLEN.
JOHN F. PAGENDARM.