Jan. 18, 1955 H. L. BONE 2,699,853

CLUTCH MEANS FOR RAILWAY SWITCH OPERATING APPARATUS

Filed Dec. 30, 1950 2 Sheets-Sheet 1

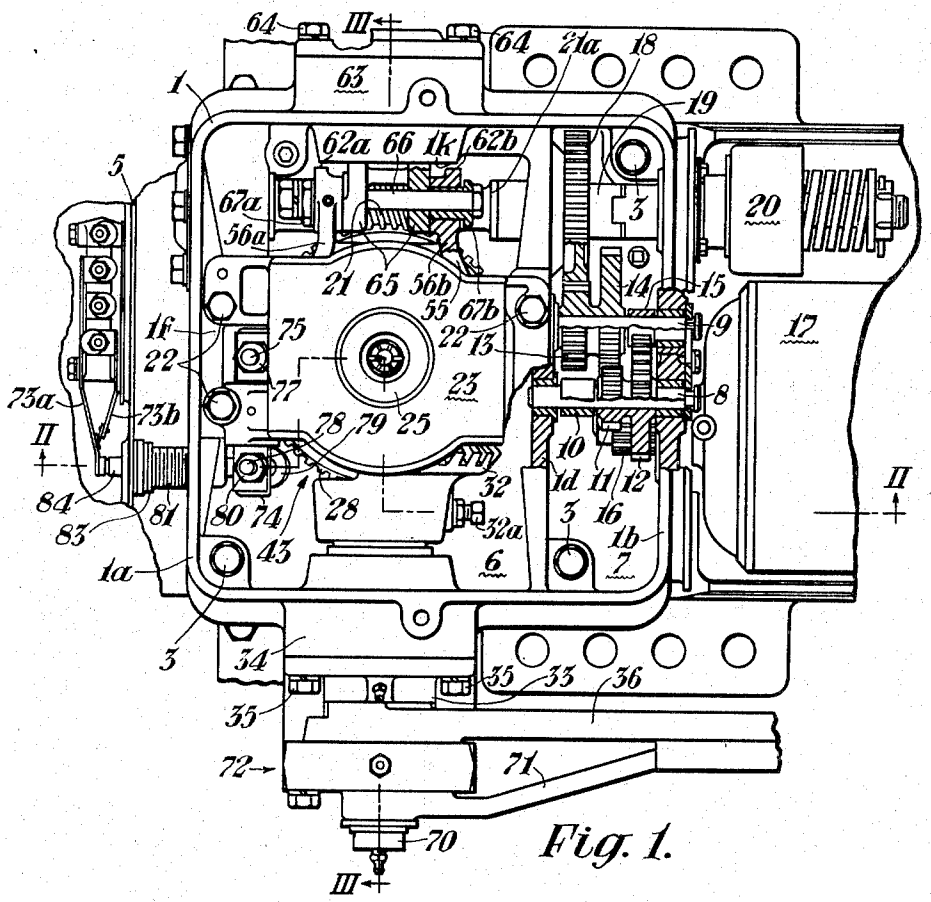


Fig. 1.

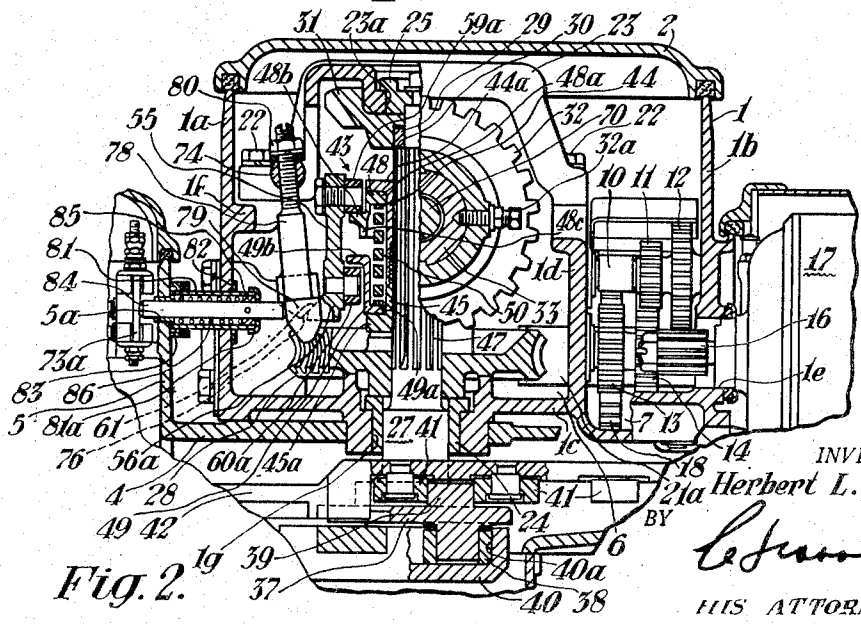


Fig. 2.

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CLUTCH MEANS FOR RAILWAY SWITCH OPERATING APPARATUS

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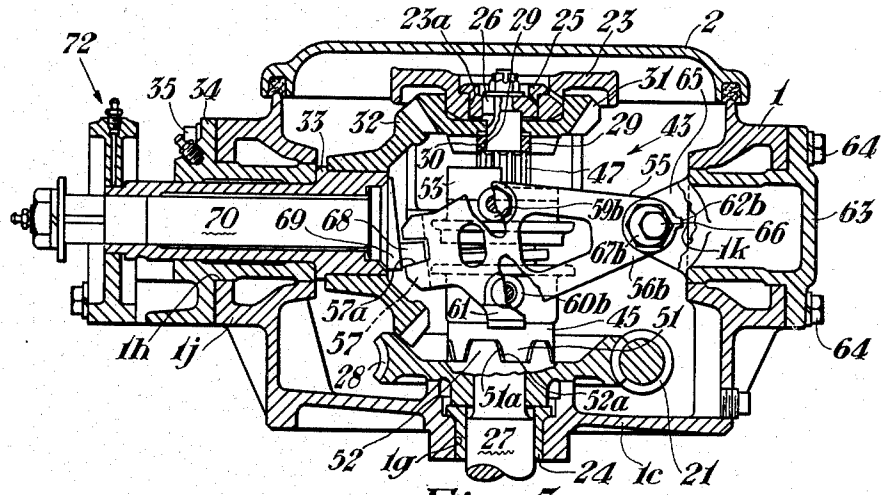



Fig. 3.

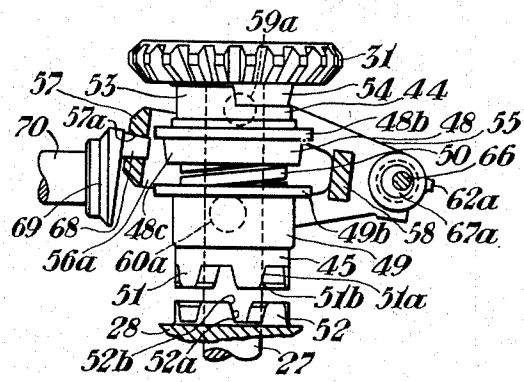



Fig. 4.

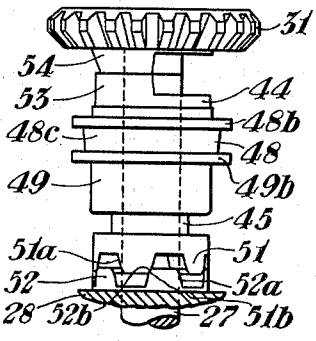



Fig. 6.

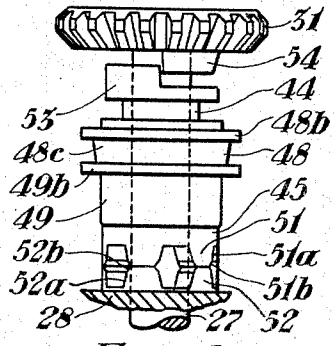



Fig. 5.

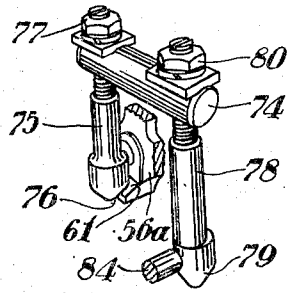



Fig. 7.

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United States Patent Office 2,699,853
Patented Jan. 18, 1955



2,699,853

# CLUTCH MEANS FOR RAILWAY SWITCH OPERATING APPARATUS

Herbert L. Bone, Forest Hills, Pa., assignor to Westinghouse Air Brake Company, a corporation of Pennsylvania

Application December 30, 1950, Serial No. 203,709

5 Claims. (Cl. 192—48)

My invention relates to railway switch operating apparatus, and particularly to dual control switch and lock movements wherein means are provided for selectively operating the movement either by power or by hand.

In at least one well-known dual control switch and lock movement for railway switches, as shown for example in Letters Patent of the United States No. 2,388,819 granted to me on November 13, 1945 for Railway Switch Operating Apparatus, the means for selecting between hand and power operation includes a clutch mechanism comprising a pivoted shifter yoke operated by a selector lever, and a sleeve splined to the switch operating crankshaft. The sleeve is provided with clutch faces, which upon movement of the sleeve by the shifter yoke selectively engage clutch faces provided on manually operated and motor driven gears rotatably mounted on the crankshaft. The shifter yoke is pivoted at one end and cooperates by way of rollers with the sleeve splined to the crankshaft, the yoke being oscillated about its pivot by an eccentrically positioned pin carried by the selector lever and cooperating with the free end of the yoke. The switch and lock movement described in the aforesaid patent further includes an auxiliary contact mechanism for interrupting the circuit of the drive motor when the selector lever is moved away from the motor operating position toward the manual operating position.

Due to the pounding of the trains over the rails, switch and lock movements installed in the trackway are subject to severe vibrations. Certain parts of the switch movement in the course of time may show signs of wear due to these excessive vibrations. In the dual control mechanism of a switch and lock movement, wear of certain parts may introduce undesirable clearances which affect the positive operation of the mechanism by the selector lever. It has also been found that when the switch movement is motor operated and the switch points of the switch are obstructed, the force transmitted back from the switch points to the switch operating crankshaft of the movement increases the friction between the engaging surfaces of the motor clutch and between the splined surfaces of the crankshaft and the clutch sleeve thereon. The added friction due to the adverse operating condition requires an additional effort in moving the selector lever of the dual control mechanism from the motor operating position to the manual operating position.

An object of my invention is to provide a selective dual control mechanism for a switch and lock movement with take-up means for adjusting the clearances of the parts to insure positive operation of the dual control mechanism.

A further object of this invention is to provide a selective dual control mechanism for a switch and lock movement in which the manual effort required in shifting from power to manual operation of the movement is reduced to a minimum and in which any upward reaction resulting from adverse operating conditions is minimized.

Still another object of my invention is to provide a novel contact mechanism for interrupting the circuit of the drive motor of a switch and lock movement when the dual control mechanism is shifted from the motor operating position toward the manual operating position by the selector lever.

According to my invention, the shifter yoke of the dual control mechanism is pivoted on eccentric bushings so that vertical adjustments may be made with respect to the rollers carried by the yoke and the clutch sleeve splined to the switch operating crankshaft. The eccentric bushings provide a take-up for any manufacturing variances so that positive operation of the clutch mechanism by the shifter yoke is insured. The shifter yoke is pivoted at one end on the eccentric bushings and cooperates at the other end by way of a tapered pin and tapered slot connection with a selector lever, the rollers cooperating with the splined sleeve being located between the pivot point of the yoke and the pin and slot connection. The eccentric bushings provided for the yoke pivot are so adjusted that horizontal movement of the yoke is minimized in view of the tapered pin and tapered slot connection of the free end of the yoke with the selector lever.

The motor clutch operated by the shifter yoke is provided with clutch faces having double angled teeth, the slope of the base portion of the teeth in mesh when the switch and lock movement is motor operated being such as to minimize the possibility of any upward reaction developing under adverse operating conditions of the switch. The upper ends of the motor clutch teeth are provided with a slope which will develop an upward reaction when engaged, the upward reaction aiding in shifting the clutch mechanism from its motor operating position to its manual operating position when the switch points are obstructed.

The movement of the shifter yoke of my novel clutch mechanism also actuates cut-out contacts in the circuit of the drive motor of the switch and lock movement. The shifter yoke is provided with a cam face which cooperates with a pivoted cam follower rod. The movement of the shifter yoke cam when shifting the clutch mechanism from its motor position to its manual position, will rotate the cam follower rod causing the cut-out contacts to be opened through the medium of a second pivoted rod. The second rod is formed with an adjustable eccentric portion which permits accurate adjustment of the parts so that the cut-out contacts are operated at the proper time.

Other objects and characteristic features of my invention will become apparent as the description proceeds.

I shall describe one form of a dual control clutch mechanism embodying my invention, and shall then point out the novel features thereof in claims.

In the accompanying drawings, Fig. 1 is a plan view of dual control clutch mechanism embodying my invention, together with portions of the drive motor and the circuit controller of a switch and lock movement. Fig. 2 is a sectional view taken along the line II—II of Fig. 1. Fig. 3 is a sectional view taken along the line III—III of Fig. 1, portions of which are broken away for a better illustration of the parts. Fig. 4 is a side elevational view of the clutch mechanism, with portions shown in cross-section to illustrate the operation of the clutch when in the manual operating position. Figs. 5 and 6 are views similar to Fig. 4 illustrating respectively the position of the clutch mechanism when the mechanism is shifted to the motor operating position and the motor clutch teeth do not mesh, and the position of the clutch mechanism when shifted to the manual operating position and the positions of the switch points do not correspond to the position of the hand-throw lever; while Fig. 7 is an isometric view of the motor cut-out operating mechanism.

Referring now in detail to the drawings, the reference numeral **1** designates a housing having end walls **1***a* and **1***b* and a bottom wall **1***c*, and provided with a removable cover **2**. The housing **1** is fixed, as by bolts **3**, to the top of horizontal wall **4** forming a part of a circuit controller housing **5** (only a portion of which is illustrated). The circuit controller housing **5** forms a part of a switch and lock movement similar to that shown and described in the aforesaid Letters Patent of the United States No. 2,388,819. The housing **1** is divided into two sections or compartments **6** and **7** by a vertical wall **1***d* integral with the bottom wall **1***c*. Suitably journaled in the end wall **1***b* and the dividing wall **1***d* are two horizontal shafts **8** and **9** having fixed thereto a spacer **10** and gears **11** and **12**, and gears **13** and **14** and a spacer **15**, respectively, within the compartment **7**. The gears **11** and **14** are in mesh while the teeth of gear **12** mesh with a pinion **16** fixed to the drive shaft of a motor **17**, the motor **17** being external of the housing **1**, with the drive shaft and pinion **16** extending into the compartment **7** through a

suitable opening 1*e* in the side wall 1*b*. The gear 13 meshes with a gear 18 fixed on a rotatable sleeve 19, the sleeve forming a portion of a conventional friction clutch generally designated by the reference character 20, the rotation of the gear being transmitted through the friction clutch to a worm 21 carried by an extended shaft 21*a* (Figs. 1 and 3) suitably journaled in the end walls 1*a* and 1*d*, the rotatable sleeve 19 being journaled on shaft 21*a*.

Fixed to the top of the dividing wall 1*d* and to a suitable extension 1*f* on the end wall 1*a*, as by bolts 22, is a top bearing plate 23 having an opening 23*a* therein which is in vertical alignment with an opening 1*g* formed in the bottom wall 1*c* of the housing. Fixed in the opening 1*g* is a flanged bushing 24, the opening 23*a* being provided with a bushing 25. Keyed to the bushing 25, as at 26, is a vertical shaft 27, the lower end of which is supported in the bushing 24. Rotatably mounted on the vertical shaft 27 directly above the lower bushing 24 is a worm gear 28 which meshes with the motor driven worm 21. Rotatably mounted on the upper end of the shaft 27 between the bushing 25 and the upper end of a bushing 29, the lower end of which rests on a shoulder 30 formed on the shaft 27, is a bevel gear 31. The bevel gear 31 meshes with a second bevel gear 32 which is fixed as by a set screw 32*a* to the inwardly extending end of a horizontal tubular shaft 33. The tubular shaft is journaled in a bearing 34 fixed in an opening 1*h* of a boss 1*j* on the housing 1 as by bolts 35. As will hereinafter be more fully described, the tubular shaft is adapted to be rotated approximately 180° by means of a hand-throw lever 36 fixed to the end thereof.

The lower end of the vertical shaft 27 terminates in a crank 37 extending in opposite directions from the shaft. The crank is provided on its under side with a roller 38 and on its upper side with rounded upstanding projections 39. The dependent roller 38 cooperates with a cam slot 40*a* in an operating rod 40 while each of the projections 39 cooperates with two of three spaced rollers 41 carried by a slide bar 42 in the well-known manner. The operating rod 40 is slidably mounted in the bottom of the housing 5 and is operatively connected at one of its outer ends with the head rod of a switch (not shown). The slide bar 42 is slidably mounted in the bottom of the housing 5 in a position in which it intersects the operating rod at right angles, the left-hand end of the slide bar being provided with a lock box which is not illustrated herein but illustrated and described in my copending application for Letters Patent of the United States, Serial No. 203,708, filed December 30, 1950, for Railway Switch Operating Apparatus.

Means are provided for selectively connecting the bevel gear 31 or the worm gear 28 with the switch operating shaft 27 to permit the switch to be operated either by the hand-throw lever 36 or by the motor 17. To this end a clutch assembly generally designated by the reference character 43 is provided which comprises two sleeves 44 and 45 which are mounted on the shaft 27 for vertical sliding movement between the two gears 28 and 31, both sleeves being provided with internal splines (not shown) which cooperate with corresponding external splines 47 on the shaft 27 so that said sleeves are rotatable with said shaft. The two sleeves are secured together to form a unitary sleeve provided at its upper and lower ends with outwardly extending flanges 44*a* and 45*a*, respectively. Placed about the sleeves 44 and 45 adjacent to the flanges 44*a* and 45*a* are two spring cups 48 and 49. The spring cups are substantially Z-shaped in cross-section (Fig. 2), the upper spring cup 48 being formed with an inwardly extending flange 48*a*, an outwardly extending lip 48*b* and a dependent sleeve portion 48*c*, while the lower spring cup 49 is formed with an inwardly extending flange 49*a* and an outwardly extending lip 49*b*. A coil compression spring 50 surrounding the sleeves 44 and 45 and having one end received within the cup 48 against the flange 48*a* and the other end received within the cup 49 against the flange 49*a*, biases the two spring cups 48 and 49 outwardly against the flanges 44*a* and 45*a*, respectively, of the two sleeves.

The lower end of the sleeve 45 is formed with double angled teeth 51 (Figs. 3–6) which cooperate with double angled teeth 52 provided in the hub of the worm gear 28. When the clutch mechanism 43 is in its lower position as illustrated in Figs. 2 and 3, the crankshaft 27 will be connected to the worm gear 28 to enable the shaft 27 to be power operated by the motor 17 in the manner hereinafter more fully described.

The upper end of the upper sleeve 44 is formed with a single projection 53 which cooperates with a matching projection 54 on the hub of the bevel gear 31. When the clutch mechanism 43 is in its upper position as illustrated in Fig. 4, the crankshaft 27 will be connected to the bevel gear 31 to permit manual operation of the shaft 27 by the hand-throw lever 36 in the manner hereinafter described.

The clutch assembly 43 is arranged to be moved longitudinally on the crankshaft 27 by means of a shifter yoke 55 so that the crankshaft may be driven either by the worm gear 28 or the bevel gear 31. The shifter yoke 55 comprises two substantially diamond shaped arms 56*a* and 56*b* interconnected at their front ends by a cross member 57 and intermediate their ends by a second cross member 58. Fixed to the inner faces of the shifter yoke arm 56*a* are two spaced rollers 59*a* and 60*a* while the shifter yoke arm 56*b* is similarly provided with two rollers 59*b* and 60*b* in horizontal alignment respectively with the rollers on the arm 56*a*. The rollers 59*a* and 59*b* are adapted to cooperate with the lip 48*b* of the spring cup 48 while the rollers 60*a* and 60*b* are adapted to cooperate with the lip 49*b* of the spring cup 49. For purposes hereinafter appearing the lower edge of the shifter yoke arm 56*a* is provided with an outwardly extending beveled surface 61, hereinafter referred to as the cam surface 61, while the rear ends of the arms 56*a* and 56*b* are formed with small rearwardly extending projections 62*a* and 62*b*, respectively.

A yoke support 63 is fixed to the rear wall of the housing as by bolts 64, the support including two horizontally spaced lugs 65 extending into the housing. Journaled in said lugs is a horizontal shaft 66, the ends of which carry eccentric bushings 67*a* and 67*b* fixed in the ends of the arms 56*a* and 56*b*, respectively. The front cross member 57 of the yoke 55 is provided with a tapered recess 57*a* which received a tapered pin 68 fixed in a disc 69. The disc 69 forms a part of a selector lever shaft 70 journaled in the hand-throw lever shaft 33. Fixed to the other end of the shaft 70 is a selector lever 71 interconnected with the hand-throw lever 36 by an interlock generally designated by the reference character 72 which insures the proper sequence of operation of the two levers as fully detailed and described in Letters Patent of the United States No. 1,887,376 for Railway Switch Operating Apparatus, issued on November 8, 1932 to G. V. Jefferson et al. The position of the selector lever illustrated in Fig. 1 is the position in which the vertical shaft 27 will be driven by the motor 17.

With the selector lever 71 in its motor position illustrated in Fig. 1, the shifter yoke 55 will be in the position illustrated in Fig. 3, having been rotated in a counterclockwise direction about its pivot on shaft 66 so that rollers 59*a* and 59*b* engaging the lip 48*b* of the spring cup has moved the sleeves 44 and 45 downwardly on the shaft 27. With the sleeves 44 and 45 in their lower positions as illustrated in Fig. 2, the double angled teeth 51 on the sleeve 45 are in mesh with the double angled teeth 52 in the hub of the worm gear 28. The vertical shaft 27 is thus rotated by the motor 17 through the reduction gearing formed by the pinion 16, gears 12, 11, 14, 13, and 18, and the worm 21, the worm gear 28, through the motor clutch formed by the double angled teeth 51 and 52, and the sleeve 45 splined to the shaft. Should it be desirable to operate the switch movement by the hand-throw lever 36, the selector lever 71 is first rotated approximately 180° to its manual position, thereby rotating the shaft 70. The disc 69, and pin 68 received within the slot 57*a* of the shifter yoke, will be rotated 180° to rotate the shifter yoke in a clockwise direction about the shaft 66 to its manual position as shown in Fig. 4. The rotation of the shifter yoke in a clockwise direction will bring the rollers 60*a* and 60*b* of the yoke into abutment with the lip 49*b* of the spring cup 49, thereby moving the spring cup upwardly. The upward movement of the spring cup 49 tends to bias the spring 50, moving the upper spring cup 48 and the sleeves 44 and 45 upwardly. The up-

ward movement of the sleeves 44 and 45 will disengage the teeth 51 of the sleeve 45 from the teeth 52 of the worm gear hub at the same time the projection 53 on the sleeve 44 aligns with the projections 54 on the bevel gear 31 so that the vertical shaft 27 is now connected by the splined sleeve 44 to the bevel gear 31. Rotation now of the hand-throw lever 36 will rotate the shaft 33 and the bevel gear 32 meshing with the bevel gear 31.

One of the features of the dual control mechanism thus far described is the mounting of the shifter yoke 55 on the eccentric bushings 67*a* and 67*b* and the provision of the rearwardly extending projections 62*a* and 62*b* on the arms 56*a* and 56*b*. The eccentric bushings 67*a* and 67*b* provide a vertical adjustment for the pivot point of the shifter yoke 55 which will permit the proper vertical adjustment of the rollers 59*a*, 59*b* and 60*a*, 60*b* with respect to the lips 48*b* and 49*b*, respectively, of the two spring cups, the eccentric bushings being also adjustable to take up any manufacturing variations in the various parts. The rearwardly extending projections 62*a* and 62*b* on the shifter yoke cooperate with the inner wall 1*k* of the housing making it necessary for the bushings to be assembled and adjusted so that rotation of the bushings around their centers will be toward the selector lever and not toward the wall 1*k* in view of the tapered pin 68 and slot 57*a*. Since the pin 68 is tapered any excessive horizontal motion of the yoke would introduce undesirable vertical clearances between the pin and its receiving recess. The extending projections 62*a* and 62*b* are such that if the eccentric bushings are fixed so that the segment of motion around their centers is toward the inner housing wall 1*k*, the yoke could not be mounted on the shaft due to insufficient clearance between the shaft and the inner wall.

Since the shifter yoke 55 is actuated at its extreme end by the selector lever 71, manufacturing variations have much less effect on the location of the rollers 59*a*, 59*b* and 60*a*, 60*b* with relation to the splined sleeves 48 and 49 than in the case where a cam actuating the yoke was intermediate the yoke pivot and the load bearing rollers. The loads on the shaft 66 and the tapered pin 68 are also less, thereby reducing the wear on these parts and reducing the friction. Less effort is therefore required to operate the selector lever.

Another feature of the dual control mechanism thus far described is the provision of the doubled angled teeth 51 and 52 on the sleeve 45 and the hub of gear 28, respectively. In Fig. 6 of the drawings the position of the clutch mechanism is illustrated when the selector lever 71 is thrown to its manual position and the positions of the switch points do not correspond with the position of the hand-throw lever 36. The double angled teeth 51 are partially disengaged from but still mesh with the double angled teeth 52 of the worm gear hub, while the upper face of the projection 53 on the sleeve 44 abuts against the lower face of the projection 54 on the bevel gear 31 but is not in mesh therewith. The spring 50 has been compressed beyond its initial length and is therefore exerting a pressure tending to mesh the projections 53 and 54 in the manner described.

In previous clutch mechanisms, the use of clutch teeth having a single angle under certain circumstances, such as when operating under extreme loads or when the switch movement was being operated at high speed and brought to an abrupt stop, was disadvantageous in that the upward reaction caused by the single angle of the gear teeth was sufficient to disengage the motor clutch. In other words, the spring 50 would be compressed and the clutch would be moved to its hand position. Under certain other circumstances when the movement was thrown to hand operation, and the switch points were obstructed, the friction between the single angle clutch surfaces and on the splines 47 was sufficient to prevent the spring 50 from shifting into manual position when the hand-throw lever was thrown to a position corresponding to the positions of the switch points.

The angle of the base portions 51*a* and 52*a* of the clutch teeth now provided does not result in a sufficiently high upward thrust which would disengage the motor clutch, the angle being approximately 10°. On the other hand, the clutch surfaces which are engaged in the manner illustrated in Fig. 6 provide a sufficient disengaging force so that the clutch will move to its manual position under the influence of the spring 50, the angle of the end portions 51*b* and 52*b* being approximately 30°. In this connection, it should be pointed out that operation of the selector lever 71 from its motor operating position to its manual operating position will raise the clutch sufficiently to move it from the 10° surface engagement to the 30° surface engagement regardless of the effort of the spring 50.

If we assume the friction of the clutch to be greater than that which the spring 50 can overcome, the first portion of the selector lever movement will bring the lower spring cup lip 49*b* into engagement with the depending sleeve portion 48*c* of the upper spring cup, compressing the spring 50. Further movement of the selector lever will move the sleeves 44 and 45 positively since the upper spring cup flange 48*a* abuts the flange 44*a* of the upper sleeve. This amount of movement is sufficient to move the lower sleeve 45 upwardly so that the 30° clutch surfaces of the teeth 51 and 52 are in engagement. When the hand-throw lever 36 is then moved to a position corresponding to the positions of the switch points, the effort then tending to move the selector lever to its full manual position is equal to the upward reaction transmitted by the 30° clutch surface together with the compression effort of the spring 50.

In Fig. 5 of the drawings, I have illustrated the positions of the parts of the clutch mechanism when the selector lever 71 has been moved to its motor position but the clutch has not shifted to full motor position because the clutch teeth 51 and 52 do not register. It will be noted that the parts are so proportioned that projections 53 and 54 forming the manual clutch are still in mesh. The positive drive of the sleeves 44 and 45 downwardly by the initial portion of the stroke of the selector lever will compress the spring 50. Operation of the motor 17 will rotate the worm gear 28 and as soon as the teeth 52 again register with the teeth 51, the spring 50 will move the sleeves 44 and 45 downwardly to mesh the clutch teeth.

Referring now to Figs. 1 and 2 of the drawings, motor cut-out contacts 73*a* and 73*b* in the electrical circuit (not shown) of the motor 17 are suitably fixed to the end wall of the circuit controller housing 5 and are actuated upon movement of the shifter yoke 55 by the selector lever 71, the action being such that when the selector lever 71 is moved from its motor position toward its manual position, the motor cut-out contacts will be opened, thereby opening the circuit of the motor 17, and when the selector lever is moved from its manual position to its motor position, the motor contacts will be permitted to close so that the motor 17 may again be energized.

For the purposes of actuating the motor cut-out contacts 73*a* and 73*b*, a horizontal shaft 74 is suitably journaled in one side of the top bearing plate 23. Threaded through the rearwardly extending end of the shaft 74 is a cam follower rod 75, Figs. 1, 2 and 7, the lower end of which is provided with a beveled surface 76 which engages the cam surface 61 on the yoke 55. The cam follower rod 75 may be vertically adjusted with respect to the cam surface and fastened in place by means of a locknut 77. Threaded through the forwardly extending end of the shaft 74 is a cut-out adjuster rod 78 provided at its lower end with an eccentric portion 79. The cut-out adjuster rod 78 may be adjusted with respect to the position of the eccentric portion 79 and fixed in place by a locknut 80.

Threaded into a suitable opening in the end wall 1*a* of the housing 1, is a pipe 81 locked in place by a locknut 82, one end of the pipe being within the housing 1 and capped by a perforated cap 81*a* while the other end abuts the end wall of the circuit controller housing 5 and in registry with an opening 5*a* in that housing. A waterproof seal 83 is provided for the opening 5*a* by a felt washer which is compressed against the housing 5 by a washer and locknuts, not otherwise designated. Longitudinally disposed within the pipe 81 and extending into the housings 1 and 5 is a push rod 84 made of insulation material. Pinned to push rod 84 within the pipe 81 is a spring retaining collar 85. Disposed about the push rod and between the housing 5 and the collar 85 is a coil spring 86 tending to bias the push rod 84 toward the right. It will be noted that the end of the push rod 84 within the housing 5 abuts the cut-out contact finger 73*a* while the other end of the rod 84 abuts the eccentric portion 79 of the cut-out adjuster rod 78. By turning the cut-out adjuster rod the eccentric portion of the rod

may be brought to bear against the rod so that when the shifter yoke **55** is in the motor position illustrated in Fig. 2, the eccentric portion **79** of the adjuster rod will be engaged by the push rod to hold the shaft **74** in its counterclockwise rotated position so that the beveled surface **76** of the cam follower rod engages the cam surface **61** on the shifter yoke.

When the selector lever **71** is in its motor position, the cut-out contacts *73a—73b* will be closed as illustrated in Figs. 1 and 2. Should the selector lever **71** be moved toward its manual position, the shifter yoke **55** will be rotated in the manner described, thereby moving the cam surface **61** upwardly relative to the cam follower rod **75**. The camming surfaces **61** and **76** will cause the cam follower rod to be rotated in a clockwise direction (Fig. 2), thereby moving the adjuster rod **78** in the same direction. The eccentric portion **79**, engaging the end of the push rod **84**, will move the push rod toward the left against the bias of spring **86** to open the cut-out contacts *73a—73b*. A return of the shifter yoke **55** to its motor position by the return of the selector lever will permit the spring **86** to return the push rod **84** and the rods **75** and **78** to the positions illustrated in Fig. 2, the cut-out contacts *73a—73b* again closing.

The dual control mechanism hereinbefore described may be used for right-hand or left-hand installations alongside the railroad switch. The mechanism as described is for a right-hand installation. To change from the right-hand installation assembly illustrated to a left-hand installation assembly, the top bearing plate **2** is first removed so that the shifter yoke **55** may be reversed. The hand-throw bevel gear **32** is then loosened by removing the screw *32a*. The complete hand-throw and selector lever assembly may then be removed by removing the bolts **35** which hold the bearing **34** to the front wall of the housing **1**. The shifter yoke **55** is then removed by pulling out the shaft **66**, and the yoke support **63** removed by unscrewing the bolts **64**. The yoke support may now be bolted to the opposite side of the housing. The hand-throw and selector lever assembly may then be bolted to the opposite side of the housing and the hand-throw bevel gear **32** again fixed to the shaft **31**. Both arms of the shifter yoke **55** are formed with a cam surface **61** to operate the cut-out contacts *73a—73b*.

Although I have herein shown and described only one form of dual control clutch mechanism embodying my invention, it is understood that various changes and modifications may be made therein within the scope of the appended claims without departing from the spirit and scope of my invention.

Having thus described my invention, what I claim is:

1. A clutch mechanism comprising, a shaft, two members rotatably mounted in spaced relation on said shaft, clutch faces on said driving members in confronting relation, manual means for driving one of said members and power means for driving the other of said members, a shiftable sleeve splined to said shaft between said members and provided with clutch faces on both ends thereof, and means for shifting said sleeve to selectively engage said manual driven member and said power driven member with said shaft, the clutch faces on said power driven member and the corresponding end of said sleeve having double angled meshing teeth, the slope of the base portions of said teeth in engagement when said shaft is driven by said power driven member being such that the upward reaction due to the camming action of the base portions of said teeth is minimized to prevent disengagement of the power driven member and said sleeve, the slope of the end portions of said teeth being such that the upward reaction due to the camming action of said end portions will tend to disengage the power driven member and the sleeve when said shiftable means is moved to connect said manually driven member with said sleeve.

2. A clutch mechanism comprising a shaft, two members rotatably mounted in spaced relation on said shaft, clutch faces on said driving members in confronting relation, manual means for driving one of said members and power means for driving the other of said members, a shiftable sleeve splined to said shaft between said members and provided with clutch faces on both ends thereof, and means for shifting said sleeve to selectively engage said manual driven member and said power driven member with said shaft, the clutch faces on said power driven member and the corresponding end of said sleeve having double angled meshing teeth, the slope of the base portions of said teeth in engagement when said shaft is driven by said power driven member being approximately 10° so that the upward reaction due to the camming action of the base portions of said teeth is minimized to prevent disengagement of the power driven member and said sleeve, the slope of the end portions of said teeth being approximately 30° so that the upward reaction due to the camming action of said end portions will tend to disengage the power driven member and the sleeve when said shiftable means is moved to connect said manually driven member with said sleeve.

3. A clutch mechanism comprising a shaft, two members rotatably mounted in spaced relation on said shaft, each of said members having clutch faces in confronting relation, driving means for each of said members, a shiftable sleeve splined to said shaft between said members and having clutch faces on both ends thereof, a shifter yoke eccentrically pivoted at one end, and means on said yoke cooperating with said sleeve for shifting said sleeve upon oscillation of said shifter yoke about its pivot, said shifter yoke being so mounted to take up any clearance between said cooperating means and said sleeve, and means cooperating with the other end of said yoke to oscillate said yoke to one extreme position in which the clutch face of one of said driven members is engaged by the clutch face on the corresponding end of the sleeve and to another extreme position in which the clutch face of the second driven member is engaged by the clutch face of the other end of said sleeve.

4. A clutch mechanism comprising a housing having a wall, a shaft journaled in said housing, two members rotatably mounted in spaced relation on said shaft and having clutch faces thereon in confronting relation, means for driving each of said members, a shiftable sleeve splined to said shaft between said members and having clutch faces on both ends thereof, a second shaft adjacent said wall, eccentric bushings rotatable on said shaft, and a shifter yoke adjustably mounted at one end on said bushings, a tapered recess in the other end of said yoke, a tapered pin registering in said recess, a rotatable member for moving said pin in an orbital path to oscillate said yoke between two extreme positions, and means intermediate the ends of said yoke and cooperating with said sleeve to engage the clutch faces on the ends of said sleeves with the clutch faces on said driven members, said eccentric bushings being so adjusted to take up any clearance between said cooperating means and said sleeve, said bushings rotating about their centers in a segment of an arc away from said wall and toward said tapered pin.

5. A clutch mechanism comprising a housing having a wall, a shaft journaled in said housing, two members rotatably mounted in spaced relation on said shaft and having clutch faces thereon in confronting relation, means for driving each of said members, a shiftable sleeve splined to said shaft between said members and having clutch faces on both ends thereof, a second shaft adjacent said wall, eccentric bushings rotatable on said shaft and a shifter yoke adjustably mounted at one end on said bushings, a projection on the pivoted end of said yoke extending toward said wall, a tapered recess in the other end of said yoke, a tapered pin registering in said recess, a rotatable member for moving said pin in an orbital path to oscillate said yoke between two extreme positions, and means intermediate the ends of said yoke and cooperating with said sleeve to engage the clutch faces on the ends of said sleeves with the clutch faces on said driven members, said eccentric bushings being so adjusted to take up any clearance between said cooperating means and said sleeve, said bushings rotating about their centers in a segment of an arc away from said wall and toward said tapered pin, the length of the projection on said yoke being such that rotation of the bushings about their centers in an arc toward said wall would cause interference between said projection and said wall.

**References Cited** in the file of this patent

UNITED STATES PATENTS

| | | |
|---|---|---|
| 200,375 | Crompton | Feb. 19, 1878 |
| 1,111,681 | Stull | Sept. 22, 1914 |

**(Other references on following page)**

UNITED STATES PATENTS

| | | |
|---|---|---|
| 1,163,415 | Kling | Dec. 7, 1915 |
| 1,634,489 | Cartlidge | July 5, 1927 |
| 1,732,754 | Jacob | Oct. 22, 1929 |
| 1,820,756 | McWhirter | Aug. 25, 1931 |
| 1,830,840 | Kienzle | Nov. 10, 1931 |
| 1,990,999 | Pondelicek | Feb. 12, 1935 |
| 2,041,900 | Carle | May 26, 1936 |
| 2,183,164 | McWhirter | Dec. 12, 1939 |
| 2,320,171 | Bone | May 25, 1943 |





| | | |
|---|---|---|
| 2,384,583 | Wildhaber | Sept. 11, 1945 |
| 2,435,536 | Ferris | Feb. 3, 1948 |
| 2,526,107 | Ambrose | Oct. 17, 1950 |

FOREIGN PATENTS

| | | |
|---|---|---|
| 97,485 | Germany | Jan. 16, 1923 |
| 129,329 | Sweden | Aug. 29, 1950 |
| 720,294 | France | Feb. 17, 1932 |