

Feb. 13, 1951

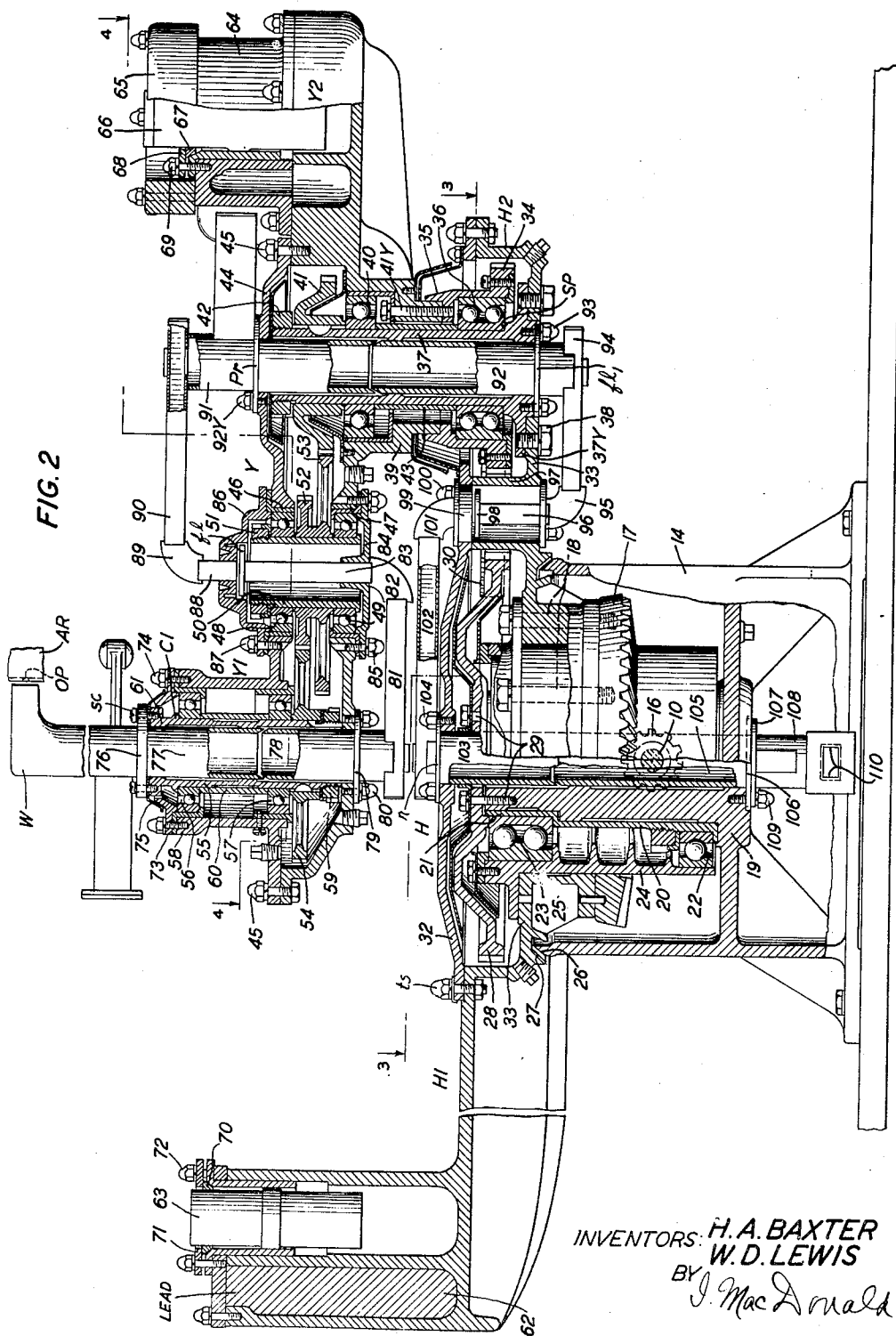
H. A. BAXTER ET AL

2,541,324

MOTION TRANSLATING MECHANISM

Filed April 20, 1945

5 Sheets-Sheet 2



INVENTORS: **H. A. BAXTER**
W. D. LEWIS
BY *J. MacDonald*
ATTORNEY

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FIG. 3

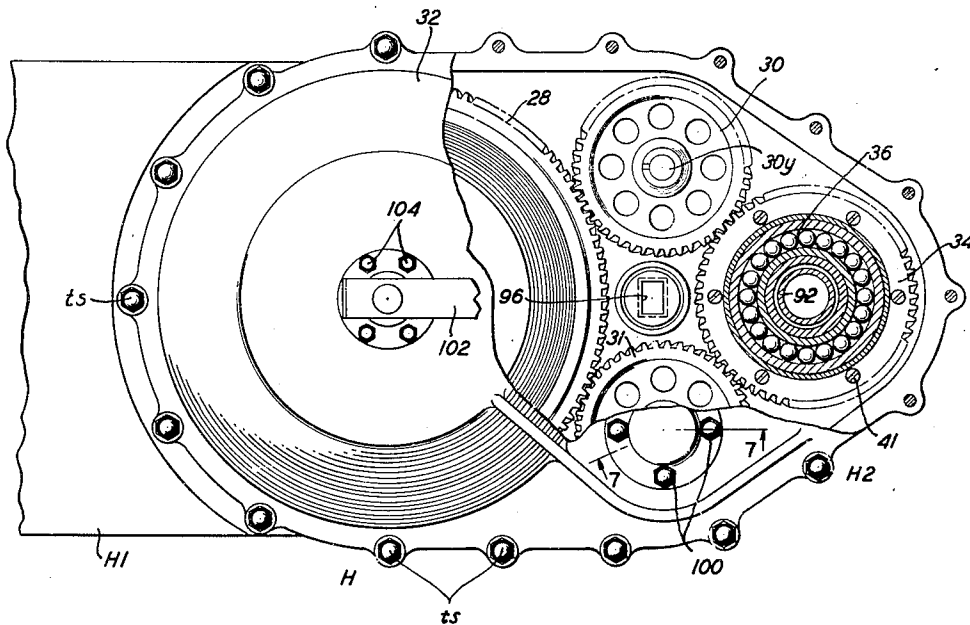
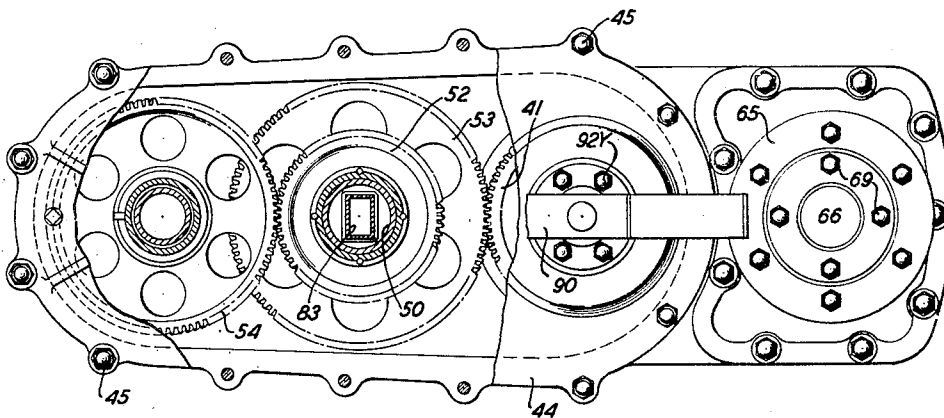


FIG. 4



INVENTORS: H. A. BAXTER
W. D. LEWIS

BY J. Mac Donald

ATTORNEY

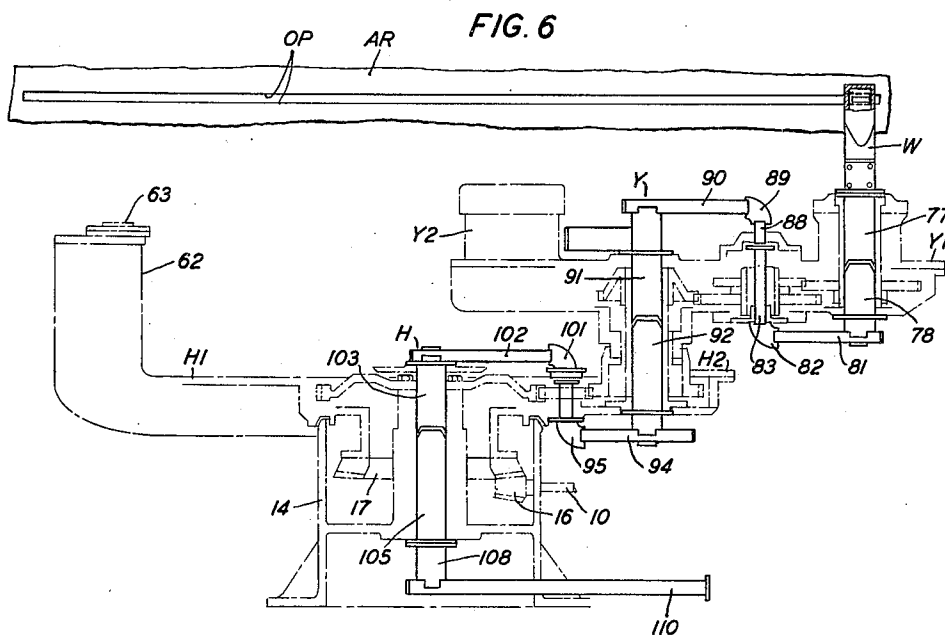
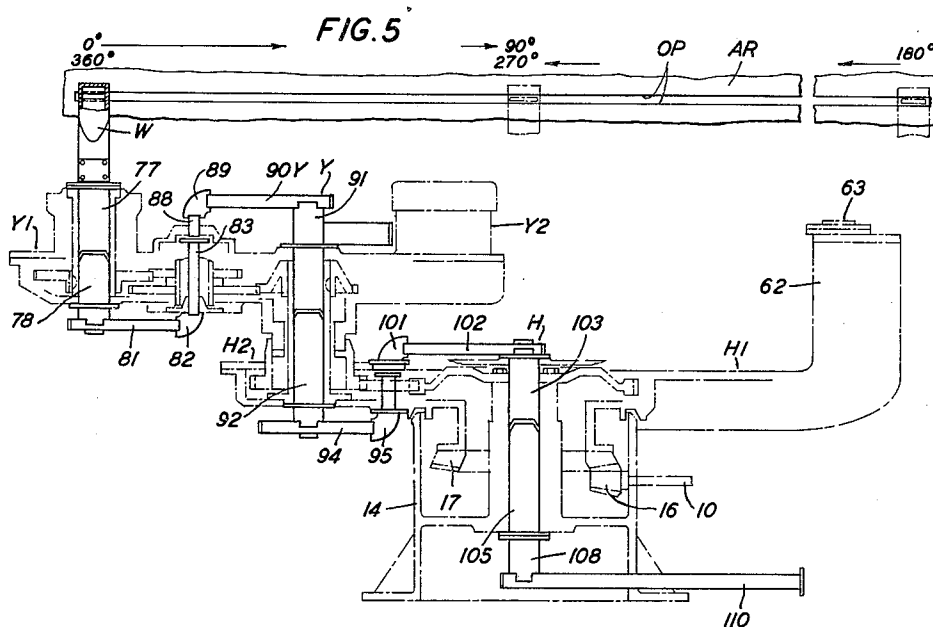
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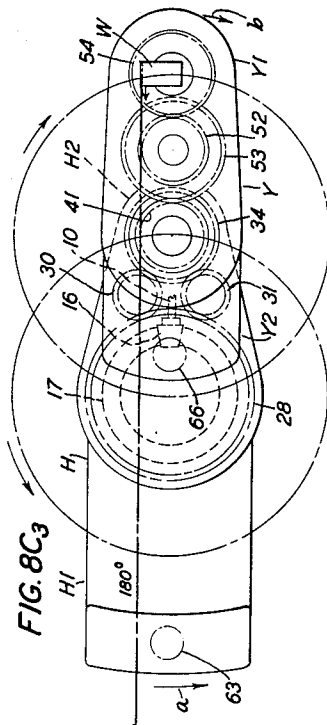


FIG. 8C3

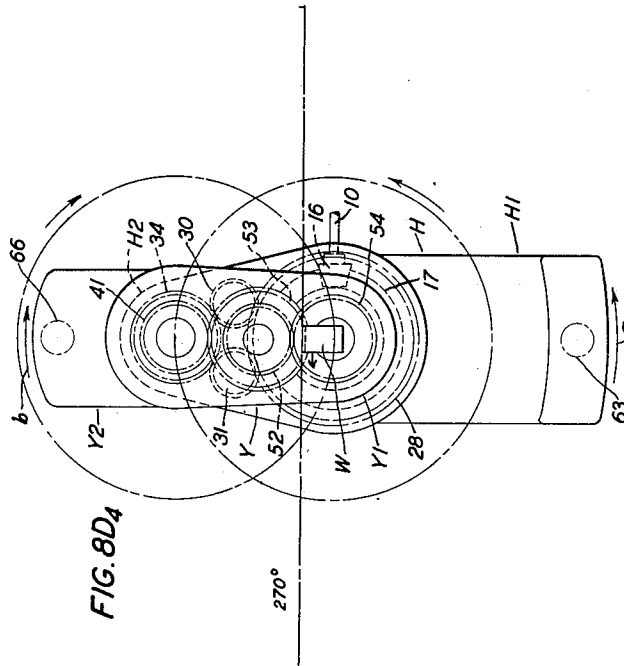


FIG. 8D4

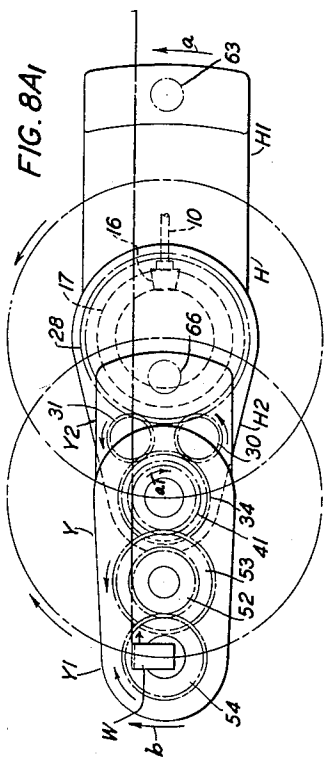


FIG. 8A1

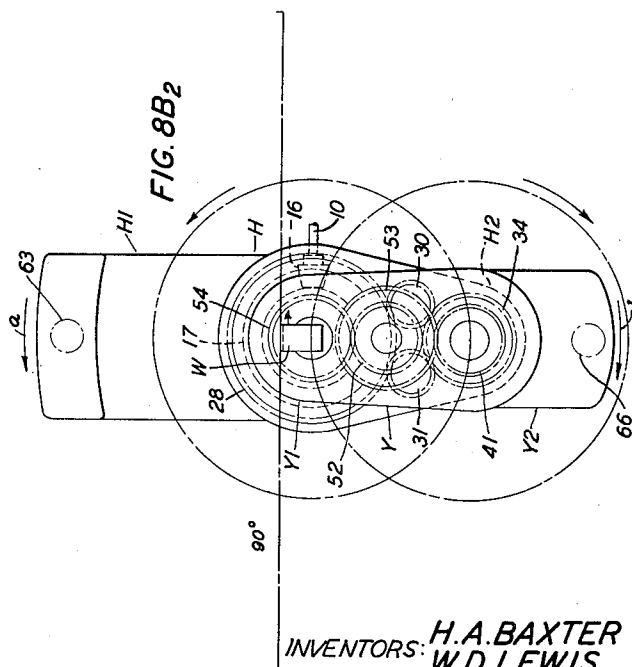


FIG. 8B2

INVENTORS: H. A. BAXTER
W. D. LEWIS
BY J. MacDonald
ATTORNEY

UNITED STATES PATENT OFFICE

2,541,324

MOTION TRANSLATING MECHANISM

Howard A. Baxter, Green Village, and Willard D. Lewis, Little Silver, N. J., assignors to Bell Telephone Laboratories, Incorporated, New York, N. Y., a corporation of New York

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5 Claims. (Cl. 250—33.65)

1 This invention relates to motion translating mechanisms of the type in which the operation of the rotating shaft is translated into a reciprocating rectilinear movement.

The object of the present invention is the provision of a motion translating mechanism of the type above referred to whereby a wave guide element in a radio signaling system is moved free of vibrations at high velocity in a rectilinear reciprocating movement along the opening of a reflector antenna forming a part of the radio signaling system.

In the drawing:

Fig. 1 is a front elevation of the translating mechanism shown in perspective, the wave guide element being positioned a small distance from one of its maximum operated positions;

Fig. 2 is a vertical central sectional view shown with the mechanism and wave guide actuated thereby positioned midway along the opening of an antenna reflector in the radio signaling system;

Fig. 3 is a partial view shown with a number of operating parts in horizontal section taken on line 3—3 of Fig. 2;

Fig. 4 is a partial view shown with a number of operating parts in horizontal section taken on line 4—4 of Fig. 2;

Figs. 5 and 6 are diagrammatic views showing the gearing mechanism and an element of the wave guide in its opposite maximum operated position;

Fig. 7 is a detail view showing one of a pair of intermediary gears in vertical sections taken on line 7—7 of Fig. 3;

Figs. 8A1 and 8C3 are diagrammatic views shown with the wave guide element in its opposite extreme operated position; and

Figs. 8B2 and 8D4 are diagrammatic views shown with the wave guide midway along the opening of the antenna reflector.

According to this invention the element W of a wave guide in a radio signaling system is driven in a reciprocating movement along a rectangularly-shaped opening OP of an antenna reflector AR by a translating mechanism actuated by a motor M. This motor is operatively connected to a shaft 10 journaled in a sleeve 13 secured as shown in Fig. 1 to a circular base or mounting 14 as by a plurality of screws 15. The mounting 14 as best seen in Fig. 2 is formed with a concentrically disposed hub or sleeve 19 fitted with sleeves 20 and 21 provided for receiving the stator ring of ball bearings 22 and 23 respectively. The rotor ring of these ball bearings is fitted in 55

2 a sleeve 24 in turn fitted in a collar 25 formed integrally with a yoke-shaped mounting H while a number of bolts such as 18 serve for securing the sleeve 24 and a bevel gear 17 collectively to the collar 25 of yoke H, the bevel gear 17 meshing with a pinion 16 keyed on or formed with the shaft 10.

The circular mounting 14 is provided with a beveled edge 26 registering with a similarly-shaped circular recess 27 in a flange 33 formed with collar 25, the flange forming a barrier for preventing the entrance of dust particles into the casing or chamber formed by mounting 14, the sleeve 19, the sleeve 24 and the flange 33.

A stationary spur gear 28 is secured as by a number of screws 29 to the top disposed end of sleeve 19 for engagement with two similar intermediate gears 30 and 31 keyed on similar spindles 30Y and 31Y best seen in Figs. 3 and 7, journaled at their ends in ball bearings as B1 and B2 which are held in position in openings in the arm H2 of the yoke-shaped mounting H and in openings in a cover 32 secured to the yoke-shaped mounting H by a number of bolts 35, cover 32 in cooperation with the wall 33 of yoke arm H2 forming a casing for the gear 28, for the intermediate gears 30 and 31 and for a gear 34.

The gear 34 engages the gears 30 and 31 and is formed with a hub portion 35 in which is fitted the outer ring of a ball bearing 36, the inner disposed ring of which is fitted over a hollow spindle 37 formed with a flange portion 37Y at its lower end secured to the arm H2 of yoke H as by a plurality of screws 38 best seen in Fig. 2, while the sleeve portion 35 of gear 34 is secured as by a number of screws 41Y passing through a hub portion 39 formed with a second yoke Y mounted for rotation on the ball bearing 36 and a ball bearing 40, the inner ring of the latter being fitted over the hollow spindle 37 and its outer ring in a recess in the hub portion 39 of yoke H.

A gear 41 is keyed on the top end portion of hollow spindle 37 and is held against longitudinal movement thereon by a nut 42 engaging the screw threaded end of this spindle while collectively securing the ball bearings 40 and 36 and a spacer member 43 against a shoulder portion SP formed at the lower end portion of the hollow spindle 37 adjacent the flange portion 37Y.

On the arms Y1 and Y2 of yoke member Y is secured as by a number of screws 45, a cover member 44 shown in Figs. 1, 2 and 4 having a circular opening 46 disposed in axial relation with an opening 47 in the arm Y1 of the yoke Y.

These openings are provided for receiving the ball bearings 48 and 49 serving for rotatably supporting a hollow spindle 50 having its top disposed end screw threaded for receiving a nut 51 serving for collectively securing the ball bearings and the common hub duplex formed gears 52 and 53 against longitudinal movement on the hollow spindle 50 while cover members 84 and 86 secured to the arm Y1 of yoke Y and to the cover 44 hold the ball bearings 48 and 49 and thereby the sleeve 50 against longitudinal movement.

The gear 41 meshes with gear 53 while gear 52 meshes with a gear 54 keyed on a sleeve 55, mounted on ball bearings 56 and 57 fitted into a circular projection 58 formed with cover 44. The lower disposed end of sleeve 55 is provided with a screw threaded portion for receiving a nut 59 serving to collectively secure the gear 54, the inner ring of ball bearing 57, a sleeve 60 and the inner ring of ball bearing 56 against a shoulder portion C1 formed at the periphery of sleeve 55. This sleeve terminates at its top disposed end portion with a collar 61 provided for securing the receiving end or mouthpiece W of a wave guide which will be hereinafter described in detail.

The arm H1 of yoke H terminates at its free end in the form of a container 62 for receiving particles of material, such as lead, in addition to a vertically disposed weight 63 serving to counter-balance the arm of this yoke relative to its arm H2. The weight 63 is held in a vertical adjusted position by the clamping action of a split ring 70 forced to close around the weight 63 by the pressure exerted on a ring 71 under the tightening effect of a number of screws 72. Similarly, the arm Y2 and yoke Y terminate in the form of a bearing surface on which is secured a sleeve 64 and a weight in the form of a collar 65 in addition to a vertically longitudinally movable weight 66 held in adjusted position frictionally by the clamping action of a split ring 67 forced to close around the periphery of the movable weight by the pressure exerted on a ring 68 by the tightening effect of a number of screws 69, the adjustment of weights 63 and 66 vertically being for the purpose of securing rotation of the yokes H and Y within a common center of gravity in addition to the balancing of their respective opposite arms H2 and Y1. The mouthpiece element W for the wave guide forming part of the radio signaling system is formed with a portion extending at right angles relative to its pivotal center in juxtaposition to the rectangularly-shaped opening OP in the reflector antenna AR as shown in Figs. 1, 2, 5 and 6. This mouthpiece element is formed with a flange portion 76 secured to the collar 61 at the top end of the rotary mounted sleeve 55 by a plurality of screws SC. This sleeve as above described extends through an opening in the cover ring 73 itself secured to the circular projection 58 of cover 44 as by a number of screws 74, the screws SC also securing a dust guard element 75 over the annular space between the collar 61 and the opening in cover ring 73. The mouthpiece element W is formed with a tubing portion 77 extending downwardly to the middle length portion of sleeve 55 as shown in Fig. 2, while a tubing 78 extends upwardly into the sleeve 55 in juxtaposition to the lower end of tubing 77, tubing 78 being provided with a flange portion 79 secured to the under side of yoke arm Y1 by a plurality of screws 80.

To the lower disposed end of tubing 78 is secured a tubing 81 of rectangular cross-section connecting with an elbow piece 82 secured to a cover 84 in turn secured to the arm Y1 of yoke Y by a number of screws 85.

The cover 84 is provided with a rectangularly-shaped projection having an opening for securely receiving the lower disposed end of a tubing 83 housed in the sleeve 50 serving as a spindle for the unit gear 52-53 while the top disposed end of tube 83 is formed with a flange portion *f* as shown in Fig. 2 disposed in a recess in a cover 86 for holding the top end of the tube 83 in coaxial relation and in juxtaposition with a tubing 88 secured to cover 86. The upper disposed end of tubing 88 connects with an elbow 89 in turn connecting with a tubing 90, the opposite end of which connects with a tubing 91 of circular cross-section and having a flange portion PR secured to the cover 44 of yoke Y at the pivotal center thereof as by a number of screws 92Y. The tube 91 extends downwardly into the sleeve 37 on which the yoke Y is rotatably mounted in juxtaposition with the upper disposed end of a tubing 92 having a flange portion *f*1 secured as by a number of screws 93 to the underdisposed side of arm H2 of yoke member H. The lower disposed end of tubing 92 connects with a tubing 94 of rectangular cross-section having an elbow 95 connecting with a tubing 96 in a circular projection 97 formed with the arm H2 of yoke H. The top disposed end of tubing 96 is formed with a flange portion 98 provided for holding the tubing concentric to the projection 97 and in juxtaposition with an opening in a plug 99 secured to cover 32 as by a number of screws 100. The plug 99 is formed with an elbow member 101 connecting with one end of a tubing 102, the opposite end of which connects with a tubing 103 having a flange portion *n* secured to cover 32 by a plurality of screws 104. Tubing 103 extends downwardly into the hub 19 of mounting 14 in juxtaposition with the upper disposed end of an axially disposed tubing 105, the latter having a flange portion 106 abutting against a flange portion 107 of a tubing 108 secured to the lower disposed end of hub 19 by a number of screws 109, the tubing 108 in turn connecting with tubing 110 itself connecting with electrical apparatus, not shown, and which forms no part of the present invention.

In a typical example of operation of the motion translating mechanism of this invention, the mouthpiece element W of the wave guide is driven in a reciprocating movement in juxtaposition to the opening OP of the antenna reflector AR by the operation of the motor M connected to the shaft 10. The operation of this shaft and that of the pinion 16 keyed thereon is effective to rotate the beveled gear 17 and thereby the yoke H mounted on ball bearings 22 and 23, for example, in the direction indicated by the arrow *a* in Figs. 8A1, 8B2, 8C3 and 8D4 for moving the mouthpiece element W of the wave guide from the position shown in Figs. 5 and 8A1 to the position shown in Figs. 6 and 8C3, passing through the successive angular positions 90 degrees as shown in Fig. 8B2, 180 degrees shown in Fig. 8C3 and 270 degrees shown in Figs. 70 5 and 8D4 to starting position, Fig. 8A1, Fig. 8C3, showing the mouthpiece element at the opposite end of the opening OP and Fig. 8B2 showing the mouthpiece W midway along the opening OP during its return movement towards starting position as shown in Fig. 8A1. In the operation

of yoke H from the position shown in Fig. 8A1 to the consecutive position 8B2, 8C3 and 8D4 to the starting position 8A1, the planetary movement of gears 30 and 31 relative to stationary gears 28 is effective to impart a rotary movement to gear 34 and thereby to yoke Y in opposite direction indicated by the arrow b in Fig. 8A1, but since the radius from the pivotal center of yoke H to the pivotal center of yoke Y is equal to the distance from the pivot of the guide wave W in the sleeve 55 to the pivotal center of yoke Y, the operation of yoke H is canceled by the motion of yoke Y rotating in the opposite direction resulting in a linear movement of the mouthpiece W equal in length to twice the radius from the pivotal center of yoke Y as shown by the positions of the mouthpiece W in Figs. 5 and 6.

The engagement of gear 41 keyed on sleeve 37 with the gear 53 formed as a unit with gear 52 and the engagement of gear 52 with gear 54 keyed on the sleeve 55 to which a mouthpiece element is secured, the sleeve 55 is rotated in a direction opposite to that of yoke Y with the result that the mouthpiece element W is maintained in juxtaposition to the opening OP in the antenna reflector AR during its reciprocating movement therealong.

In actual operation the motion translating mechanism of this invention has been found to move the wave guide W at high reciprocating velocity substantially free of vibrations while not requiring adjustment or repairs after a large number of reciprocating operations.

What is claimed is:

1. In a radio signaling device, a wave guide for said device having a rotatable mouthpiece at one end thereof, a base, a gear secured to said base, a lever member pivoted on said base, a gearing mechanism carried by said lever member connecting with the gear secured to said base, another lever pivoted at the free end of the first-mentioned lever member and having a gear connecting with said gear mechanism for rotation at twice the speed of the lever pivoted on said base and in opposite direction thereto, means carried at the free end of said other lever member for rotatably supporting said mouthpiece and a gear mechanism operatively connecting said mouthpiece to the first-mentioned mechanism to cause said mouthpiece to generate a rectilinear reciprocating scanning movement upon the operation of said lever members.

2. In a radio signaling device including a reflector antenna having a rectangular opening therein, a wave guide, a movable mouthpiece for said wave guide, having a tapered portion of rectangular cross-section disposed in juxtaposition to said mouthpiece, a motion translating mechanism for operating said mouthpiece, said mechanism comprising, a base having a hub portion, a yoke mounted for rotary movement on said hub portion, a gearing mechanism for actuating said yoke, a tubing partially extending into said hub portion and secured thereto, a second tubing partially extending into said hub portion in juxtaposition to the end of the first-mentioned tubing for rotary movement relative thereto upon the operation of said yoke, a hollow spindle secured to one arm of said yoke at a predetermined distance from the turning axis of the latter, a second yoke pivoted on said hollow spindle, a gear secured to the hub portion of said base, a gearing mechanism operatively connecting said gear to said second yoke to cause the rotation of the latter in opposite direction to the first-men-

tioned yoke, a third tubing extending into said hollow spindle having a flange portion secured to said second yoke, a fourth tubing carried by said second yoke extending into said hollow spindle in juxtaposition to said third tubing, a cover member for said second yoke having a circular projection at the end of one of its arms, a hollow spindle mounted for rotation into said projection, a fifth tubing secured to said second yoke extending into said hollow spindle and disposed at a distance from the turning axis of said second yoke, another tubing secured to said hollow spindle extending therein in juxtaposition to the end of said fifth tubing, said mouthpiece element being disposed contiguous to said fifth tubing and rotatable with said hollow spindle in a direction opposite to the rotation of said second yoke whereby said mouthpiece element is maintained in juxtaposition relative to the surface of said reflector antenna during the rotation of said second yoke, and the reciprocating movement of said mouthpiece, each of said tubings forming an element of said wave guide for said device.

3. In a radio signaling device including a reflector antenna having a rectangular opening therein, a wave guide for said device, a mouthpiece connecting with said wave guide at one end thereof and having a tapered portion of rectangular cross-section coextensive therewith, the small end portion of said tapered portion having an oblong-shaped opening formed therein, a driving mechanism for imparting rectilinear reciprocating movement to said mouthpiece, said mechanism comprising a rotatable yoke, a motor, a gearing mechanism operatively connecting said yoke to said motor, a spindle carried by one arm of said yoke, a second yoke member pivoted on said spindle and having one arm of a length equal to the arm of said first yoke, a gearing mechanism for imparting a planetary movement to said second yoke upon the operation of said first yoke in opposite directions thereto, a spindle carried by said arm of said second yoke for pivotally mounting said mouthpiece, a gearing mechanism operatively connecting said mouthpiece to said second yoke for causing said mouthpiece to generate a planetary movement in a direction opposite to that of said second yoke for maintaining said mouthpiece in juxtaposition with respect to the rectangular opening in said reflector antenna.

4. In a radio signaling device including a reflector antenna having a rectangular opening therein, a wave guide, a mouthpiece for said wave guide having a tapered portion of substantially rectangular cross-section, a mechanism for imparting rectilinear reciprocating movement to said mouthpiece, said mechanism comprising a drive shaft, a motor for rotating said shaft, a rotatable yoke member operatively connected to said shaft, a spindle carried by one arm of said yoke member, a second yoke member mounted on said spindle for rotation thereon, a weight carried by the other arm of said first-mentioned yoke for balancing the first-mentioned arm, means carried by one arm of the second-mentioned yoke at a distance corresponding to the distance of the turning axis of the first-mentioned yoke with respect to said spindle, for rotatably supporting said mouthpiece, a weight carried by the other arm of said last-mentioned yoke for balancing said mouthpiece, a gear mechanism actuated by the first-mentioned yoke for actuating said other yoke at twice the speed and

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in a direction opposite thereto, a gearing mechanism actuated by the rotation of said other yoke for imparting a rotary movement to said mouthpiece in a direction opposite to its supporting yoke to cause said mouthpiece to generate a rectilinear reciprocating movement in juxtaposition with respect to a straight-line surface of the small end of the rectangular opening in said reflector antenna.

5. In a radio signaling device including a reflector antenna having a rectangular opening therein, a wave guide, a mouthpiece connected to said wave guide and having a tapered portion of substantially rectangular cross-section coextensive with respect thereto and with the smaller end portion of said tapered portion in juxtaposition with respect to the small end of said mouthpiece, a driving mechanism for imparting a reciprocating rectilinear movement to said mouthpiece, said mechanism comprising a rotatable yoke member, a motor, a gearing mechanism operatively connecting said motor to said yoke member for actuating the latter, a stationary supporting spindle for said yoke member, a spindle secured to a stationary gear mounted on said sta-

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tionary spindle, a spindle carried by one arm of said yoke, a second yoke mounted on the last-mentioned spindle, a gearing mechanism connecting the second-mentioned yoke to said stationary gear for rotating said second yoke upon the operation of said first-mentioned yoke, said second yoke having means for pivotably receiving said mouthpiece disposed at a distance equal to that of said stationary supporting spindle to the third-mentioned spindle, and a gearing mechanism for rotating said mouthpiece in a direction opposite to the direction of movement of the second-mentioned yoke to cause said mouthpiece to generate a rectilinear reciprocating movement upon the operation of said motor.

HOWARD A. BAXTER.
WILLARD D. LEWIS.

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