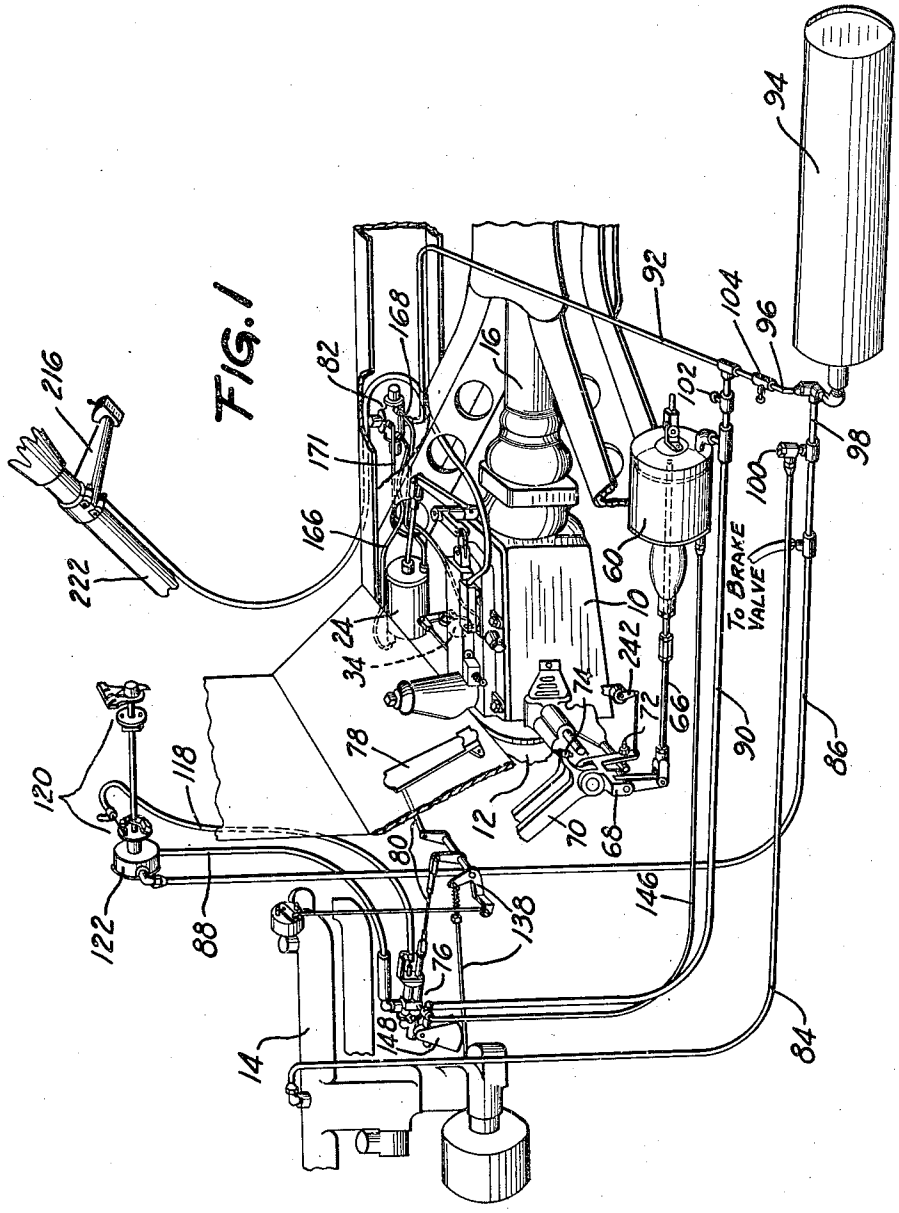
April 1, 1941. H. W. PRICE 2,237,264

GEAR SHIFTING MECHANISM

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FIG. 1



INVENTOR.
HAROLD W. PRICE
BY H. O. Clayton
ATTORNEY

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GEAR SHIFTING MECHANISM

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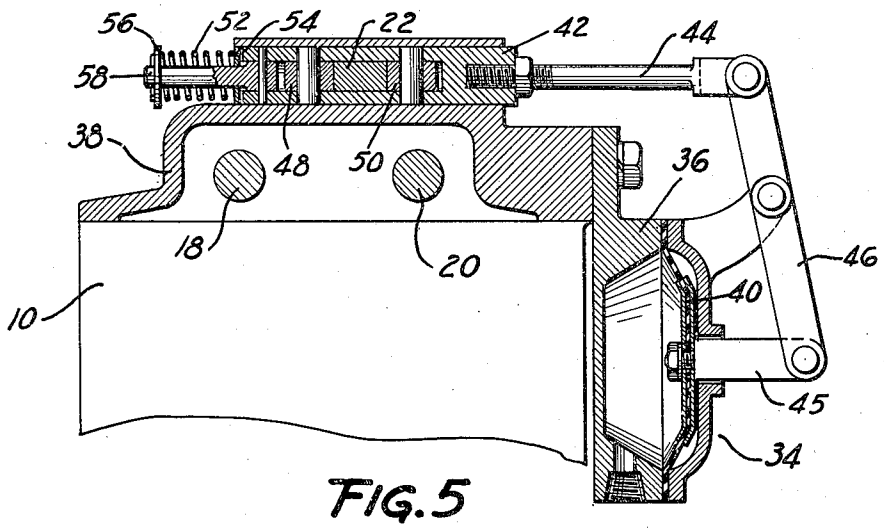


FIG. 5

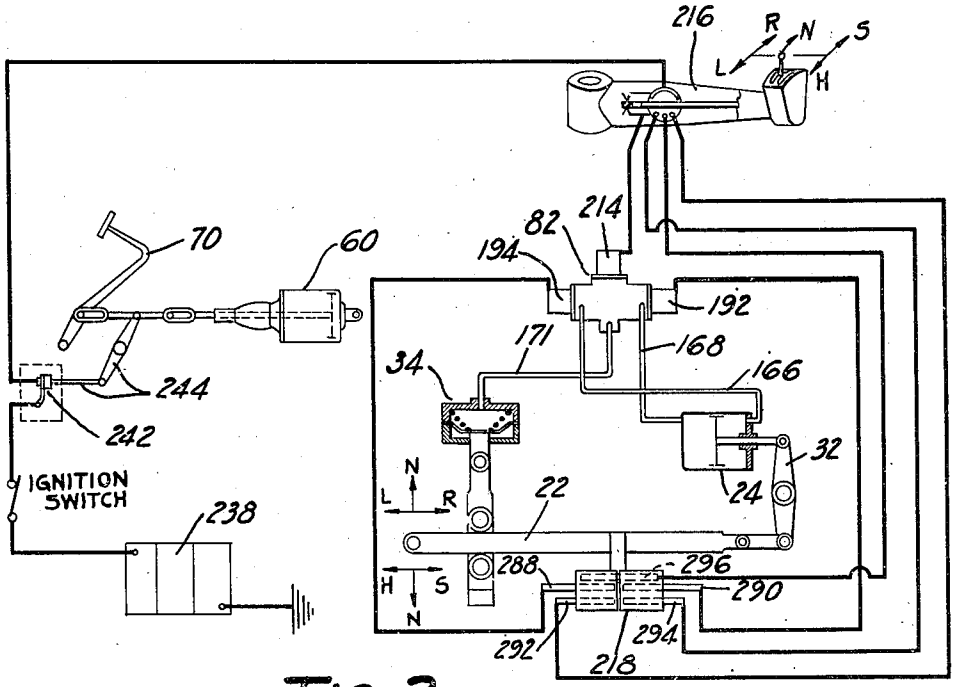


FIG. 2

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GEAR SHIFTING MECHANISM

Original Filed Oct. 4, 1934 14 Sheets-Sheet 3

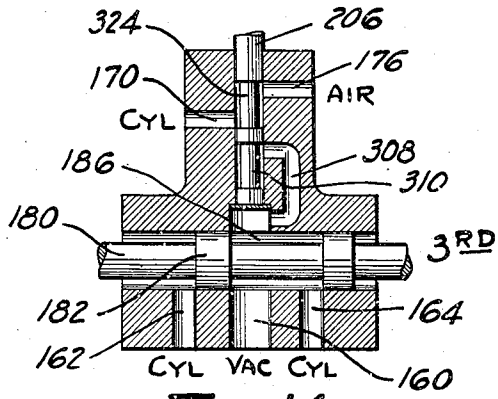


FIG. 14

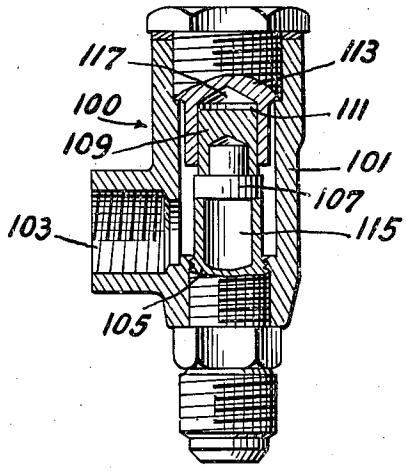


FIG. 47.

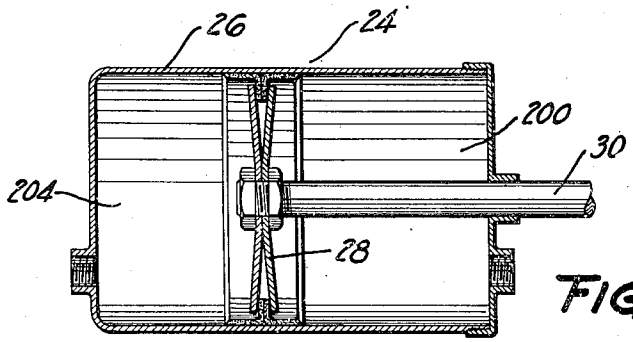


FIG. 3

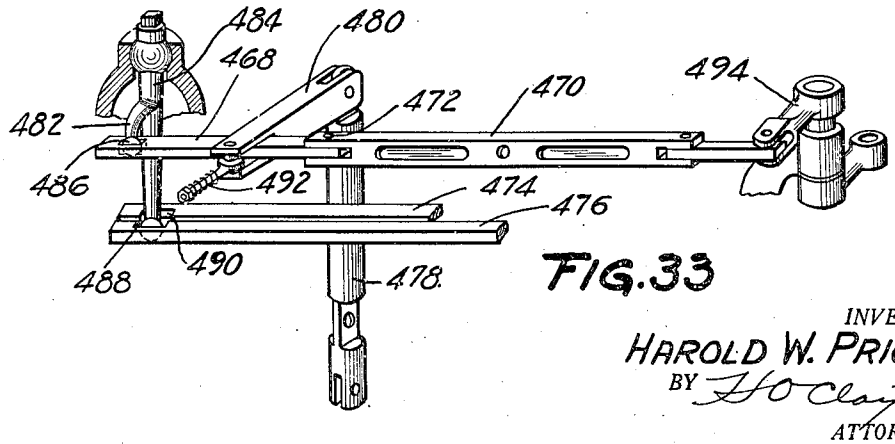


FIG. 33

INVENTOR.
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ATTORNEY

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GEAR SHIFTING MECHANISM

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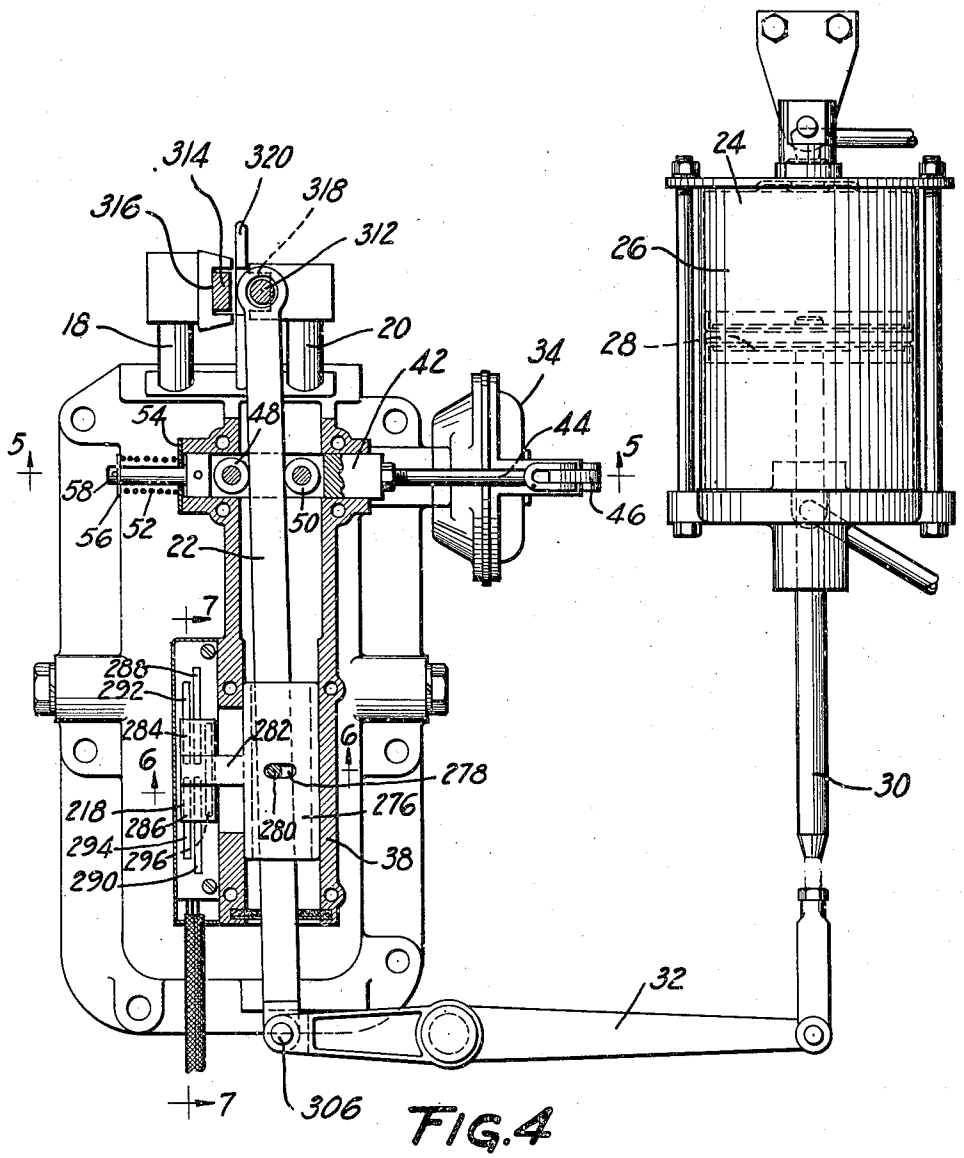


FIG. 4

INVENTOR.
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April 1, 1941. H. W. PRICE 2,237,264

GEAR SHIFTING MECHANISM

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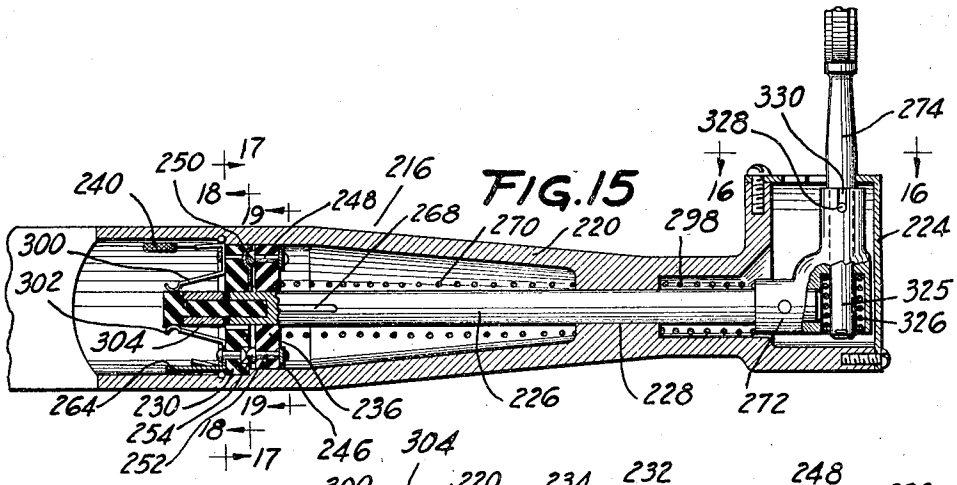


FIG. 15

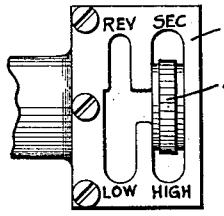


FIG. 16

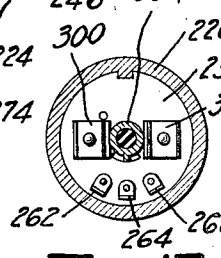


FIG. 17

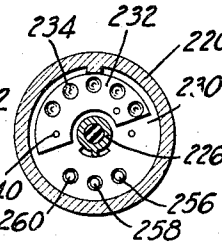


FIG. 18

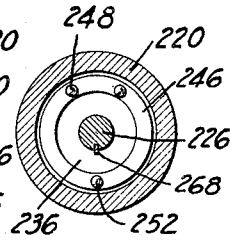


FIG. 19

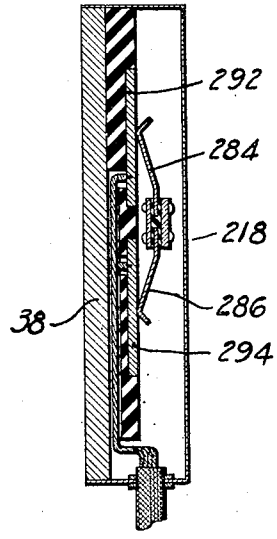


FIG. 7

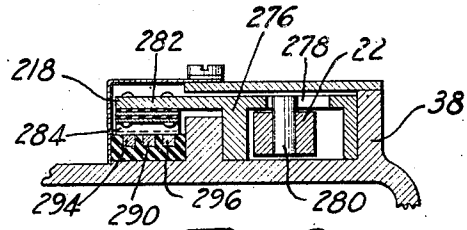


FIG. 6

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GEAR SHIFTING MECHANISM

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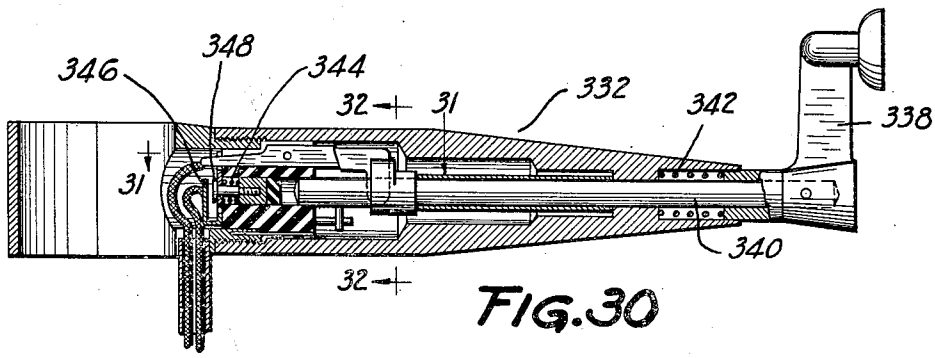


FIG. 30

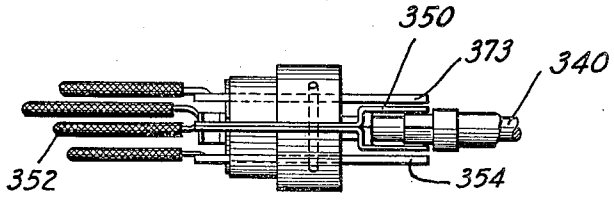


FIG. 31

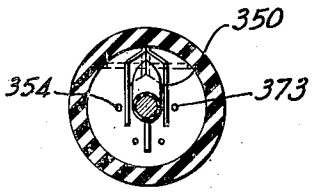


FIG. 32

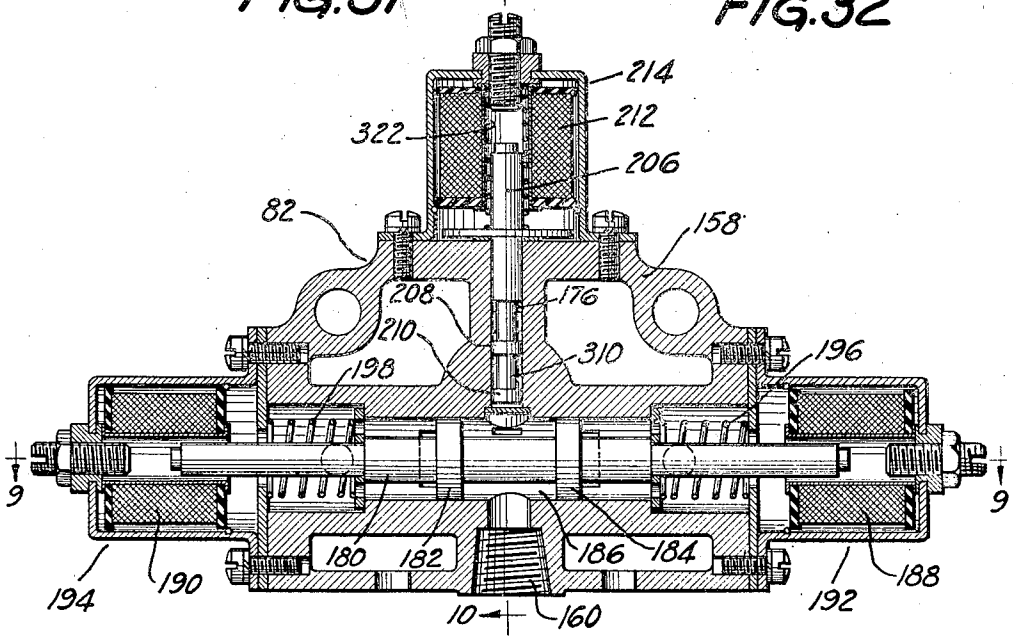


FIG. 8

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GEAR SHIFTING MECHANISM

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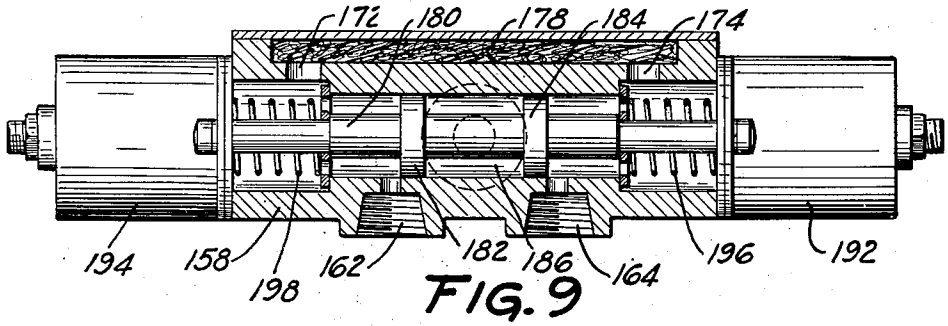


FIG. 9

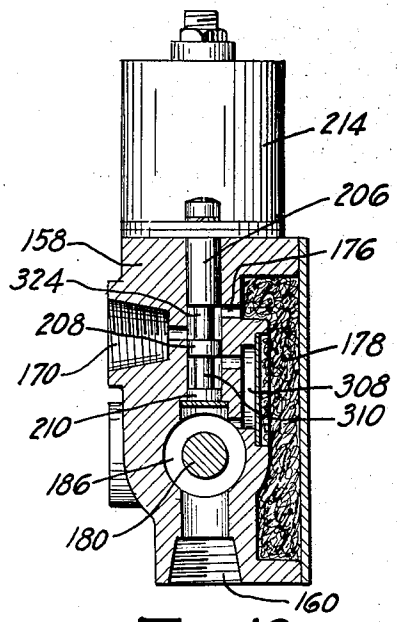


FIG. 10

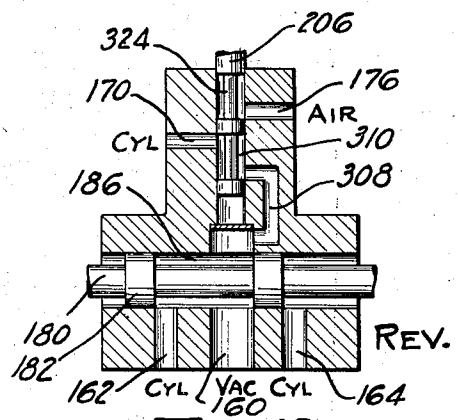


FIG. 13

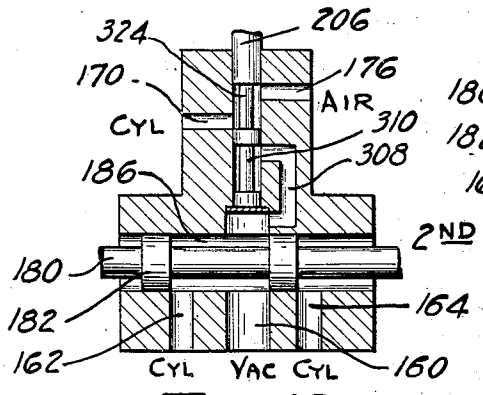


FIG. 12

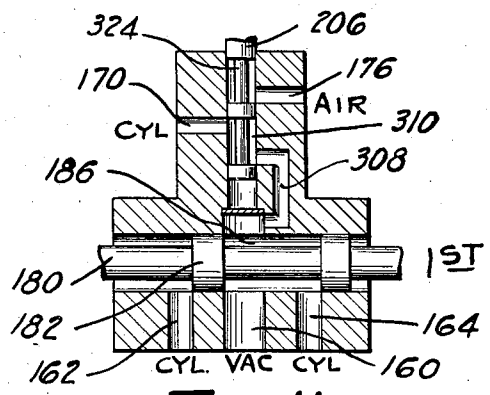


FIG. 11

INVENTOR.
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April 1, 1941. H. W. PRICE 2,237,264

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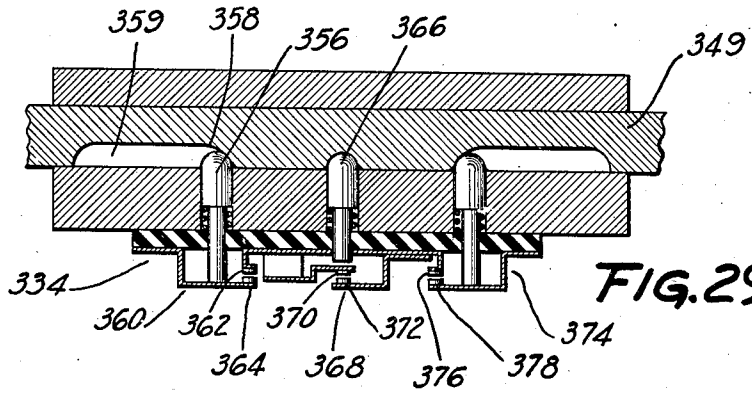


FIG. 29

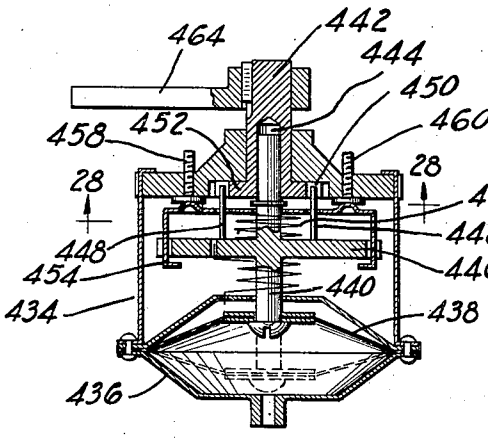


FIG. 27

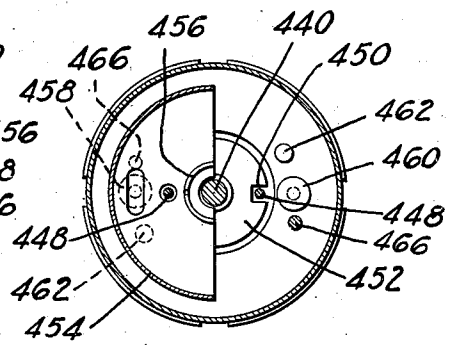


FIG. 28

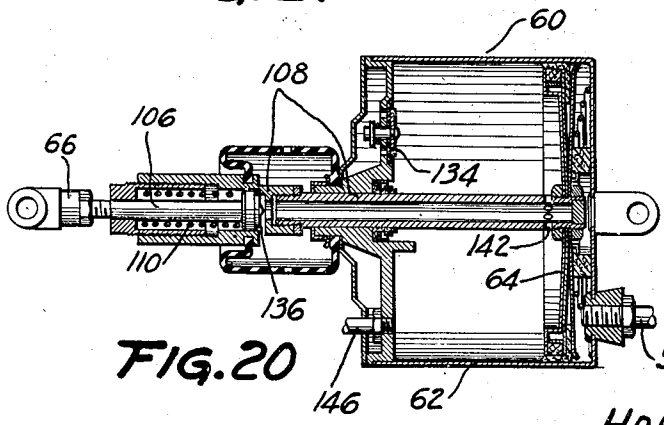


FIG. 20

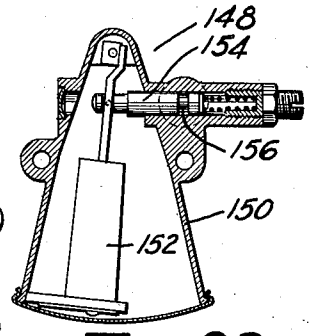


FIG. 22

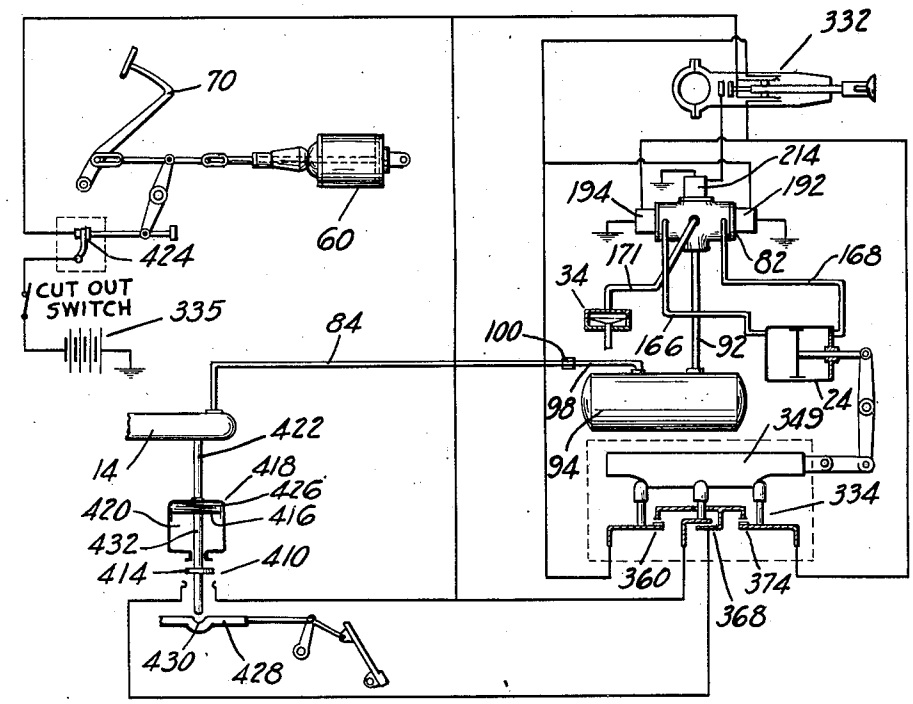
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April 1, 1941. H. W. PRICE 2,237,264

GEAR SHIFTING MECHANISM

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FIG. 26



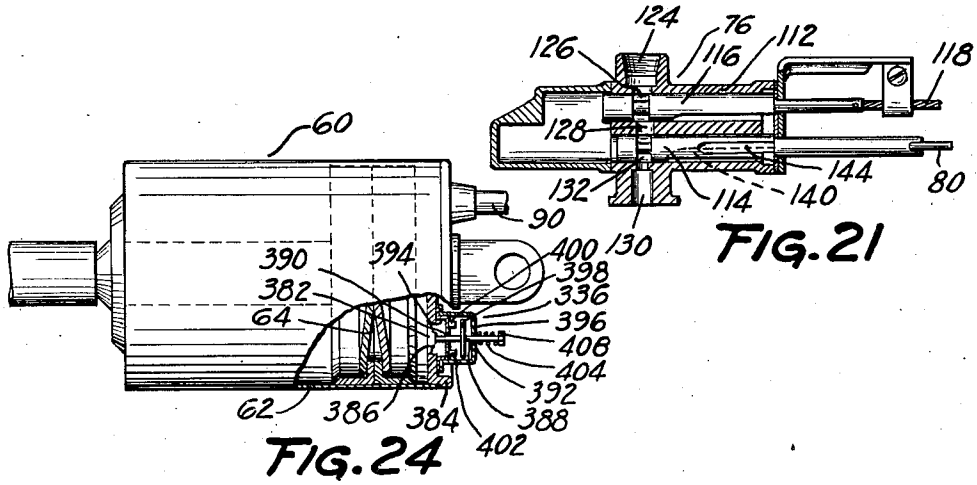


FIG. 21

FIG. 24

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GEAR SHIFTING MECHANISM

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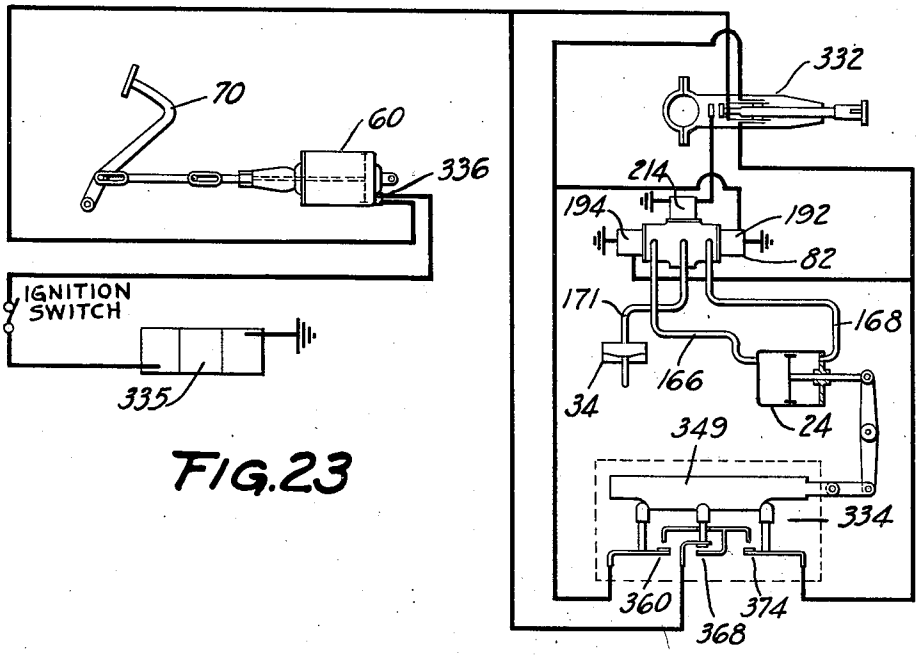


FIG. 23

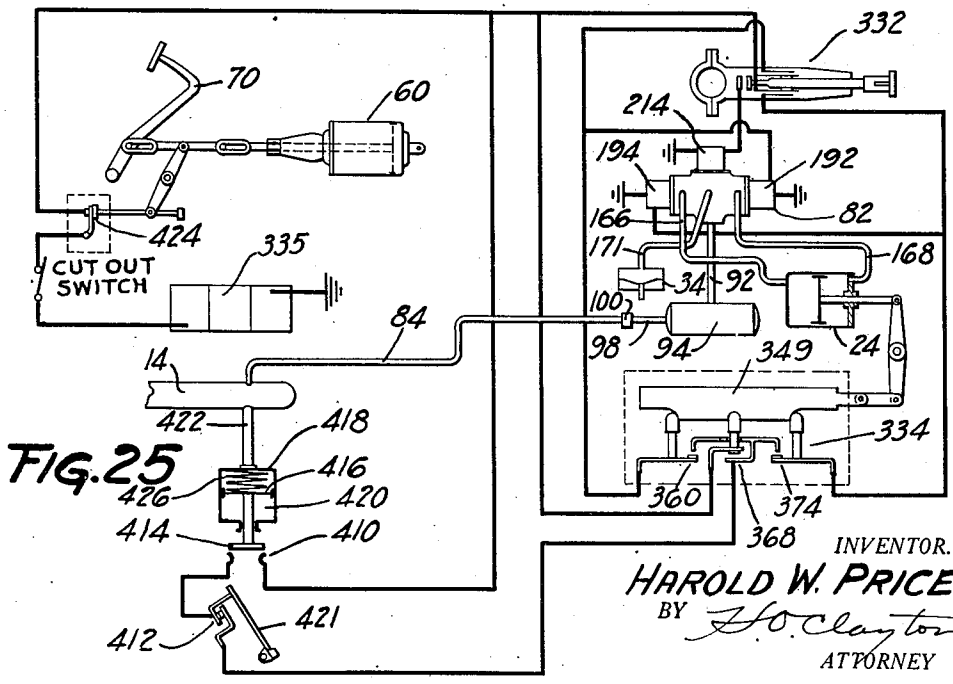


FIG. 25

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April 1, 1941. H. W. PRICE 2,237,264

GEAR SHIFTING MECHANISM

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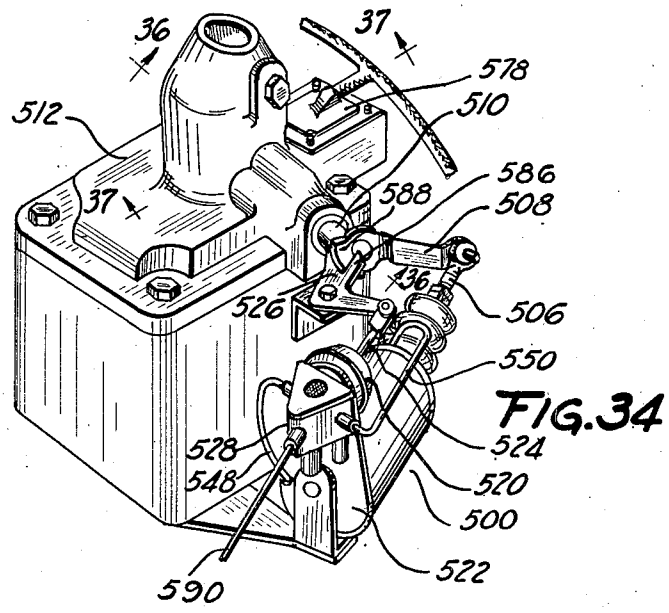


FIG. 34

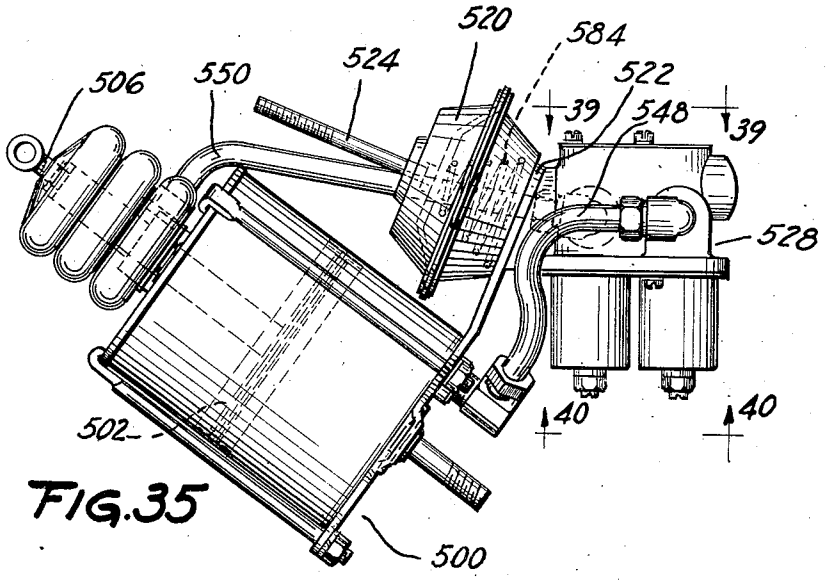


FIG. 35

INVENTOR.
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April 1, 1941. H. W. PRICE 2,237,264

GEAR SHIFTING MECHANISM

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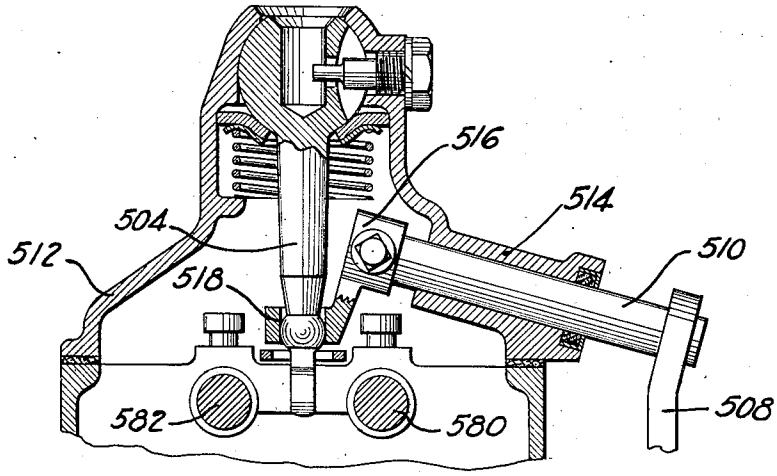


FIG. 36

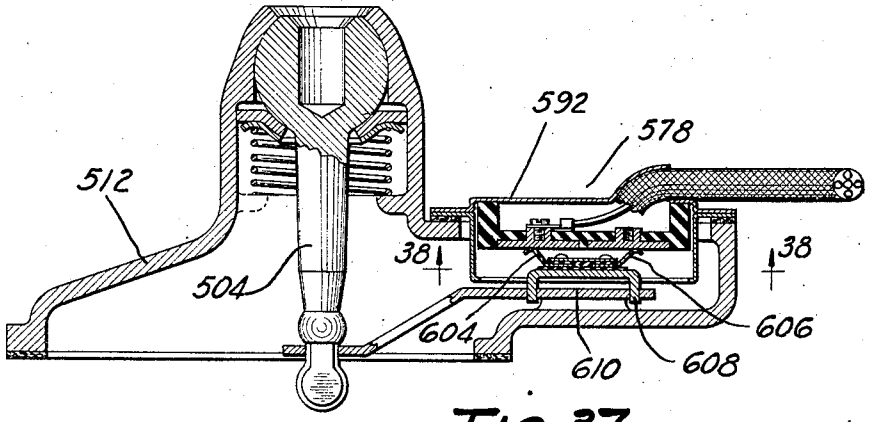


FIG. 37

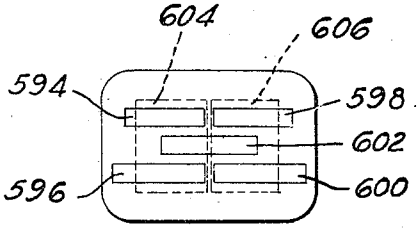


FIG. 38

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April 1, 1941. H. W. PRICE 2,237,264

GEAR SHIFTING MECHANISM

Original Filed Oct. 4, 1934 14 Sheets-Sheet 13

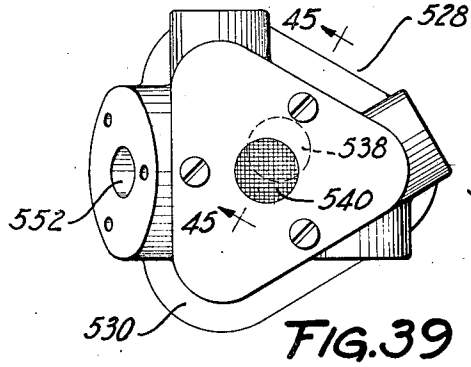


FIG. 39

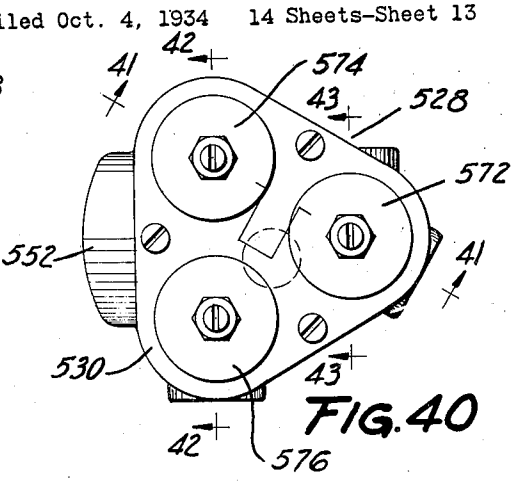


FIG. 40

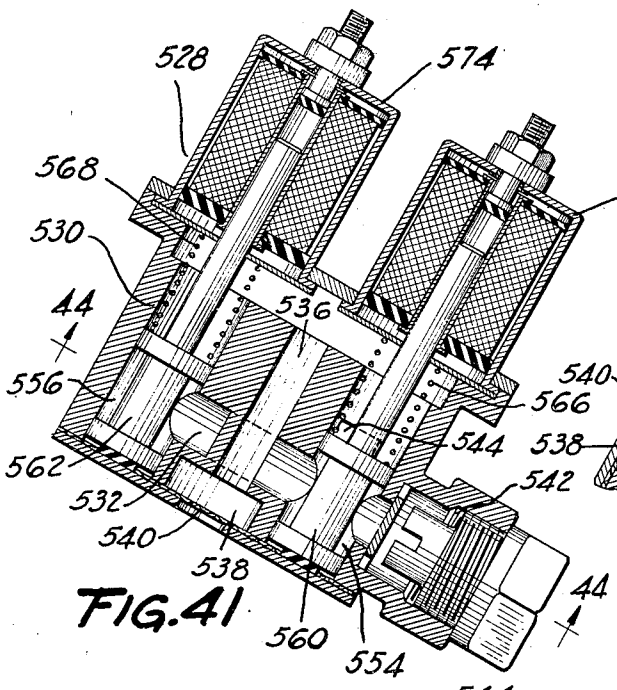


FIG. 41

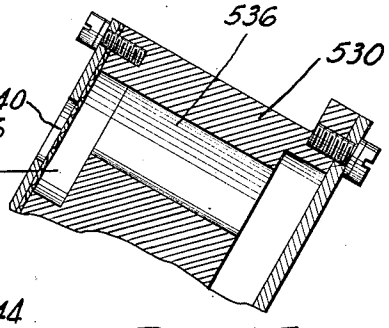


FIG. 45

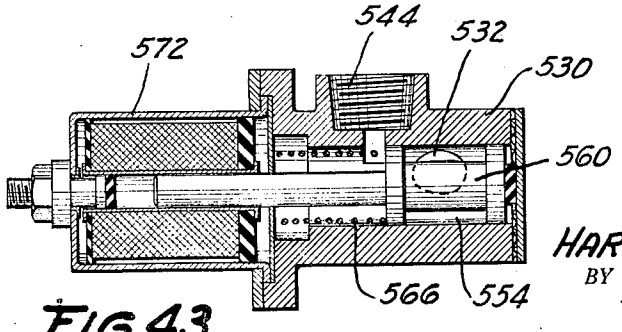


FIG. 43

INVENTOR.
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ATTORNEY

April 1, 1941. H. W. PRICE 2,237,264

GEAR SHIFTING MECHANISM

Original Filed Oct. 4, 1934 14 Sheets-Sheet 14

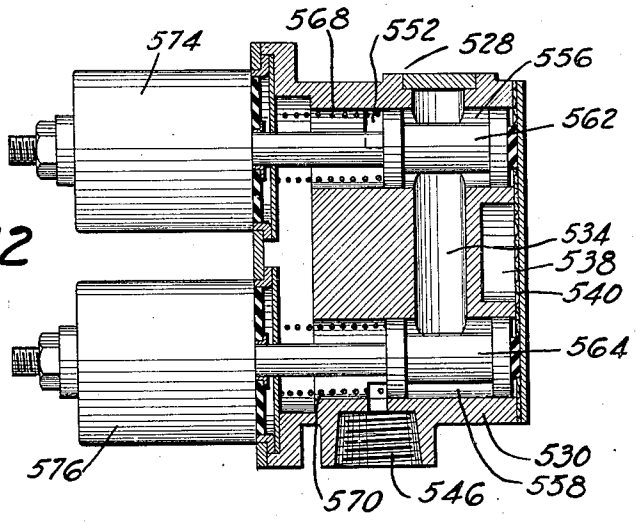


FIG. 42

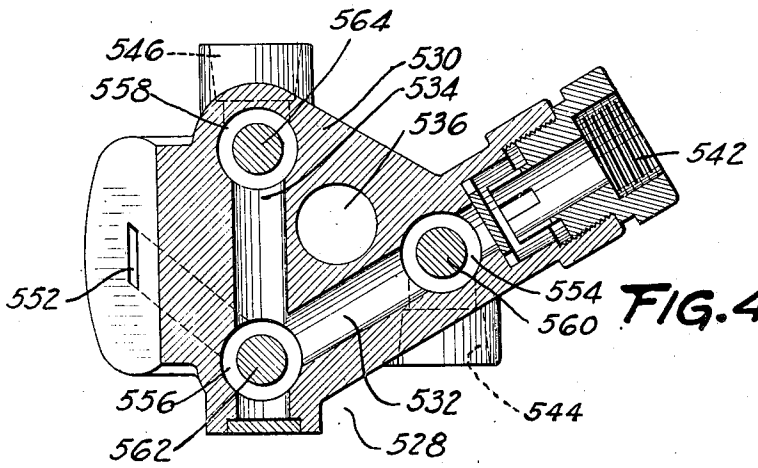


FIG. 44

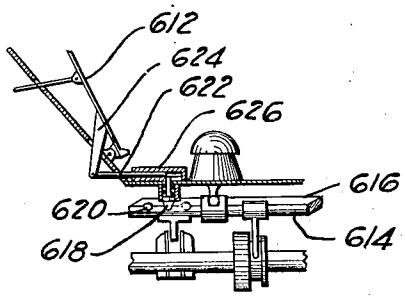


FIG. 46

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BY H. O. Clayton
ATTORNEY

Patented Apr. 1, 1941

2,237,264

UNITED STATES PATENT OFFICE

2,237,264

GEAR SHIFTING MECHANISM

Harold W. Price, South Bend, Ind., assignor to Bendix Products Corporation, South Bend, Ind., a corporation of Indiana

Continuation of application Serial No. 746,759, October 4, 1934. This application November 15, 1940, Serial No. 365,836

24 Claims. (Cl. 192—.01)

This invention relates to power transmission mechanism, and more particularly to control means therefor. The invention is especially useful as a means for operating the change-speed transmission of an automotive vehicle: however, other power transmission mechanisms may equally well be controlled by my invention.

It has heretofore been proposed to employ power means for effecting a change in the ratio of transmission gearing and with such an arrangement control mechanisms for said power means have been utilized, which have been conveniently located remotely from the transmission and readily accessible to the operator. The latter, when operating a motor vehicle equipped with such a structure, had merely to operate the conveniently located control mechanism by a simple manual movement, which thereby controlled the flow of fluid to said power device to effect a change in the speed ratio of the transmission gearing. In the constructions heretofore utilized, however, the control devices operable by the operator have taken the form of rotatable valve mechanisms, push buttons and other devices, the operation of movement of which was totally dissimilar from the operation of the conventional gear shift lever, which the power mechanism had replaced. Accordingly, an operator, accustomed to operating a vehicle provided with the conventional manually operated gear shift lever, was compelled to completely change his accustomed methods of gear changing when it became necessary for him to operate a vehicle equipped with the above-referred-to remotely controlled power gear shifting device. This has been found to be a rather serious disadvantage, resulting in confusion and improper operation of the power operated change-speed transmissions.

It is therefore one of the objects of the present invention to provide a transmission gearing control mechanism so constructed as to avoid the above-referred-to difficulties, and to this end the invention contemplates a power operated selective gear shifting mechanism so constructed and arranged that the movements of the same in effecting a control of the changing of the transmission gearing simulate in every respect the corresponding movements of a conventional manually operable gear shift lever to the end that an operator may readily operate a vehicle equipped with such mechanism in the same manner as if the vehicle were provided with a manually operable gear shift.

Another object is to provide, in a transmission gearing, controlling mechanism having gears shiftable by power, control valve mechanism for the power means, said valve mechanism being operated electrically, thereby providing a power means readily adaptable for remote control by the operator. Such a mechanism is particularly adapted for the control of selective gear transmissions, or other power transmission mechanisms, interlocked at either end of an automotive vehicle. Thus, for example, the invention will have utility with the advent of rear engine mountings.

Another object of the invention is to provide, in a device of the above character, a remotely positioned dummy gear shift lever operable in a gear shifting simulating manner to effect the control of power to the power operated gear shifting mechanism, whereby an operator may readily and efficiently control the necessary changes in the gearing ratios of the transmission by manually moving a control member in the same manner as that to which he has been accustomed when manually shifting the transmission gearing.

A further object of the invention is to provide, in electrical valve operating means, a manually operable selector switch operable to select any one of a plurality of circuits, said switch cooperating with a power operated switch automatically operable, with the gear shifting operation of the power means, to control said circuits. A follow-up type of valve control is thus provided, whereby a manually selected valve operating electrical circuit is automatically broken, to obviate unnecessary use of current, after a gear selection has been made.

Yet another object of the invention is to provide a manually operable preselector switch operable, in conjunction with a plurality of automatically operable power operated switches, to control a transmission operating power mechanism.

The invention further contemplates the provision of a manually operated switch mechanism selectively operable to initiate any one of the five conventional operations of a three-speeds forward and reverse transmission.

The invention also contemplates pressure differential operated power means operable to select and actuate the conventional shifter rods of a standard three-speeds forward and reverse transmission in the same manner as now effected by the manually operable gear shift lever.

Yet another object of the invention is to provide a transmission gearing control mechanism so constituted as to enable an operator to pre-

select a desired gear relation of the transmission while another gear relation is established, the construction being such that the establishment of a preselected gear relation is effected in a novel and efficient manner.

Another object of the invention is to provide a novel power operated selective gear changing transmission wherein novel control means are incorporated permitting a preselection of the desired gear relation and establishment thereof upon a subsequent disengaging operation of the clutch, thus enabling a desired gear relation to be preselected while the change-speed transmission is in another gear relation.

A further object of the invention is to provide, in an electrically operated valve operating mechanism, a manually operated switch selectively operable to effect the operation of any one of a plurality of solenoids, together with a plurality of power operated switches automatically operable to both break a selected circuit to deenergize the aforementioned energized solenoid and to make, in part, a new circuit preliminary to energizing a second solenoid.

A further object of the invention is to provide, in a power gear shift mechanism, electrical valve operating means comprising means selectively operable to effect one gear selecting operation of the power means, and further comprising means automatically operable to prepare the valve operating means for effecting a further operation of the power means.

Yet another object of the invention is to provide switch means for controlling a power gear shift mechanism of an automotive vehicle, said means comprising a manually operated switch selectively operable to initiate any one of the conventional three-speeds forward and reverse operations of the gear shift mechanism, and further comprising a power operated switch mechanism operable automatically, with the aforementioned operation of the shift mechanism, to facilitate a subsequent operation of the shift mechanism.

A further object of the invention is to provide switch means for controlling a power gear shift mechanism, said means being operable, after a gear selection has been made, to place the transmission in neutral by merely flicking or momentarily operating a manually operable switch member.

Yet another object of the invention is to provide a power gear shift mechanism operable to place the transmission in neutral with a momentary operation of a manually operated switch, said operation initiating the operation of a power operated switch, which is automatically operated to maintain the transmission in neutral when the transmission reaches a neutral position.

A further object of the invention is to provide, in a power gear shift mechanism, electrical means automatically operative when the engine dies to effect a transmission neutralizing operation of the shift mechanism. To this end there is suggested a manifold vacuum operated switch mechanism interlocked with the accelerator, whereby with both a release of the accelerator and a stopping of the engine the switch is rendered operative to close an electrical circuit and so operate the power means as to neutralize the transmission: if desired, the switch may at the same time close a circuit to effect a recranking of the engine.

Yet another object of the invention is to provide separate pressure differential operated units for operating the clutch and transmission, said units being controlled by an eccelerator operated pilot valve. In addition to the fluid interlock between the clutch and transmission power operators, the invention contemplates an electrical interlock, whereby the transmission operating means may be rendered operative to shift gears only when and if the clutch is disengaged. With such a mechanism, therefore, the transmission may be power operated only when the accelerator is released and the clutch is disengaged.

The invention also contemplates the provision of a clutch motor operated switch operable to render inoperative an electrically controlled power gear shift mechanism when the clutch is engaged.

A further object is to provide a compact power operated selective gear shifting mechanism of relatively few working parts, which may be readily incorporated in the standard three-speeds forward and reverse transmission of the present-day automotive vehicle. To this end the major portion of the mechanism is mounted in and adjacent to the cover plate of the transmission and with but slight modification of the plate.

Other objects and novel features of the invention, including a mechanical interlock between the accelerator and the gear shift mechanism, and compact and effective designs of electrical selector switch and solenoid operated valve mechanisms, will become apparent from a reading of the following specification, taken in conjunction with the accompanying drawings. It is to be expressly understood, however, that the drawings are employed for purposes of illustration only and are not designed as a definition of the limits of the invention, reference being had for said purpose to the appended claims.

Figure 1 is a diagrammatic view of the clutch and transmission operated power gear shift mechanism constituting my invention;

Figure 2 is a wiring diagram of the electric features of the gear shift mechanism of Figure 1;

Figure 3 is a longitudinal sectional view of one of the pressure differential operated shifter rail operating motors;

Figure 4 is a plan view partly in section, of the shifter bar operating mechanism of the invention, disclosing in particular the shift rail construction and the pressure differential motors for operating the same;

Figure 5 is a sectional view, taken on the line 5—5 of Figure 4, indicating the details of the shifter bar selector mechanism;

Figures 6 and 7 are sectional views, taken respectively on the lines 6—6 and 7—7 of Figure 4, of the wiper switch mechanism;

Figure 8 is a vertical sectional view of the control valve of the power gear shift mechanism of Figure 1;

Figures 9 and 10 are sectional views, taken on the lines 9—9 and 10—10 of Figure 8, disclosing details of the valve mechanism;

Figures 11–14, inclusive, are diagrammatic sectional views indicating the several relative positions of the valve plungers to effect the four gear selections of the transmission;

Figure 15 is a longitudinal sectional view of the selector switch mechanism of Figure 1;

Figure 16 is a partial plan view of the selector switch of Figure 15, disclosing the H-shaped slot structure;

Figures 17, 18 and 19 are sectional views dis-

closing details of the selector switch mechanism, the views being taken on the lines 17—17, 18—18 and 19—19, respectively, of Figure 15;

Figure 20 is a longitudinal sectional view of the clutch operating pressure differential motor;

Figure 21 is a sectional view of the control valve of the clutch control mechanism;

Figure 22 is a sectional view of the inertia operated valve of the clutch control mechanism;

Figure 23 is a wiring diagram of a modified form of power gear shift mechanism, this embodiment also disclosing a clutch controlled fluid pressure operated circuit breaker as distinguished from the mechanically operated breaker of Figures 25 and 26;

Figure 24 discloses in detail the structure of the fluid pressure operated circuit breaker of Figure 23;

Figures 25 and 26 are wiring diagrams disclosing, in addition to the electrical valve operating mechanism of Figure 23, different forms of electrical means for automatically neutralizing the transmission when the engine dies and the accelerator is released;

Figure 27 is a sectional view of a combined vacuum and accelerator operated engine starter and transmission neutralizing switch means;

Figure 28 is a sectional view, taken on the line 28—28 of Figure 27, disclosing certain details of the switch mechanism of Figure 27;

Figure 29 is a fragmentary sectional view of the shift rail operated switch mechanism of Figures 23, 25 and 26;

Figure 30 is a longitudinal sectional view of another embodiment of selector switch mechanism;

Figures 31 and 32 are sectional views of the switch mechanism of Figure 30 taken respectively on the lines 31—31 and 32—32 thereof;

Figure 33 is a diagrammatic view of a shift rail construction differing somewhat from that disclosed in Figure 4;

Figure 34 discloses, in perspective, a unitary type of gear shift operating power mechanism mounted upon a standard transmission;

Figure 35 is a view, in perspective, disclosing the unitary gear shift mechanism of Figure 34;

Figures 36 and 37 are sectional views, taken on the lines 36—36 and 37—37 of Figure 34, disclosing details of the shifter mechanism;

Figure 38 is a view, taken on the line 38—38 of Figure 37, disclosing a portion of the wiper switch of Figure 37;

Figure 39 is a top plan view, taken on the line 39—39 of Figure 35, of the control valve mechanism of Figure 34;

Figure 40 is a bottom plan view, taken on the line 40—40 of Figure 35, of the control valve mechanism of Figure 34;

Figures 41, 42 and 43 are sectional views disclosing details of the control valve of Figures 34 and 35, the sections being taken respectively on lines 41—41, 42—42 and 43—43 of Figure 40;

Figure 44 is a sectional view, taken on the line 44—44 of Figure 41, disclosing further details of the control valve, particularly the valve passages thereof;

Figure 45 is a partial sectional view, taken on the line 45—45 of Figure 39, disclosing in detail the principal air passages of the control valve;

Figure 46 is a diagrammatic view of a mechanism for interlocking the accelerator and shifter rods of the transmission to permit an operation of the accelerator only when the transmission is in gear or in neutral; and

Figure 47 is a sectional view disclosing in detail the check valve disclosed in Figure 1.

Referring to Figure 1, there is disclosed a conventional three-speeds forward and reverse transmission housing 10 associated with a clutch housing 12 located, as usual, at the rear of the engine 14. The transmission mechanism within the housing 10 is designed to afford variable speeds between the conventional driving mechanism and the propeller or driven shaft 16.

The aforementioned conventional mechanisms are not a part of this invention, the latter being directed to remotely controlled power means for operating the clutch and transmission in such fashion as to simulate a conventional manual operation thereof. The invention is, however, particularly directed to the transmission operating power means.

As disclosed in Figures 4 and 5, the conventional transmission comprises shifter rods 18 and 20 adapted to be moved lengthwise to effect a desired gear relation. These rods are normally shifted by means of a manually operated shift lever. However, such lever is supplanted, in the instant invention, by a shift rail, or what may be termed a power bar 22, selectively operated by pressure differential operated power means controlled by the driver.

The power means preferably includes a double-acting motor 24 conveniently secured to a portion of the chassis as disclosed in Figure 1, said motor including a cylinder 26 and a piston 28, the latter being operatively connected to the shifter rail 22 by a link 30 and a lever 32 and serving to impart lengthwise movement to the rail to select the desired gear ratio of the transmission. The rail is moved laterally to select the desired shifter bar by means of a second unit of the power means; namely, a motor 34 disclosed in Figures 4 and 5. The motor comprises a housing 36, preferably fixedly secured to a transmission cover plate 38, and a power or diaphragm element 40, the latter being operatively connected to the rail 22 through the intermediary of a forked coupling member 42, links 44 and 45 and lever 46. As disclosed in Figure 5, the rail is positioned within the member 42 by rollers 48 and 50 and a compression spring 52, interposed between a side member 54 of the transmission cover and a stop 56 mounted on one end of a pin 58, the latter pivotally secured to the member 42.

The pressure differential motor mechanism of the invention further includes a single-acting motor 60 comprising a cylinder 62 and a piston 64, the latter operatively connected to the clutch by means of a rod 66 and a crank 68. A clutch pedal member 70 is connected to the crank 68 by a lost motion connection, not shown, whereby the clutch may be selectively operated either manually or by power. Stops 72 and 74 serve to determine the off positions of the crank 68 and pedal 70.

The above-described clutch and transmission operating motors are controlled by valvular means including a pilot valve unit 76, Figure 21, operated by an accelerator pedal 78 through the intermediary of linkage 80, and an electrically operated controlling valve unit 82, detailed in Figures 8 to 14, inclusive. The pilot valve 76 functions, at closed throttle, to interconnect the intake manifold as a source of vacuum power with the clutch motor 60 and the valve unit 82. The fluid connection includes conduits 84, 86, 88, 90 and 92. It will be apparent, therefore, that the clutch motor 60 and the valve unit 82 are in

parallel and that the valve 76, in series in the connection with the manifold, controls the flow of power fluid to both the motor and the valve. The transmission operating power means may not, therefore, be operated until the accelerator is released and the clutch disengaged. The fluid circuit is described, disclosed and claimed in an application of Victor W. Kliesrath and Roy S. Sanford, Serial No. 580,434, filed December 11, 1931.

If desired, a vacuum storage tank 94 may be incorporated in the system, the same being connected to the conduit 92 by a short conduit 96 and to the conduit 86 by a conduit 98 and a check valve 100, the latter serving to maintain the tank evacuated when the engine is not running. Stop cocks 102 and 104 are incorporated in the conduits 92 and 96 respectively to select either the manifold or the tank as a source of vacuum for the transmission operating power means. The check valve 100, which is disclosed in detail in Figure 47, includes a hollow casing 101 having a vacuum port 103 therein and a tubular plug 105 threadedly mounted in the base portion of the casing. A valve member, including a plug 107 and a cylindrically shaped part 109 tightly fitted together is seated by the force of gravity upon the upper edge of the hollow plug 105, said edge portion constituting a valve seat. The space outlined by the lower face of the valve part 107 and the wall of the plug 105 may be defined as a compartment 115. The valve part 109 is made to losely fit within a substantially tubular shaped recess 111 in a plug 113 threadedly mounted in the top of the casing 101. Accordingly, the gaseous pressure within a dome portion 117 of the recess 111 is at all times equal to that within the interior of the hollow casing 101, which is, as disclosed in Figure 47, open to the vacuum port 103.

Describing the operation of this check valve when the gaseous pressure within the tank 94 is substantially higher than the gaseous pressure within the intake manifold, the aforementioned valve 107, 109 will, by virtue of the difference in gaseous pressures within the dome portion 117 of the compartment 115, be moved upwardly to thereby unseat the valve and permit a partial evacuation of the tank. When the gaseous pressures within the tank and manifold are equal or substantially equal then the valve 107, 109 will, by the force of gravity, be receded. Or, if the gaseous pressure within the manifold is suddenly raised, for example by a depression of the accelerator pedal, then the valve 107, 109 will be reseated by virtue of a reversal of the differential of pressure acting upon the valve; that is the gaseous pressure within the dome 117 acting upon the top face of the valve part 109 will be greater than the gaseous pressure in the compartment 115 which is in fluid transmitting connection with the tank 94.

The above merely gives a brief description of the principal elements of the invention, and such elements, together with the operation of the mechanism, will now be described in detail. The clutch motor, detailed in Figure 20, is not claimed herein, inasmuch as the same constitutes the subject matter of a patent of Victor W. Kliesrath, No. 2,173,116, issued September 19, 1939.

The piston of the motor is connected to link 66 by a valve connection comprising parts 106 and 108 interconnected by a spring 110 in series with said parts. The accelerator operated pilot valve 76, disclosed, described and claimed in the patent of Victor W. Kliesrath, No. 2,092,256, issued September 7, 1937, comprises a casing 112 housing an accelerator operated plunger 114 and a cut-off plunger 116 operably connected, by a Bowden control 118, to a manually operated control or indexing mechanism 120, Figure 1. This latter mechanism, which may be conveniently mounted on the dash, comprises a pressure regulating valve 122 incorporated in series in the fluid connection with the manifold. The control 120 includes three selections; namely, a complete cut out of the valve 122, an operation of said valve to establish the clutch motor as an assistor mechanism without, however, so diminishing the maximum vacuum as to render the power gear shift mechanism inoperative, and, lastly, an operation of the cut-off valve 116 to render both the clutch and the transmission means inoperative.

Describing now the operation of the clutch control mechanism, upon release of the accelerator, the valve plunger 114 is moved to the right, Figure 21, to interconnect the manifold and clutch motor via conduits 84, 86 and 88, a valve port 124, a recess 126 in the cut-off plunger 116, valve ports 128 and 130, recess 132 in the valve plunger 114 and conduit 90. The clutch motor is thus evacuated and the clutch disengaged, an inwardly opening valve 134 in the motor 60 permitting the piston 64 to move to the right, Figure 20. With this operation the spring 110 is compressed to unseat a valve 136. Upon depressing the accelerator, the throttle, not shown, is operated by linkage 138 and the valve plunger 114 is moved to the left, Figure 21, to cut off the connection with the manifold and vent the clutch motor to atmosphere via a slot 140 in the plunger 114 and conduit 90. The clutch springs then serve to engage the clutch, the first phase of the engaging movement being relatively rapid by virtue of the relatively rapid efflux of air from the clutch motor via openings 142 in the member 108 and the valve 136. When the clutch plates have contacted, the spring 110 expands to close the valve 136 and the remainder of the engagement of the clutch is controlled by means of a tapered bleed slot 144 in the accelerator operated plunger 114, controlling the flow of air from the clutch motor to the slot via a conduit 146. If desired, a vehicle inertia operated valve unit 148 may be incorporated in the bleed conduit 146. This valve constitutes the subject matter of an application of Harold W. Price, Serial No. 622,513, filed July 14, 1932, and is not claimed herein. The inertia operated valve comprises a casing 150 housing a pendulum bob 152, the latter being operatively connected to a spring balanced valve plunger 154 recessed at 156 to open and close the conduit 146. At or above a predetermined acceleration of the vehicle, caused by a jerking clutch, the valve is operated by the inertia effect of the bob, cutting off the air bleed and effecting a slipping clutch.

The disengagement and engagement of the clutch is thus controlled by the accelerator, and with the accelerator released and the clutch disengaged the transmission may then be operated, as will now be described in detail.

The electrical means for controlling the valvular means of the transmission operating power means constitutes the most important feature of the instant invention. The preferred embodiment of this control is disclosed diagrammatically in Figure 2. Referring first however to the control valve unit to be operated, there is

disclosed in detail in Figures 8, 9 and 10 a casing 158 ported at 160 to receive the vacuum supply conduit 92, ported at 162 and 164 to receive conduits 166 and 168, connected one to each end of the motor 24, ported at 170 to receive a conduit 171 connected to the motor 34, and ported at 172, 174 and 176 to vent the valve mechanism to atmosphere via an air cleaner 178.

The casing is bored to receive a reciprocable valve plunger 180 having full-bodied elements 182 and 184, the latter providing a recess 186 communicating with the vacuum port 160. The ends of the plunger are housed within windings 188 and 190 providing, with the end portions as armatures, solenoids 192 and 194 to operate the valve. Return springs 196 and 198 serve to bias the plunger to the position disclosed in Figures 8 and 9, both end compartments 200 and 204 of the cylinder 26 being then vented to atmosphere. There is thus provided, with the aforementioned construction, two separate and distinct three-way valve units to control the energization of the motor 24.

The valve unit further includes a third three-way valve for controlling the motor 34. This valve comprises a plunger 206 having full-bodied portions 208 and 210. The upper end of the plunger, together with a winding 212, constitutes a valve operating solenoid 214.

The solenoids 192, 194 and 214 are preferably controlled by a manually operated selector switch 216 and a power operated switch 218. The switch 216 preferably comprises a hollow casing 220, rigidly secured to the steering column 222 and is provided at its end with a box-like housing 224 slotted on its top to simulate the H-shaped gear shift lever receiving slot of the conventional gear shift mechanism. A rod 226, slidingly and rotatingly mounted at 228 in the casing, serves as an operating means for the switch mechanism comprising an insulator support 230 to which is secured a contact plate 232 having a series of depressions 234 therein, and further comprising an insulator support 236. The plate 232 is connected to a battery 238 by means of a lead 240, a circuit breaker 242, operated by the clutch through the intermediary of linkage 244, being incorporated in the connection. A contact ring 246 is secured to the support 236 by a plurality of contact pins 248 having rounded heads 250 adapted to fit within the depressions 234. The ring is further secured to the support by a contact pin 252 having a rounded head 254 adapted to abut any one of three contact pins 256, 258 and 260, the latter serving to secure three contact clips 262, 264 and 266 to the support 230. The insulator support 236 is non-rotatably mounted on the rod 226 by a key 268, and is urged to the left to maintain the aforementioned contacts by means of a compression spring 270. A member 272, secured to the outer end of the rod, serves as a support for a selector arm 274 or dummy gear shift lever adapted to fit within the aforementioned H-shaped slot. The arm is preferably conveniently positioned adjacent the periphery of the steering wheel so that the driver may actuate the arm by his finger tips without removing his hand from the wheel.

The power operated switch 218, which is of the wiper type, comprises a U-shaped plate 276 slotted at 278 to receive a pin 280, the latter being secured to the shift rail 22. An arm 282, extending from the plate 276, serves as a support for two insulated contact wipers 284 and 286, the latter adapted to complete electrical circuits through insulated contact bars 288, 290, 292 and 294 wired respectively to the solenoids 194 and 192 and the contact clips 262 and 266 in the selector switch. The wiper switch further comprises a contact bar 296 wired to the clip 264.

Describing now the operation of the aforementioned mechanism, upon release of the accelerator, with the engine idling, the pilot valve 76 is actuated to both disengage the clutch through the intermediary of motor 60 and interconnect the source of vacuum with the transmission controlling valve unit 82. With the disengagement of the clutch, the circuit is completed at the breaker 242, making possible the operation of the valve unit to operate the transmission. Assuming the selector arm 274 in a neutral position, in which it is biased to the right by a spring 298, contact will be made between pins 252 and 258, completing an electrical circuit only as far as the bar 296.

Should the driver now desire to place the transmission in low gear, the arm is moved to its low gear position in the H slot. A movement of the arm and its connected rod 226 laterally to the left against the action of the spring 298 serves to register a pair of spring contact clips 300 and 302, connected respectively with the hot wire 240 and the solenoid 214, with a copper contact sleeve 304 on the rod 226. The solenoid 214 is thus energized, moving the valve plunger 206 upwardly to the low and reverse gear position of the valve member, disclosed diagrammatically in Figures 11 and 13. A fluid circuit between the evacuated intake manifold and the motor 34 is thus established, energizing the motor to angularly move the shift rail about its connection 306 with the lever 32 as a pivot. The fluid circuit includes the conduit 92, port 160, valve recess 186, a duct 308, valve recess 310, port 170 and conduit 171. In effecting this lateral shift, the rail 22 is forced to the right, compressing the biasing spring 52. To one end of the rail there is secured an arm 312, Figure 4, extending from a lever member 314, the latter being universally mounted within a projection extending from the transmission cover 38. The lower end of the member 314 is adapted to fit within notches 316 and 318 in the shifter bars 18 and 20 respectively. A pin 320 serves to maintain the lever member 314 within the selected notch during the shifting operation. Normally, the spring 52 maintains the member 314 housed within the bar 18, as disclosed in Figure 4. The structure just described is in general similar to the shifter bar construction disclosed in Figure 33.

In effecting the low gear position of the arm 274 the contact pins 252 and 256 are also registered to complete the circuit to the solenoid 194 via lead 240, usually defined as the hot wire, one of the pins 248, plate 232, ring 246, pins 252 and 256, clip 262 and bars 288 and 292. With the energization of solenoid 194, the valve plunger 180 is moved to the left, Figure 8, completing the fluid circuit, between the manifold and the compartment 200 of the motor 24, via conduit 92, recess 186 and conduit 166. The motor is thus energized to move the shift rail and its interconnected low and reverse gear shifter rod 20 to establish a low gear selection of the transmission. It is to be noted, however, that by virtue of the particular switch construction just described the motors 34 and 24 are operated successively, thus insuring the selection of the shifter bar 20 before the longitudinal movement thereof.

Completing the description of the aforemen-

tioned operation, the wiper member 284 is moved out of contact with the bar 292, the latter being slightly shorter than bar 288, just as the low gear selection is completed, thereby automatically breaking the circuit to the solenoid 194 and, with the deenergization of the solenoid, permitting the spring 198 to return the plunger 180 to its off position. The breaking of the solenoid circuit effects a saving of current during traffic light changes and at all other times after the clutch has been disengaged and the shift has been completed.

The transmission now having been placed in low gear, the accelerator is depressed to engage the clutch and accelerate the vehicle by opening the throttle.

Assuming the driver now desires to place the transmission in second gear, the accelerator is again reelased to disengage the clutch and close the circuit breaker 242. The arm 274 is then moved, both by the pressure of the fingers and the spring 298, to its second gear position, whereupon the contact between the fingers 300 and 302 and sleeve 304 is broken to deenergize the solenoid 214 and permit a spring 322 to return the valve plunger 206 to its off position. The motor 34 is thus deenergized by venting the same to atmosphere via port 176, a recess 324 in the plunger 206, port 170 and conduit 171. The spring 52 is then rendered operative, tending to move the shift rail to the left, Figure 4. The second gear position of the selector arm also serves to energize the solenoid 192 by completing a circuit via pins 252 and 260 and bars 290 and 294. The valve plunger 180 is thus moved to interconnect the manifold and compartment 204 of the motor 24, energizing the latter and returning the rail to its neutral position, whereupon the spring 52 moves the rail to the left, as disclosed in Figure 4, registering the member 314 with the shifter bar 18. The motor 34, being energized, continues to operate, completing the second gear shift.

The shift into second gear having been completed and the vehicle accelerated, the selector arm is then moved to its high gear position, whereupon the solenoid 194 is again energized, without, however, energizing the solenoid 214, and the shift is ultimately effected as will be obvious from the aforementioned description: likewise, the transmission may be shifted into reverse gear from neutral by successively energizing the solenoids 214 and 192. The arm is preferably of two-diametered construction, a smaller section 325 fitting within the reverse gear section of the H-shaped slot, which is of smaller width than the remaining sections. In order to select a reverse gear operation of the transmission it is necessary for the operator to raise the arm 274 upwardly, against the action of a spring 326, a locking pin 328 moving out of registry with a slot 330. The arm 274 may then be moved forwardly to reverse gear position.

Upon bringing the vehicle to a stop with the transmission in high gear, the usual practice is to neutralize the transmission, and with the instant invention this is effected by moving the selector arm to its neutral position. The solenoid 192 is thus energized, the circuit being completed via pins 252 and 258 in the selector switch and the bar 296 in the motor operated switch 218. The valve 82 is thus again operated to energize the motor 24 and neutralize the transmission, it being noted that the piston 28 of the motor automatically stops in its neutral position by virtue of the fact that in such position the wiper members 284 and 286 are both out of registry with the bar 296 to automatically deenergize the solenoid 192.

Briefly reviewing the above, it will be apparent that in the operation of the dummy shift lever to operate the transmission there is provided a member simulating in every detail the operation of the conventional manually operated shift lever.

There is diagrammatically disclosed in Figure 23 a modified form of electrical valve control means. As with the preferred modification, a manually operated selector switch 332 cooperates with an automatically operated power or motor operated switch 334, Figure 29, to control the solenoids of a control valve, the latter being a duplicate of the valve previously described.

The selector switch 332, disclosed in detail in Figures 30, 31 and 32, is not claimed herein, inasmuch as the same is described, disclosed and claimed in a patent of Victor W. Kliesrath, No. 2,219,323, issued October 29, 1940.

It is believed that the structure of the modification of Figure 23 is best made clear by describing the operation of the mechanism. As with the previously described mechanism, upon releasing the accelerator the clutch is disengaged by power and a battery 335 placed in circuit with the valve controlling means with the closing of a circuit breaker 336.

Should the driver desire to shift the transmission into low gear, a selector arm 338 and a rod 340, normally biased by a spring 342 to a neutral position, are pressed to the left to compress a spring 344 and complete a circuit between the battery and the solenoid 214 via contacts 346 and 348. The solenoid is thus energized to actuate the valve and energize the motor 34, the latter being operably connected to a shift rail 349 by the previously described linkage. The arm 338 is then rotated counterclockwise, to simulate an operation of a conventional shift lever into its low gear position, forcing one prong of a U-shaped clip 350, connected by a lead 352 to the battery, into contact with a contact 354, Figures 31 and 32, thus completing the circuit between the battery and solenoid 194. The valve thus actuated, as previously described, energizing the motor 24 operably connected with the rail 349, the latter being shown diagrammatically in Figure 23. The rail and its connected shifter bar are thus moved to the right to establish the low gear selection of the transmission.

According to a particular feature of the mechanism being described, the movement of the shift rail serves first to permit a spring pressed pin 356 to ride up on a cam face 358, forming the outline of a recess within the shift rail. The upward movement of the pin permits the closing of a switch 360 comprising contacts 362 and 364. The initial movement of the rail also serves to depress a spring pressed pin 366, operable to close a switch 368 comprising a contact 370 and a contact 372 connected with the aforementioned contact 362. The contact 364 is wired to the solenoid 192 and also to the contact 373 of the selector switch, and the contact 370 is wired to the battery. It follows therefore that the initial movement of the shift rail effects an energization of the solenoid 192, counteracting the effect, upon the valve piston 180, of the energized solenoid 194. However, with the particular construction of the valve it is apparent that the position of the same will not be disturbed; this by virtue of the greater depth of the armature of solenoid 194 within its winding than that of the armature of the solenoid 192.

The parts are so proportioned, however, that when the shift into low gear has been completed, that is when the rail has moved to the end of its stroke, the pin 366 will move into registration with the cam recess 359, automatically breaking the switch 368 and deenergizing the solenoid 192.

When the shift has been completed, the operator releases the selector arm 338, thus deenergizing the solenoid 194 and automatically returning the valve to its off position. The shift having been completed, the driver depresses the accelerator to engage the clutch and operate the throttle to accelerate the vehicle.

Should the driver now desire to shift into second gear, the selector arm is rotated clockwise, completing the circuit to energize the solenoid 192 and effect a reverse operation of the motor 24, the shift rail moving to the left to successively make and then break the switch 368. In this operation a switch 374 is brought into operation, said switch comprising a contact 376, connected with contacts 362 and 372, and a contact 378 wired to the solenoid 194 and to the selector contact 354. The driver may subsequently operate the selector to effect either a high gear operation of the transmission or he may place the same in reverse, as will be obvious from the aforementioned description of the mechanism.

The important feature of the mechanism just described lies in its neutralizing function. It will be remembered, for example, that with the rail in its low gear position that the pin 366 occupies the position of the pin 356 when the transmission is in neutral, all as disclosed in the several figures disclosing the switch 334. It follows therefore that only a very slight movement of the rail to the left will depress the pin 366 to close the switch 368. This slight movement is effected by momentarily energizing the second and reverse gear solenoid 192, this being accomplished by flicking the arm 338 forwardly or clockwise. The control valve is thus operated long enough to initiate a sufficient movement of the rail to depress the pin 366 and close the switch 368. This results in maintaining the solenoid 192 energized, until the rail is moved sufficiently to again break the switch 368. It will be apparent that the transmission may thus be neutralized from any established gear relation by a mere flicking operation of the selector arm 338.

Referring now to the circuit breaker 336, this mechanism is fluid pressure operated and includes an opening 382, preferably, though not necessarily, located in the end wall 384 of the clutch motor receiving the vacuum conduit 90. The opening is covered by a flexible diaphragm 386 and a stem 388, secured to the diaphragm, extends through openings 390 and 392 in plates 394 and 396 respectively. A contact plate 398 is fixedly mounted on the stem 388 and is adapted to abut contact pins 400 and 402 wired respectively to the battery 335 and to the contact member 370. A spring 404, interposed between plate 396 and a nut 408, threaded on the end of the stem, provides a means for determining the time of operation of the switch. With the clutch disengaged, the pressure differential acting on the diaphragm 386 results in a closing of the switch to make possible an operation of the power gear shift mechanism. With an operation of the accelerator to engage the clutch, the gaseous pressure acting on the diaphragm momentarily increases due to the venting of the motor to the atmosphere and then drops somewhat below atmospheric pressure due to the vacuum creating effect of the clutch springs. When the clutch plates contact, however, this vacuum pump effect of the clutch springs is automatically terminated, whereupon the gaseous pressure acting on the diaphragm suddenly increases to open the switch and thereby cut out the transmission operating power means. The adjustment of the tension of the spring 404 by the nut 408 serves to determine the time of operation of the diaphragm.

There is thus provided a pressure differential operated means operative to cut out the operation of the transmission operating power means when the clutch plates have contacted at a predetermined load during the engagement of the clutch.

There are disclosed in Figures 25 and 26 means for automatically neutralizing the transmission by the power means when the accelerator is released and the engine is inoperative. As disclosed in Figure 25, a vacuum operated switch 410 and an accelerator operated switch 412 are placed in series in a circuit shunting the switch 368, whereby with the closing of the switches 410 and 412 one or the other of the solenoids 192 and 194 are automatically energized to effect a neutralizing operation of the transmission operating power means. The switch 410 comprises a contact member 414 secured to a piston 416 of a vacuum motor 418, the cylinder 420 of the motor being connected with the intake manifold by a conduit 422. With this construction, the motor 418 is energized at closed throttle, thus breaking the switch 410.

Describing the operation of the aforementioned mechanism, upon release of an accelerator 421 to indirectly effect the closing of a switch 424 and directly close the switch 412, together with the stopping of the engine, for example by the cutting off of the ignition switch, the motor 418 is automatically deenergized to effect a closing of the switch 410. This closing operation is effected by a spring 426. As described above, one or the other of the solenoids 192 or 194 is now energized to neutralize the transmission. It is preferable, with this construction, that the tank 94, Figure 1, serves as a source of vacuum. The transmission operating power means is thus to a degree rendered fool-proof, for should the driver forget to neutralize the transmission by the above-described flicking operation of the selector and subsequently kill the engine, for example by turning off the ignition, the transmission would nevertheless be neutralized by the automatic mechanism just described.

In Figure 26 there is disclosed a modified form of automatic neutralizing mechanism, wherein the accelerator operated switch 412 of Figure 25 is supplanted by an accelerator operated mechanical interlock or latch 428 provided with a detent 430 to receive the end of a piston rod 432 to close the switch when the accelerator is released. Upon depression of the accelerator, however, the piston rod may not locate in the detent, thus preventing the automatic neutralizing operation when the accelerator is depressed.

There is disclosed in Figures 27 and 28 another embodiment of mechanical interlock between the accelerator and a vacuum operated switch. There is here provided a vacuum motor 434 comprising a cylinder 436 and a diaphragm member 438, the latter having secured thereto a rod 440 rotatably mounted at its end within a pin 442 bored at 444 to receive the rod 440. To the rod is secured a flange 446 having pins

448 extending therefrom adapted to extend within slots 450 in a flange 452 extending from the end of the pin 442. The pins 448 extend through a cup-shaped contact member 454 biased by a spring 456 into contact with contact pins 458 and 460, leading respectively to the battery and to the contact 372. The member 454 is also biased into contact with contact pins 462, Figure 28, leading to the starting motor of the engine.

Describing now the operation of the aforementioned mechanism, when the engine is idling to provide a vacuum in the manifold, the motor 434 is automatically energized to move the diaphragm 438 to the dotted-line position of Figure 27. The plate 454 is thus moved out of contact with the pins 458, 460 and 462 to break the circuits leading to the starting motor and transmission operating means. Upon release of the accelerator and a stopping of the engine the motor 434 is deenergized and the parts moved to the position disclosed in full lines in Figure 27, thus making the aforementioned circuits: however, should the engine stop, when the accelerator is depressed, the pin 442 will be rotated by a crank 464, secured to the accelerator, moving the slots 450 out of registry with the pins 448 and preventing the movement of the plate 446 into contact with the pins 458, 460 and 462 to make the circuits.

It is apparent therefore that to make the aforementioned circuits the accelerator must be released and the engine stopped. Stop pins 466 serve to prevent an operation of the accelerator to injure the mechanism prior to an energization of the motor 434.

There is disclosed in Figure 33 a modified form of shift rail construction. The rail is here constructed of two parts 468 and 470, pivotally connected at 472. The part 468 is angularly moved, to select either of the two conventional shifter bars 474 and 476, by a fluid pressure operated motor, not shown, connected to the part 468 by links 478 and 480. A projecting arm 482 of a lever member 484 is secured at 486 to the rail part 468 and the end of the lever is adapted to register within one or the other of slots 488 and 490 in the shifter bars.

In operation, the motor and a spring 492 serve to move the part 468 to select one or the other of the shifter bars, whereupon a lever 494, operated by other fluid pressure means as previously described, serves to move the two parts of the rail bodily and lengthwise to mesh the gears: the part 470 is preferably constrained to move only lengthwise by guide means, not shown. A conventional shift lever member may, if desired, be mounted on the head of the lever 484, whereby there is provided a mechanism for shifting the gears either manually or by power.

There is disclosed in Figures 34–45, inclusive, an embodiment of power gear shift mechanism, particularly adapted for an installation in any conventional automotive vehicle provided with a standard form of three-speeds forward and reverse transmission. The only modification necessary is a slight change in the transmission cover plate construction.

As disclosed in Figures 34 and 35, there is provided a compact unitary form of power mechanism, including a double-ended pressure differential motor 500, the piston 502 of which is operably connected to a conventional shift lever member 504, Figures 36 and 37, through the intermediary of a rod 506, a crank 508, a shaft 510 journalled in a transmission cover plate 512 at 514, and a crank 516 universally connected at 518 to the lower end of the lever member 504. It will be noted that the upper end of the universally mounted lever 504 is recessed to receive a detachable conventional so-called gear stick, or shift lever, not shown. Thus in the event of the failure of the power means the transmission may be operated manually in the usual fashion.

A diaphragm type of pressure differential motor 520, mounted on a bracket 522 connected to the motor 500, is also operably connected to the lever 504, the connection including a rod 524, a bell crank 526, and the aforementioned shaft 510 and crank 516. An electrically operated valve unit 528, also mounted on the bracket 522, functions to control the operation of the motors 500 and 520. The valve unit, detailed in Figures 39–45, inclusive, comprises a casing 530, bored at 532 and 534 to interconnect the motors with the manifold as a vacuum source and at 536 and 538 to vent the motor to atmosphere via an air cleaner 540. The various ports cooperating with the aforementioned bores comprise a vacuum port 542, ports 544 and 546 connected, by conduits 548 and 550, to the motor 500, and lastly a port 552 interconnecting the valve and the motor 520. The valve unit further comprises bores 554, 556 and 558 adapted respectively to slidingly receive valve plungers 560, 562 and 564, the latter being operated by return springs 566, 568 and 570 and solenoids 572, 574 and 576.

The solenoids are preferably controlled by a selector switch such as that disclosed in Figure 15 and by a power operated wiper switch 578, Figures 34 and 37, described in detail hereinafter.

Describing now the operation of the aforementioned mechanism, with the selector switch in neutral the solenoids 570, 572 and 574 are, of course, deenergized and the motors 500 and 520 vented to atmosphere, the motor 520 via bores 536 and 538 and port 552 and the motor 500 via bores 536 and 538, ports 544 and 546 and conduits 548 and 550. The standard type of low and reverse shifter rod 580 and high and second rod 582, Figures 36 and 37, are at this time in their neutral positions, and a spring 584 in the motor 520 is provided to bias the shift lever 504 to select the rod 582. In effecting this operation the shaft 510 is moved bodily lengthwise and to the right, Figure 36, by means of the forked end 586 of the crank 526 cooperating with an ear 588 on the crank lever 508.

Should the driver now desire to place the transmission in low gear preparatory to starting the vehicle, the selector switch 216, Figure 15, is operated as previously described, whereupon the solenoids 574 and 576 are energized, moving the plungers 562 and 564 upwardly and interconnecting the vacuum source with the motor 520 via a conduit 590, port 542, bore 532 and port 552, and with the motor 500 via the conduit 590, port 542, bores 532 and 534, port 546 and conduit 550. The parts are so proportioned that the motors 520 and 500 are successively energized. The crank 526 is thus actuated to bodily move the shaft 510 and angularly move its connected lever 504 to select the low and reverse shifter rod 580: thereafter the crank 508 is rotated counterclockwise to move the selector rod 580 and establish the low gear ratio of the transmission. As with the mechanism of Figures 4, 6 and 7, means are provided whereby the current to the solenoid 576 is automatically cut off when the low gear is effected, and it is to this end that the wiper switch

578 is provided. The switch comprises a two-part casing 592, secured within the transmission cover plate, said casing housing insulated contact bars 594, 596, 598, 600 and 602, wired to the selector switch and solenoids in the same manner as the corresponding bars in the modification of Figures 4, 6 and 7, and cooperating with insulated contact wiper members 604 and 606, operably connected to the lever 504 by plates 608 and 610. In moving to the right, Figure 37, the wiper 604 bridges the bars 594, 596 and 602 and the wiper 606 moves out of contact with the bar 598, thus breaking the circuit to the solenoid 576, controlling the first and high gear operations of the transmission and permitting the valve plunger 564 to return to its off position through the action of the spring 570.

Inasmuch as the electrical hook-up of the modification under discussion is identical with the previously described modification of Figures 4, 6 and 7, the operation will not be further described: however, suffice it to say that with the clutch disengaged the transmission may be power operated by the finger-tip control of a dummy shift lever in a manner simulating a conventional manual operation of the standard shift lever. This mechanism, however, has an advantage over the standard transmission in that the driver may at any time preselect a desired gear ratio while the vehicle is being propelled.

The effectiveness and general utility of the mechanism just described will be apparent. The compact unit of the mechanism is bracketed to the transmission, and the transmission cover plate is but slightly modified to house the shaft 510 and switch 578: otherwise the transmission construction is standard.

There is disclosed in Figure 46 a mechanism whereby an accelerator 612 is mechanically interlocked, with shifter rods 614 and 616, by means of a spring pressed plunger 618. With the transmission in neutral or in gear the rounded end of the plunger nests within mating recesses 620 in the shifter rods, thus permitting an operation of the accelerator by permitting a rod 622, connected to the accelerator by a bracket 624, to freely slide within a housing 626. However, at all other positions of the shifter rods, that is when the gears are not in mesh, the plunger 618 acts as a stop to contact the rod 622 and prevent the depression of the accelerator. This mechanism is well adapted to cooperate with the previously described power means, for with such an interlock the throttle may not be opened and the clutch may not be engaged until the gear-changing operation is completed.

This application is a continuation-in-whole of Price application Serial No. 746,759, filed October 4, 1934.

I claim:

1. An automotive gear shifting power mechanism comprising electrical valve operating means including a manually operated switch operable to select either one of two circuits to thereby initiate a gear shifting operation of the power mechanism, together with other switch means operable, with said gear shifting operation, to both break the aforementioned selected circuit and in part make two other circuits preparatory to a further operation of the manually operated switch to complete one or the other of the last-mentioned two circuits and thereby initiate either a transmission neutralizing operation of said power mechanism or another gear selecting operation thereof.

2. In a power operated gear shifting mechanism for the change-speed transmission of an automotive vehicle, a control valve unit, and electrical means for operating said unit comprising a manually operated selector switch operable either to close one of two circuits to effect a high or a second gear shift of the transmission or to close two circuits to effect a low or a reverse gear operation of the transmission, said electrical means further comprising a power operated switch operable, after a momentary opertaion of the aforementioned selector switch, to effect a transmission neutralizing operation of the power mechanism.

3. In an automotive vehicle provided with a clutch and a change-speed transmission, power means for operating both the transmission and the clutch, said means including a pressure differential operated clutch operating motor, electrical means for controlling the operation of the transmission operating power means, and means operative in accordance with the gaseous pressure of the clutch motor to control the operation of the transmission operating power means.

4. In an automotive vehicle provided with an internal-combustion engine, an accelerator and a change-speed transmission, power means for operating said transmission to simulate a conventional manual operation thereof, said power means including manually operated means for in part controlling the power means to neutralize the transmission, and further including means automatically operable, when the accelerator is released and the engine dies, to neutralize the transmission.

5. In an automotive vehicle provided with an internal-combustion engine, an accelerator and a change-speed transmission, power means for operating said transmission to simulate a conventional manual operation thereof, said power means including a plurality of switch mechanisms for in part controlling the power means, manually operated means for in part controlling the switch mechanisms to neutralize the transmission at the will of the driver, said power means further including an engine operated means operable, when the engine dies and the accelerator is released, to automatically neutralize the transmission.

6. In a power gear shift mechanism for the change-speed transmission of an automotive vehicle, a two-part power operated bar mounted in the transmission cover, one of said parts being angularly movable by pressure differential operated means to prepare for either a low or reverse gear operation of the transmission or a high or second gear operation thereof, and both of said parts being bodily movable by the pressure differential operated means to effect a gear selection.

7. In a power operated gear shift mechanism for a three-speeds forward and reverse transmission of an automotive vehicle, said transmission including a shifter rod operating member univrsally mounted in a transmission cover, a lever member journalled in said transmission cover and operatively connected to said rod operating member, and a pressure differential operated power unit secured to the transmission housing and operable to so actuate said lever member as to selectively operate the shifter rods as to simulate a conventional manual operation thereof.

8. In an automotive vehicle provided with an accelerator and a standard three-speeds forward and reverse transmission, the shifter rods of said transmission being modified from standard

construction by the provision of a plurality of mating recesses therein, the combination with said mechanism of interlocking means including a stop arranged to fit within certain of said recesses only when the rods are in either their neutral or gear established positions, to thereby permit an operation of the accelerator.

9. The combination with a standard three-speeds forward and reverse transmission comprising a universally mounted shift lever adapted to interlock with one or the other of two shifter rods, of power means for operating said lever to simulate a conventional manual operation thereof, said power means comprising a bodily and angularly movable shaft mounted in the cover plate of said transmission and operably connected to the lever, and further comprising a motor and valve unit bracketed to the transmission, said unit including a plurality of motors, the same being so connected to said lever operating shaft as to effect the aforementioned bodily and angular movement thereof.

10. A gear shifting power mechanism comprising control valve means and electrical means for operating said valve means, said electrical means including a manually operable selector switch for closing any one of a plurality of circuits, and further including switch means operable by the power mechanism, during the shifting of the gears, to open the aforementioned closed circuit and thus provide a follow-up control of the electrical means.

11. A gear shifting power mechanism comprising control valve means and electrical means for operating said valve means, said electrical means including a manually operable selector switch for closing any one of a plurality of circuits, and further including switch means automatically operable, with a gear shifting operation of the power means, to modify the operation of said electrical means in effecting subsequent gear shifting operations.

12. A gear shifting power mechanism comprising control valve means and electrical means for operating said valve means, said electrical means including a manually operable selector switch for closing any one of a plurality of circuits, and further including switch means automatically operable with a gear shifting operation of the power means.

13. A gear shifting power mechanism comprising control valve means and electrical means for effecting a remote control of said valve means, said electrical means comprising a manually operable switch mechanism for selecting any one of a plurality of circuits to initiate a gear shifting operation of the power means, together with a power operated switch rendered operable, with the aforementioned shifting operation, to preselect another circuit preliminary to effecting another gear shifting operation.

14. An automotive gear shifting power mechanism comprising electrical valve operating means including a manually operable selector switch operable to initiate an operation of the power means to effect any one of the five conventional transmission operations, and further including a power operated wiper switch mechanism automatically operable, with a gear shifting operation of the power means, to disable the power means after the shift has been completed and also make possible a subsequent operation of the power means through the intermediary of the selector switch.

15. In a power operated gear shifting mechanism for the change-speed transmission of an automotive vehicle, a control valve unit, and electrical means for operating said unit comprising a manually operated selector switch operable to close any one of a plurality of electrical circuits to initiate a gear shifting operation of the power means, and further comprising switch means operated by the power means and operable, with a flicking or momentary operation of the aforementioned selector switch, to initiate a transmission neutralizing operation of the power means.

16. In a power operated gear shifting mechanism for the change-speed transmission of an automotive vehicle, a control valve unit, and electrical means for operating said unit comprising a manually operated selector switch operable to close any one of a plurality of electrical circuits to initiate a gear shifting operation of the power means, and further comprising a power operated switch operative to complete a subsequent transmission neutralizing operation of the power means after the operation is initiated by an operation of the aforementioned selector switch.

17. In a power operated gear shifting mechanism for simulating a conventional manual operation of a change-speed transmission of an automotive vehicle, valve means for controlling the operation of said power means, and electrical means for operating said valve means comprising a plurality of solenoids, a manually operated switch selectively operable to effect an energization of any one of said solenoids and a power operated switch operable to effect an energization of another solenoid after said latter solenoid has been initially energized as a result of an operation of said manually operated switch.

18. In a power operated gear shifting mechanism for simulating a conventional manual operation of a change-speed transmission of an automotive vehicle, valve means for controlling the operation of said power means, and electrical means for operating said valve means comprising a plurality of solenoids, a manually operated switch selectively operable to effect an energization of any one of said solenoids and a power operated switch automatically operable by the power means to in part effect an energization of another of said solenoids.

19. In a power operated gear shifting mechanism for simulating a conventional manual operation of a change-speed transmission of an automotive vehicle, valve means for controlling the operation of said power means, and electrical means for operating said valve means comprising a plurality of solenoids, a manually operated switch selectively operable to effect an energization of any one of said solenoids and a power operated switch operable by the power means and operative to in part control the subsequent operation of another of said solenoids.

20. In an automotive vehicle provided with a conventional transmission, power means for operating the transmission comprising a shift rail mounted in the cover plate of the transmission, said rail being operative to selectively operate one or the other of the shifter rods of the transmission, fluid pressure means for imparting a lateral bodily movement of said rail, and other fluid pressure means for imparting a lengthwise bodily movement of said rail.

21. In an automotive vehicle provided with a conventional transmission, power means for operating the transmission comprising a shift rail

mounted in the cover plate of the transmission, said rail being operative to selectively operate one or the other of the shifter rods of the transmission, fluid pressure means for imparting a lateral bodily movement of said rail, and other fluid pressure means for imparting a lengthwise bodily movement of said rail, together with a wiper switch mechanism connected to said rail and rendered operative with said lengthwise bodily movement of the rail.

22. In an automotive vehicle provided with a clutch and a standard change-speed transmission, power means for selecting and moving either of the shifter rods of said transmission, said power means including a follow-up control means, whereby the power means is deenergized after a gear selection has been made.

23. In an automotive vehicle provided with a clutch and a standard change-speed transmission, power means for selecting and moving either of the shifter rods of said transmission, said power means including a follow-up control means, whereby the power means is deenergized after a gear selection has been made, said power means further including a preselecting mechanism operable to preselect a desired gear relation while another gear relation is established.

24. In a preselector gear shifting mechanism having a member operative to select and establish different gear relations in the change-speed transmission of an automotive vehicle, said vehicle also being provided with a clutch, power operated means for moving said member, preselector control means for said power means including a manually operable selector switch and a switch operated by the power means, said control means being rendered operative to effect a gear selecting operation of the power means only when the clutch is disengaged.

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