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SEARCHLIGHT CONTROL MECHANISM

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by its Attorney.

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His Attorney.
My invention relates to operating mechanisms and more particularly to operating mechanisms for searchlights in which the searchlight may be operated either automatically by an electric motor or by hand from a control station located at a distance from the searchlight which is invisible to the operator.

One object of my invention is to provide an improved operating mechanism which may be easily changed from automatic motor operation to hand operation.

Another object of my invention is to provide an improved operating mechanism wherein the actual position of the searchlight is indicated to the operator at the hand control when that hand control is in use.

Another object of my invention is to provide an improved clutch mechanism whereby the hand control may be connected to the searchlight in the exact relationship at which it was disconnected so that the indicator, operated from the hand control, indicates the actual position of the searchlight when the hand control is operatively connected to the searchlight.

For a consideration of what I believe to be novel and my invention, attention is directed to the following specification, the accompanying drawings and the appended claims.

Fig. 1 of the drawings illustrates diagrammatically a searchlight control mechanism built in accordance with my invention.

Figs. 2, 3 and 4 illustrate sectional views of the clutching mechanism built in accordance with my invention for use in the control system shown in Fig. 1.

Figs. 5 and 6 illustrate one modification of the clutch mechanism, and Fig. 7 illustrates another modification.

In Fig. 1, a searchlight drum 18 is mounted on arms 11 and 12 for movement in a vertical plane about trunnions 13 of which only one is shown. The arms 11 and 12 are integral with a ring gear 15 which may be rotated about a vertical axis by a gear 16 and a shaft 17. Movement of the drum about its trunnions 13 is obtained by a worm gear 17 attached to a trunnion 13 and a worm 18 operated by a shaft 19. The shaft 19 is driven by a shaft 20 through a pair of bevel gears and the shaft 20 is driven through a differential 21 and a pair of concentric vertical shafts 22 and 23 rotated in opposite directions through gears 24 and 25, by a shaft 26. The shafts 22 and 23 are rotated in opposite directions at equal speeds and are connected respectively to the idler gear spider 21' and one of the planetary gears 21'' of the differential 21. The second planetary gear 21''' of the differential is connected to the shaft 28. In operation therefore the first planetary gear 21'' and the spider 21' being driven in opposite directions at the same rate, transmit a rotation to the second planetary gear 21''' and the shaft 20 which is one half that of either the gear 21'' or the spider 21' due to the inherent construction of a differential mechanism. Simultaneously this rotation is transmitted to the shaft 29 in such a manner that the horizontal forces tending to rotate the drum 18 in a horizontal plane are neutralized. The method and apparatus for driving shaft 29 by the shaft 28 is the subject of my application, Serial No. 677,208, filed June 25, 1933, and is fully described and claimed therein.

The control mechanism for moving the shafts 18 and 29, and thereby the searchlight drum 18, includes motors 27 and 28. The motor 27 is geared to a clutch member 28 by a worm 30 and a worm gear 31. It operates a second clutch member 32 and the shaft 18' through a sleeve 33 and a pair of gears 34 and 35 when the clutch members 29 and 32 are in engagement. The motor 27 thereby controls the horizontal position of the searchlight or, in other words, the traverse. Motor 28 operates a clutch member 36 through a worm 37 and worm gear 38 and a second clutch member 39, when the clutch members 36 and 39 are in engagement with each other. The clutch member 36 is attached to a sleeve 40 and drives the shaft 28 through a pair of gears 41 and 42. The motor 28, therefore, controls the position of the searchlight in a vertical plane, or in other words its elevation.

The motor controls are supplemented by hand controls which are located within the ship from where the operator cannot see the searchlight itself and must therefore control the searchlight by the guidance of an indicator. The traverse of the searchlight may be controlled from a hand control station 43 through a set of gears 44 and 45, shaft 46, gears 41, 48, clutch member 48 and clutch member 46 which is keyed to a shaft 51. The shaft 51 is concentric with the motor clutch members 29 and 32, but is not driven thereby when these clutch members are in engagement. This shaft is connected to drive the sleeve 33 and gear 24 only when the hand operation clutch members 52 and 53 are in engagement with each other. The shaft 51 is furthermore connected to drive an indicator 54 through a shaft 55 and speed-reducing gears 56 and 57. This indicator is so geared to the shaft 55.
that it follows the exact movement of the drum about its axis. The indicator, therefore, makes a complete revolution about its dial when the drum makes a complete revolution. Since the shaft 51 cannot follow the movements of the searchlight during the time that motor control, or local control, is used, it is necessary to reconnect the hand control to the searchlight at the same relationship of the hand control and the searchlight so that the indicator will indicate correctly the position of the searchlight. For this purpose the hand operation clutch members 62 and 63 are brought into engagement with each other only when the proper relationship of the searchlight drum and the indicator exists, although it may take several revolutions of the clutch members with respect to each other before such relationship is reached. The clutch mechanism built in accordance with my invention, to obtain the desired result, is clearly shown in Figs. 2, 3 and 4 and modifications thereof are shown in Figs. 5, 6 and 7.

For controlling the elevation of the searchlight by a hand, a second control station 49, similar to station 43, is provided. From this control station the elevation of the searchlight is controlled through worm 59, worm gear 60, shaft 61, bevel gears 62 and 63, clutch members 64 and 65, and shaft 66. Shaft 66 drives shaft 26 through hand operation clutch members 67 and 68 when the two members are in engagement. This clutch is a duplicate of the clutch 52—53 and will be described later in the specification. An indicator 70 driven by the shaft 66 through speed-reducing gears 71—72 and shaft 73 indicates upon a dial the movement of the drum 10 in elevation when the hand operation clutch 67—68 is closed. The drum is not capable of making a complete revolution in a vertical plane and the indicator dial in this case is accordingly marked. This shaft, similar to shaft 51, is not operated when the searchlight is operated by the motor 28.

For the purpose of properly closing and opening the various clutches, a selector handle 75 is provided. In Fig. 1 the selector handle is shown as set in its mid position at which all the clutches are opened. This position is used when it is desired to manipulate the searchlight drum directly, that is, push the drum about its axis by hand. This operation is for convenience referred to as local control.

When the selector handle 75 is moved toward the left the disc 16, upon which handle 75 is mounted, and a shaft 77 to which the disc is attached, are turned toward the left. By this operation the motor operation clutches 29—32 and 34—36 and the local control clutches 49—50 and 64—65 are closed, whereas the hand operation clutches 52—53 and 67—68 remain open. The local control clutches 49—50 and 64—65 are respectively operated by bell cranks 78, 79 and the operating rods 80 and 91 connected between the disc 16 and the respective bell cranks 78 and 79.

When the handle 75 is in the position illustrated in Fig. 1, the rods 80 and 91 are in position to open the clutches 49—50 and 64—65 by moving the bell cranks about their respective pivots to disengage the clutch members. When the handle 75 and thereby the disc 16 is moved either to the motor control position at the left, or to the hand control position at the right, the rods 80 and 91 are drawn away from the shafts 51 and 66, the bell cranks 78 and 79 are turned about the respective pivots, and the clutches 49—50 and 64—65 are closed. The closing of the local control clutches when motor operation is used does not effect operation since, as stated above, the shafts 51 and 66 do not move during motor operation.

As stated before, the selector shaft 77 is moved with the disc 16. Shaft 77 is geared to a cam shaft 82 through gears 83 and 84 and moves this shaft and two cams 85 and 86, which are attached thereto, in a counterclockwise direction for motor control and clockwise for hand control. The cams 85 and 86 are provided with notches 89' and 86', respectively. When the handle 75 is moved to the left for motor control, the cams are moved counter-clockwise until rollers 87 and 88, which roll on the cam surfaces, ride into the notches respectively. This permits arms 89 and 91, which are respectively pivoted at 82 and 83 to raise the clutch members 32 and 39, due to the pressure of springs 20 and 22 respectively, until they are in engagement with the clutch members 29 and 30. The motor 27 is thereby connected to drive shaft 26 through the connection being worm 30, worm gear 31, clutch 29—32, sleeve 33 and gears 34 and 35. The motor 28 is connected to drive the shaft 26 through worm 37, worm gear 38, clutch 39—41, sleeve 40 and bevel gear 42.

The hand operation clutches 52—53 and 89—88 are operated by a pair of arms 100 and 101, 30 respectively operated by a second pair of cams 102 and 103. These cams are mounted upon a cam shaft 105 which is geared to the selector shaft 77 through gears 84, 106, shaft 107 and gears 108 and 109. The arrangement of the 35 gears 83, 84, 108, 109 is such, however, that the shaft 107 will turn in an opposite direction to that in which shaft 77 is turned. The cams 102 and 103 will, therefore, turn clockwise when the handle 75 is moved to the motor control position, whereas the cams 85 and 86 move counterclockwise. Notches 102' and 103' are accordingly so placed that when the handle 75 is moved to the left or the motor control position, the notches 102' and 103' are moved clockwise and away from rollers 110 and 111 whereby the clutches 52—53 and 89—88 remain open. When the handle 75 is moved to the right or to the hand control position, the cams 102 and 103 move counter-clockwise and the notches 102' and 103' move into position to receive the rollers 110 and 111 whereby the springs 112 and 113 force the arms 100 and 101 upward respectively about their respective pivots 114 and 115. The clutches will not close, however, until the indicators 49 and 70 indicate the proper position of the drum 10. At this movement of the handle 75, the notches 89' and 91' are moved away from the rollers 87 and 88 whereby the motor clutches 29—32 and 89—88 remain open.

The motor clutch 36—39 and hand operation clutch 67—68 are shown in detail in Figs. 2, 3 and 4. As stated before, the clutches 29—32 and 89—88 are duplicates of the clutches 36—39 and 67—68 respectively. Fig. 2 is a vertical sectional view through the center of the clutch mechanism. This view illustrates the clutch members 36—39 and 67—68 in the open position. The arms 81 and 101 for operating the clutch members 36 and 67, respectively, are not shown. The entire mechanism is supported by a collar 116' pinned to the shaft 66. A collar 116' pinned to the shaft 66 prevents axial displacement of the parts along the shaft.
drives the worm wheel 38. Worm wheel 38 is freely rotatable about a sleeve 40 and is provided on its under side with a series of clutch teeth comprising the clutch member 36. This worm wheel is prevented from axial displacement by a flange 118 integral with the sleeve 40 and by a cotter 121 engaged in a slot in the sleeve 40 by a set screw 121. The sleeve 40 is free to rotate about the shaft 66 when the clutch members 67 and 68 are disengaged, and is movable about the shaft irrespective of the engagement or disengagement of the clutch members 36 and 39. As above explained, drives the elevator mechanism for the drum is keyed to the sleeve 40 by a key 122 and the clutch member 39 is keyed to the sleeve by a key 123, but is axially movable into and out of engagement with the clutch member 36. By this arrangement, therefore, the motor 25 through worm 37, worm gear 38, clutch members 36–39, sleeve 40 and gear 41 can control the elevation of the searchlight drum 10. The shaft 66 during such operation remains dormant and the indicator 70, therefore, does not follow the position of the drum.

When hand operation of the selector handle 75 is turned to the right whereby the clutches 64–65 and 67–68 are set for closing as soon as the proper relation between the cooperating members thereof is reached. The clutch member 61 is keyed to the shaft 66 and rotates therewith and the member 64 is geared to the operating wheels 58 so that to close this clutch it is only necessary to turn the clutch member 64 a fraction of a revolution until its slots are in line with the teeth on the member 65 to close the clutch. Before the clutch members 67–68 may be engaged, however, the shaft 66 will need to be rotated several revolutions until the indicator 70 indicates the correct position for the drum 10.

The clutch member 68 comprises a ring which is attached to the sleeve flange 118 by bolts 124. This member of the clutch, therefore, follows the movement of the drum since the sleeve 40 and gear 41 are always connected to it irrespective of the arrangement of the clutches.

The member 67, on the other hand, follows the movement of the shaft 66. This is accomplished by a disc 126, keyed to the shaft 66 by a key 127 and provided with tapered holes 128 into which the pins 129, attached to the clutch member 67, project. A loose connection is thereby formed between the disc 126 and the clutch member 67 which, due to the taper on pins 129, becomes a rigid connection when the clutch is closed.

The clutch members 67 and 68 are prevented from closing, until a proper relation between drum position and indicator is reached by a locking disc 130 which is free to rotate about the shaft 66. This locking disc 130 is provided with a series of downwardly-projecting pins 131 which are axially arranged about the center of the disc, at such radius as to project within the clutch member 68, which as above stated is in the form of a ring and is attached to flange 118. There are in the present embodiment of the invention thirty pins equally spaced. Moreover the locking disc 130 and the flange 110, the shaft 66 is provided with a circular cam 132 which is eccentrically mounted with respect to shaft 66 and is better illustrated in Figs. 3–4. About the cam 132 and rotatable with respect to it is a gear 133 provided with 27 teeth.

This gear is of such diameter that the gear teeth engage the pins at the point at which the cam is at the greatest distance from the center of the shaft. The gear is prevented from rotating with respect to the clutch member 68 by a pin 134 projecting from flange 118 into a slot on the under side of the gear. By this arrangement the teeth of the gear successively engage the pins as the cam 132 and the shaft 66 rotate with respect to the clutch member 68.

Due to the fact that there are only 27 teeth in 10 the gear and there are 30 pins in the locking disc 130, the locking disc is given a rotational movement with respect to the clutch member 68. This may be readily understood when considering the pins 131 as constituting an internal gear. Since there is a difference in the number of teeth of the two engaging gears, there will be a difference in the rotary movement of the two gears about their common axis. In the present case the gear 133, being pinned to a flange 110, cannot rotate with respect to the clutch member 68, but the locking disc is rotated with respect there to a fraction of a revolution proportional to the difference in the number of teeth or one-tenth of a revolution. This is made use of to prevent the engagement of the clutch members 67–68 when the shaft 66 with the indicator and the gear 41 with the drum 10 are not in a predetermined position with respect to each other.

The clutch member 68 is provided with two slots 30 spaced diametrically opposite each other on the edge of the clutch member 68, into which the prongs 137 mounted on the circumference of the clutch member 67 are arranged to project when the member 67 is lowered. The member 68 is provided with a radial slot 138 extending inwardly from the edge of the clutch member. This slot is shaped to accommodate a steel ball 140. The disc 130 is similarly provided with a radial slot 141. When the two slots are directly above each other, the weight of the clutch member 67 assisted by the spring pressure upon the lever arm 101 forces the ball 140 into the slot 138–141, which, when in that position, form a tubular chamber, the two halves of which are held in position by the ball.

When, during operation, the clutch member 67 is lifted, the shaft 66, disc 126, and the clutch member begin to rotate with respect to the clutch member 68. The slot 141 in the disc 130 is somewhat shorter than the radius of the ball 140 so that when the disc 130 begins to move, the ball 140 is forced out of the slot 141 and into the path of the upper clutch member 67 as illustrated in Fig. 2. The edge of the disc 130 and the inner edge of the clutch member 67 are provided with chamfers, or rounded surfaces, having a radius substantially equal to that of the ball, so that when these two surfaces move with respect to each other, the ball which remains in the slot 138 in the clutch member 68 will merely roll and will offer substantially no frictional resistance. As already stated, the disc 130 revolves at a speed equal to one-tenth of that of the shaft 66. When the searchlight drum 65 and the indicator become out of synchronism, it is not only necessary to return the clutch members 67 and 68 into angular relation within one revolution of each other, but it is necessary to turn the shaft 66 with the disc 126 and clutch 67 member 67 until the total angular distance, which it traveled away from its original position with respect to the position at which the clutch 67–68 was opened, is eliminated.

By this arrangement, therefore, the clutch 75
members 67 and 68 may revolve with respect to each other several revolutions and cannot be reengaged merely by moving the prongs 37 above the slots 36. The clutch members 67—68 must be revolved until the locking disc is brought into the position at which the slot 141 is directly above slot 138 and the ball 140 is enabled to move into the channel, thereby provided, and out of the way of the clutch member 68. A casing comprising members 142 and 143 partially encloses the clutch mechanism. It provides a support for the pivots 93 and 115 of the arms 91 and 101. Roller bearings 144 and 145 provide a guide for the shaft 66 through the casing 142—143.

Fig. 5 illustrates a modification of the clutch shown in Figs. 2, 3 and 4. In this modification the shafts 150 and 151 are to be connected to each other when the proper angular relation exists between them; that is, the exact relationship at which the two shafts were disconnected. In this modification the shaft 150 has keyed thereon to the clutch member 152 by a key 153. A second clutch member 154 is keyed to the shaft 151 by a key 155. This member is slidable into and out of engagement with the clutch member 152.

The clutch member 154 is provided with a pair of power-transmitting fingers 156 and a guiding finger 157. The guiding finger normally projects partly into a radial slot 158 in a bushing member 159. This bushing member 159 is free to rotate about the clutch member 152. It cannot move axially with respect to this clutch member because of pins 160 which project into a circular slot 161 in the clutch member 152 at one end and into slots 162 in a ring gear member 163 at the other end. This ring gear member is in effect a worm and engages a worm gear 164.

The worm gear 164 is mounted on a horizontal shaft 165 to which a bevel gear 166 is attached. Bevel gear 165 engages a bevel gear 167 mounted on a vertical shaft 168. Both shafts 165 and 168 are mounted for rotation in bearings located in a bracket 170. A pinion 171 is attached to the other end of shaft 165 and is arranged to engage the gear teeth on the rim of a locking ring 172. This entire assembly is enclosed in a casing 173 which is attached to, and rotates with, the clutch member 152. The particular means for attaching the casing 173 to the clutch member 152 is set screw 174 and nut 175. The bracket 170 is attached to the casing 173.

In operation when the clutch members 152 and 154 are separated the shaft 150 drives clutch member 152, casing 173, bracket 170 and therefore the worm gear 164. The shaft 151, on the other hand, drives clutch member 154, bushing 158, worm ring 163. The shaft 151 is prevented from axial displacement by a split ring 176 which fits into a circular slot near the end of the shaft and projecting beyond the surface of the shaft. The ring fits into the clutch member 152, being locked therein by a bushing 177 which is held in place by a screw 178. The ring 176 is so arranged that shaft 151 may, of course, rotate with respect to the clutch member 152 when the clutch members 152 and 154 are separated.

In operation, when the clutch members are disengaged, the slots 180, 158 and 181 in the members 152, 159 and 172, respectively, are out of alignment. As above explained, the clutch members 162 and 164 being attached respectively to the shafts 152 and 151 rotate with respect to each other and therefore the fingers 156 on the clutch member 154 are out of line with slots 182 in the clutch member 152. The fingers 162 and 164 disengage the bushing 159 through the slot connection 165, causes the disalignment of the slots 180 and 183. With the construction so far considered, it would be necessary to turn the shafts 150 and 151 not more than one revolution to permit the reengagement of the clutch members. This is undesirable, however, since due to various gear reductions the shafts may be out of alignment several revolutions. For this reason the worm ring 163 being driven from shaft 151, as above explained, rotates with respect to the worm gear 164 which is driven from shaft 150 through the casing 173 and bracket 170 and thereby transmits, through gears 166, 161 and 171 and the shafts 165 and 168, a movement to the bushing 172. This movement causes the disalignment of slot 181 in the bushing 172 with respect to the slots 180 and 158.

The finger 157 is made of such dimensions that the engagement of the clutch members is impossible unless all three slots are in alignment. The speed reduction between the worm ring 163 and the bushing 172 is therefore made by allowing the angle 25° since the worm and worm gear are employed. The ratio is of course dependent upon the gear ratios used in other parts of the apparatus. If, therefore, in operation the shafts are moved more than one revolution, the finger 157 can not be closed until this angular distance is eliminated either by turning the shafts back to eliminate the angular distance and bringing the bushing 172 back to its original position or forward to complete a revolution of the bushing 172.

Fig. 7 is another modification of my clutch mechanism in which a locking member 200 is driven by one of the clutch members 201 through a set of reducing gears comprising solely sprocket gears. In this modification the shafts 202 and 203 are connected by clutch members 204 and 201, 204 being slidable along the shaft 202.

When the clutch members are disengaged shaft 202 drives clutch member 204 and a casing 205 which is keyed to this clutch member by a key 207. The shaft 203 drives the clutch member 201, a gear 208, a bushing 209, the locking ring 200 and a ring gear 210. The bushing 208 and clutch member 201 are keyed to the shaft 203 by keys 212 and 213. When the shaft 203 is rotated with respect to each other, the gear 208 rotates with respect to the casing 205 and thereby transmits motion to the gears 214, 215, 216, shaft 217, which revolves in bearings attached to the casing 205, gears 218, 210 and 210. The locking ring 200 is thereby rotated and a ball 221 similar to the ball 140 of Fig. 2 is forced into the path of the clutch member 204 preventing its engagement with the clutch member 201. The ball rests in a slot 222 in the clutch member 201. A short slot 223 in the locking ring 200 enables the ball 221 to be forced into the path of the clutch member 204 when the latter is lifted.

The ratio of transmission between gear 208 and the locking ring 200 through gear 210 is such that several revolutions are permitted between the shafts before the locking ring makes a complete revolution and therefore returns to its original position. In order that the clutch members may engage each other, it is necessary to turn the shafts until the clutch members and the locking ring are in the proper position.

What I claim as new and desire to secure by Letters Patent of the United States is:
1. In a searchlight-control mechanism, the combination of a searchlight mounted for movement about an axis, an electric motor arranged to move said searchlight about said axis, when connected to said searchlight, manual-control means for moving said searchlight about said axis when connected thereto, an indicator operated by said manual-control means for indicating the position of said searchlight, and clutching means operable to connect said motor and said manual-control means to said searchlight alternately and arranged to connect said manual-control means to said searchlight only when said indicator indicates correctly the position of said searchlight.

2. In a searchlight-control mechanism, the combination of a searchlight mounted for adjustment about a vertical and a horizontal axis, electric motors for adjusting said searchlight about its axes, manual-control means for adjusting said searchlight about its axes, indicating means operative by said manual-control means to indicate the position of said searchlight about its axes, and clutching means for alternately connecting said manual-control means and said motor to said searchlight and arranged to connect said manual-control means to said searchlight only when said indicating means indicates correctly the position of said searchlight about its axes.

3. In a searchlight-control mechanism, the combination of a searchlight adjustable about a horizontal and a vertical axis, automatic-control means for adjusting said searchlight about said axes, manual-control means for adjusting said searchlight about said axes, indicating means operated by said manual-control means for indicating the position of said searchlight about both axes, clutching means, and a common control handle for connecting said automatic and said manual-control means to said searchlight alternately, said clutching means being arranged to connect said manual-control means to said searchlight only when said indicating means indicates correctly the position of said searchlight about both of said axes.

4. In a clutch mechanism, the combination of a driven member, a driving member arranged to normally rotate with respect to said driven member, means for moving said members into engagement with each other, means for preventing the engagement of said members until a predetermined angular relation exists between them including a locking member arranged concentrically with and between said driven and driving member, a series of annularly arranged pins attached to and arranged concentrically on said locking disc and engaged successively by said gear when said second driving member and said driving member rotate with respect to each other, the number of said pins and the number of teeth in said gear differing from each other whereby said clutch is rotated.

5. A clutch mechanism comprising a driven member, a driving member, means for moving said driving member into engagement with said driven member, means for preventing the engagement of said two members until a predetermined angular relation exists between them including a locking member arranged concentrically with and between said driven and driving member, and rotated at a speed proportional to the difference of rotation between said driving and driven members.

6. A clutch mechanism comprising a driven member, a driving member, means for moving said driving member into engagement with said driven member, means for preventing the engagement of said two members until a predetermined angular relation exists between them including a locking member arranged concentrically with and between said driven and driving member, and rotated an angular distance proportional to the angular distance which said members turned away from the engaging position.

7. A clutch mechanism, the combination of a driven member, a driving member, means for moving said driving member into engagement with said driven member, means for preventing the engagement of said two members until a predetermined angular relation exists between them including a locking member which is geared to said driven and said driving member and arranged to rotate in proportion to the angular distance that said driven and driving members move away from the relationship at which they were disengaged whereby the said two members are required to return to the engaging position through several complete revolutions to eliminate the total angular distance traveled from the relative positions at engagement.

8. In a clutch mechanism, the combination of a driven member, a driving member, means for moving said members into engagement with each other, means for preventing the engagement of said members until a predetermined angular relation exists between them including a slot in said driven member, a floating member arranged concentrically with said driven member and rotatable in synchronism with said driven member, a slot in said floating member, a locking member arranged concentrically with said driven member and rotatable in proportion to the rotation between said driven and driving member, and driving members, a slot in said locking member, and a guiding finger upon said driving member which holds said driving member out of engagement with said driven member until the slots in said driven, floating and locking members are in line with each other.

9. In a clutch mechanism, the combination of a driven member, a driving member, means for moving said members into and out of engagement with each other, means for preventing the engagement of said members until a predetermined angular relation exists between them including a slot in said driven member, a floating member arranged concentrically with said driven member and rotatable in synchronism with said driven member, a slot in said floating member, a locking member arranged concentrically with said driven member and rotatable in proportion to the rotation between said driven and driving member, and driving members, a slot in said locking member, and a guiding finger upon said driving member which holds said driving member out of engagement with said driven member until the slots in said driven, floating and locking members are in line with each other.

10. In a clutch mechanism, the combination of a driven member, a driving member, means for moving said members into and out of engagement with each other and means for preventing the engagement of said members until a predetermined angular relation exists between them including a locking disc mounted concentrically with said driven and driving members, means for moving said driving disc in proportion.
to the angular movement between said driving and driven members, a ball mounted between said driven member and said disc, a pocket for said ball formed when said disc, said driven member and said driving members are in proper alignment for engagement, and means for forcing said ball into the path of said driving member and prevent its engagement with said driven member until such proper alignment exists.

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