April 6, 1937. S. VORECH 2,075,917

CONTROL MECHANISM

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Fig. 1.

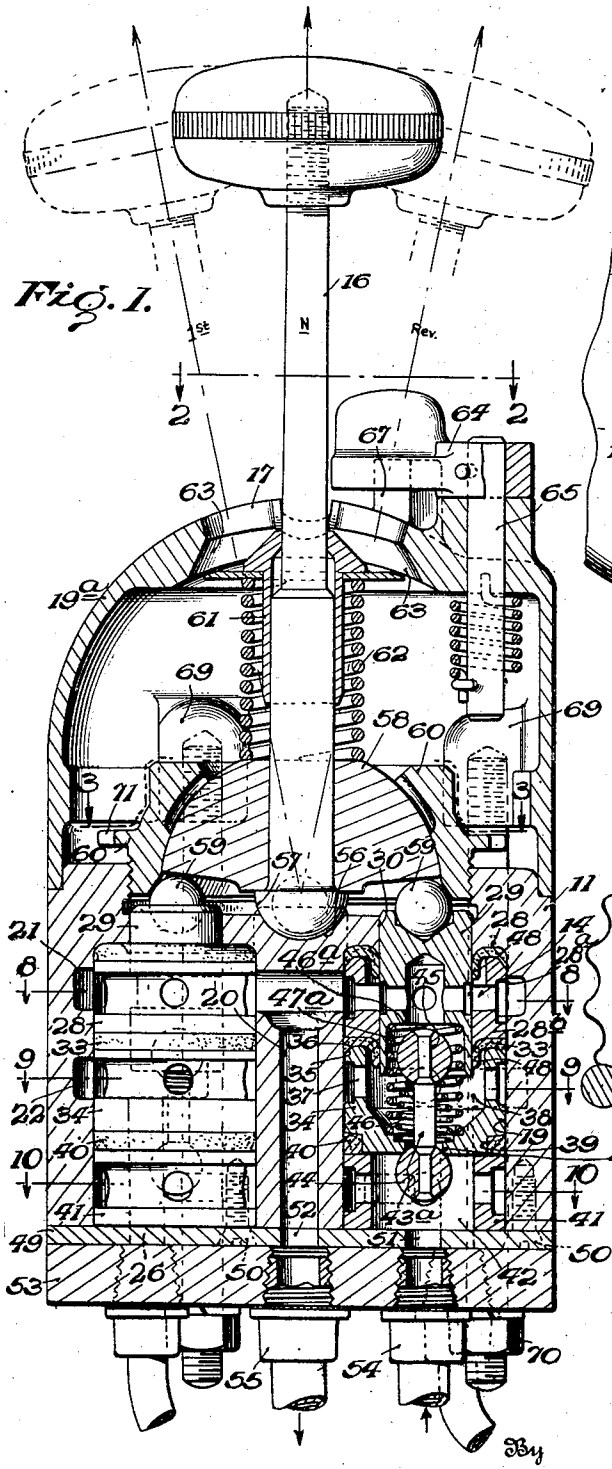



Fig. 2.

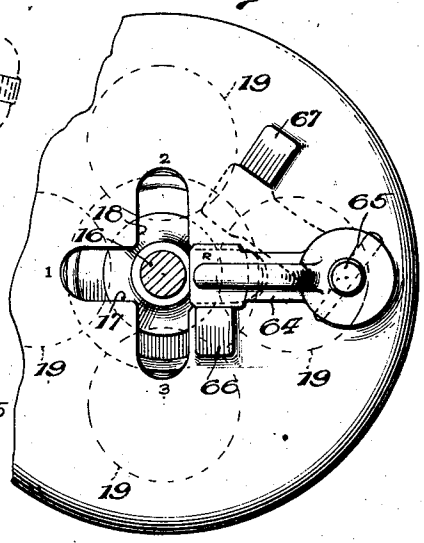
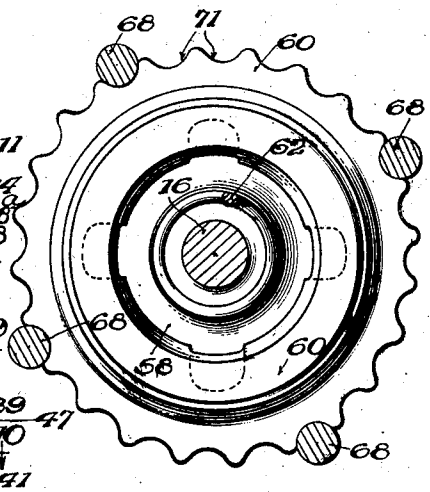



Fig. 3.




Inventor

Stephen Vorech

N. D. Parker Jr.

Attorney

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CONTROL MECHANISM

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Fig. 4.

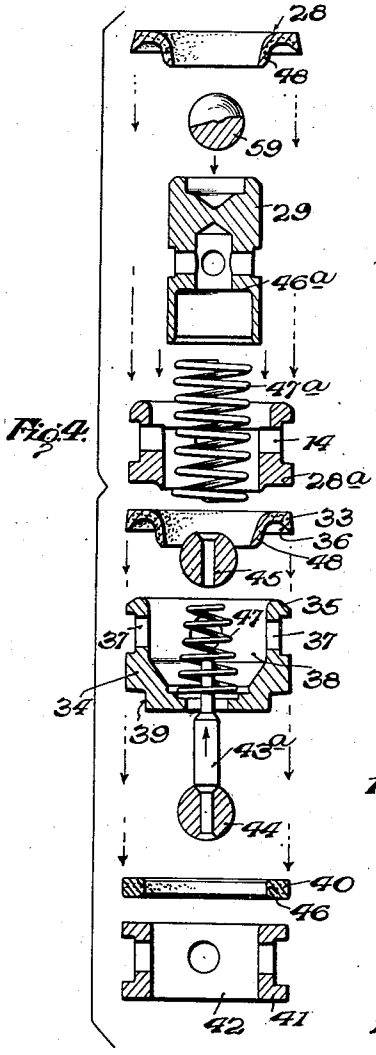



Fig. 5.

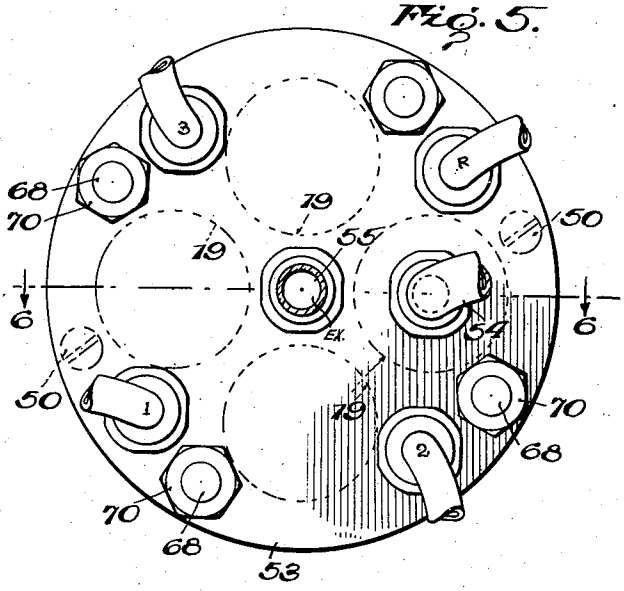
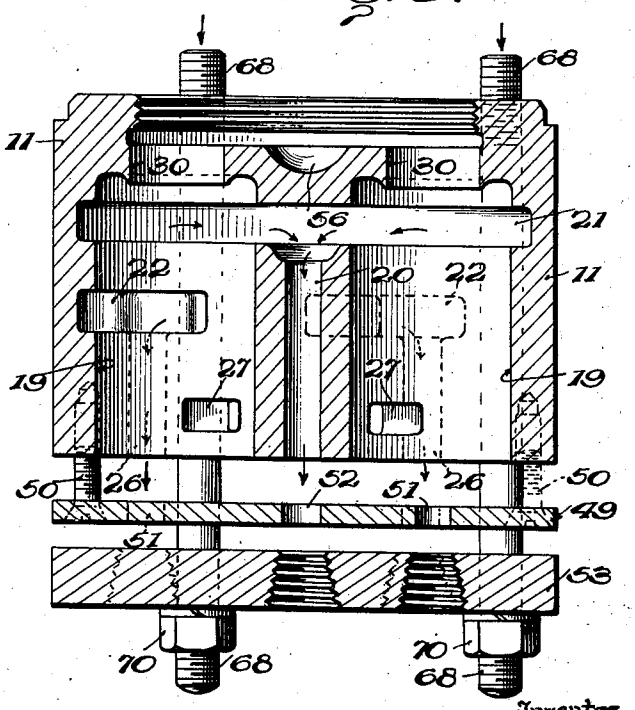



Fig. 6.




Inventor

Stephen Vorech

By N. D. Parsons Attorney

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CONTROL MECHANISM

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Fig. 7.

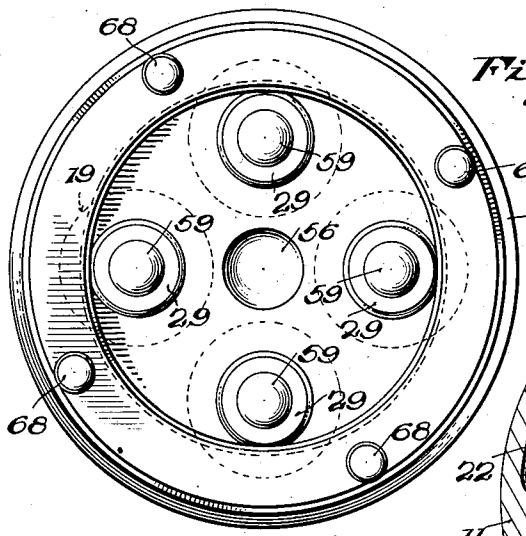
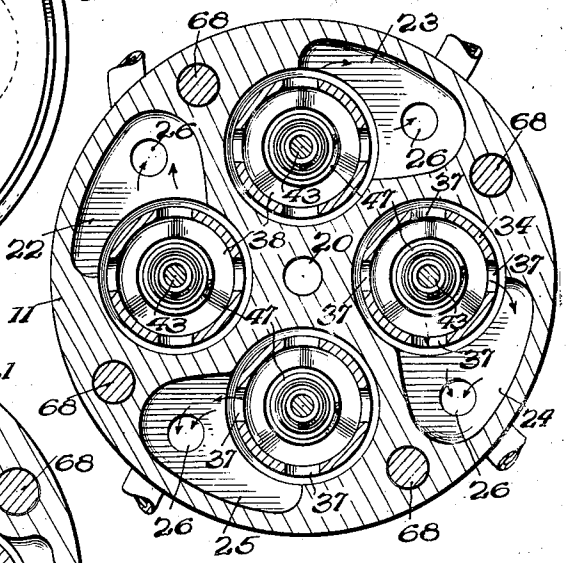



Fig. 9.



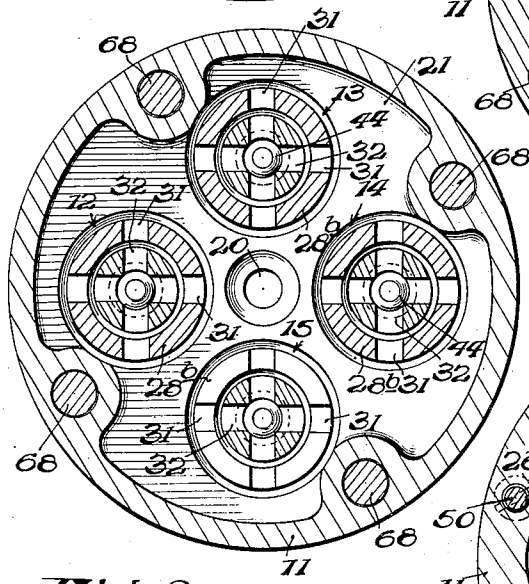




Fig. 8.

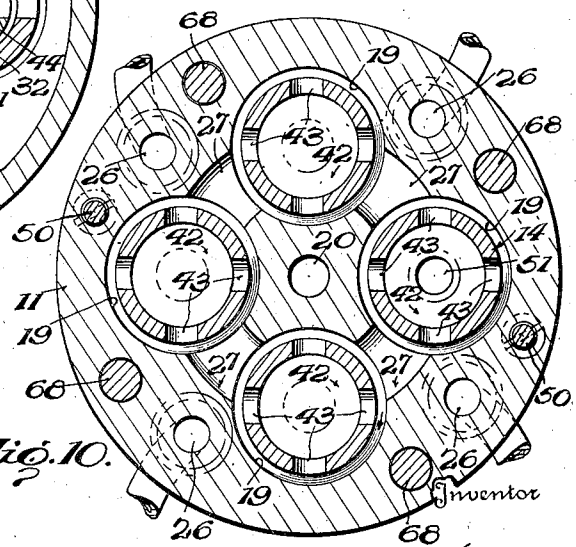



Fig. 10.

Inventor

Stephen Vorech

By N. D. Lawless Jr.

Attorney

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# UNITED STATES PATENT OFFICE

2,075,917

## CONTROL MECHANISM

Stephen Vorech, Pittsburgh, Pa., assignor to Bendix-Westinghouse Automotive Air Brake Company, Pittsburgh, Pa., a corporation of Delaware

Application January 3, 1936, Serial No. 57,447

10 Claims. (Cl. 277—2)

This invention relates to control mechanism and more particularly to a fluid pressure control apparatus especially adapted for controlling the application and exhaust of fluid pressure to and from a plurality of remotely-positioned actuators.

One of the objects of the present invention is to provide a novel fluid pressure-controlling mechanism so arranged and constituted that an operator may control the flow of energizing fluid to a plurality of remotely-positioned actuators in a simple and efficient manner as well as with a minimum of manual effort.

Another object of the invention is to provide a novel operator-controlled unit for apparatus of the above character which includes a plurality of valvular mechanisms so arranged as to be selectively operated from a single manually-operable member.

Still another object is to provide, in a unit of the above type, a novel means for securing the various component parts in operative position whereby the assembly may be completed with a minimum of adjusting operations, this arrangement greatly facilitating the installation and servicing of such units.

A further object is to provided a novel fluid pressure-controlling valve provided with a plurality of readily assembled sealing members arranged in such a manner that leakage from one valve part to another is minimized to a high degree.

A still further object is to provide, in an arrangement of the above character, a compact and efficiently-operable construction involving relatively few parts constructed and arranged in such a manner as to insure long life with a minimum of attention.

Other objects and novel features of the invention will appear more fully hereinafter from the following detailed description when taken in connection with the accompanying drawings, wherein one embodiment of the invention is illustrated. 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 this purpose to the appended claims.

In the drawings, wherein similar reference characters refer to similar parts throughout the several views:

Fig. 1 is an axial sectional view of a control valve assembly constructed in accordance with the principles of the present invention;

Fig. 2 is a top view of the control valve assembly, the top portion of the control lever having been removed;

Fig. 3 is a view of the adjusting means for the control lever and is taken along lines 3—3 of Fig. 1;

Fig. 4 is an exploded view in section of the parts constituting one of the control valves;

Fig. 5 is a bottom view of the control valve unit of Fig. 1;

Fig. 6 is an axial sectional view of the valve body;

Fig. 7 is a top plan view of the valve body and associated valves;

Fig. 8 is a transverse sectional view of the control valve device of Fig. 1 taken along lines 8—8 of the latter;

Fig. 9 is a transverse sectional view taken along line 9—9 of Fig. 1, and

Fig. 10 is a transverse sectional view taken along line 10—10 of Fig. 1.

Referring more particularly to Figs. 1 and 2, the present invention is illustrated therein as being constituted by a control valve assembly which may be particularly adapted for use in connection with the remote control of fluid pressure-operated gear-shifting motors for selecting and establishing a desired gear relation of an automotive transmission. As illustrated, the control valve unit comprises a body member 11 having a plurality of valves 12, 13, 14 and 15 disposed therein, said valves being adapted to be selectively operated by means of a control lever 16 universally mounted in the body member 11. The valve-actuating movement of the control lever 16 is suitably guided as by means of right-angularly disposed slots 17 and 18 formed in a dome-shaped cap 19a, and for purposes of illustration, it may be assumed that movement of the control lever 16 to the left and right in slot 17, as viewed in Fig. 2, will effect a selection and establishment of first and reverse gear relations respectively, while movement of the control lever upwardly and downwardly in the slot 18, as viewed in this figure, selectively effects establishment of second and third gear relations.

Referring more particularly to Figs. 6 and 8 to 10, the body member 11 is formed with a plurality of bores 19 for receiving the valve assemblies 12, 13, 14 and 15 and is also provided with a centrally-disposed exhaust passage 20 which communicates directly with an exhaust chamber 21 formed as a pocket in the body member and illustrated particularly in Fig. 8. Below the exhaust chamber 21, the body member is formed with a plurality of pockets 22, 23, 24 and 25 constitut-

ing outlet chambers for the various bores 19, it being observed from Fig. 9 that each of these outlet chambers is isolated one from the other, communicates with its respective valve-receiving bore and also has unrestricted communication through passages 26 with suitable conduits leading to the power-operated selecting and shifting motors, not illustrated.

In order that power fluid may be made readily available for each of the control valves, a single fluid intake connection is led to the valve bore 19 which houses the valve 14 for example. Referring more particularly to Fig. 10, it will be observed that fluid so conducted to the above mentioned valve bore will be directly conducted to the remaining valve bores 19 through ports 27 formed in the body member.

The valve mechanisms 12, 13, 14 and 15 positioned in the valve-receiving bores 19 of the body member are so constituted that upon selective operation of the control lever 16, fluid will be conducted through the proper outlet chamber for actuating the desired gear-selecting and shifting motors. These valves are furthermore constructed in such a manner as to promptly exhaust said motors through the proper outlet chamber and exhaust chamber of the valve body when the control lever 17 is returned to the neutral position, as illustrated in Fig. 1. Since all of the valve mechanisms 12, 13, 14 and 15 are of similar construction, one only need be described in detail.

Referring more particularly to Figs. 1 and 4, it will be observed that the bore 19 for reception of the valve 14 terminates adjacent the top portion of body member 11, the latter providing a seat 28, against which a fluid-sealing cup washer 28a is placed as by means of a valve-actuating plunger guide 28b. The latter serves to guide a reciprocable valve-actuating plunger 29 slidable in a reduced bore 30 of the valve body and is provided with a plurality of passages 31 which serve to connect the exhaust chamber 21 with passages 32 formed in the plunger 29, see Fig. 8. Seated against the lower face of the guiding member 28b is a second sealing washer 33, the latter being firmly maintained in fluid-sealing engagement with the wall of the bore 19 as by means of an intake valve seat member 34, such sealing engagement being facilitated by forming the member 34 and washer 33 with coacting beveled surfaces 35 and 36. The member 34, as will appear more particularly from Fig. 9, is formed with a plurality of ports 37 which serve to connect the outlet chamber 24 with an outlet cavity 38, the latter being formed by the relative positioning of members 34 and 29 as will be readily observed from Fig. 1. It will be understood from the above that the outlet chamber 24 is in constant communication with the outlet cavity 38 through the aforementioned ports 37.

The lower face of the member 34 is peripherally recessed in order to provide a seat 39 for receiving a fluid-sealing washer 40 which is maintained in fluid-tight engagement with the wall of the bore 19 as by means of a ring 41. The latter is preferably so formed as to provide a fluid intake chamber 42 which communicates with the valve bore 19 through ports 43 in the ring 41 and, as stated heretofore, fluid will be conducted to the remaining valve-receiving bores through the ports 27, see Fig. 10.

In order to control the flow of fluid from the intake chamber to the outlet cavity and from the latter to the exhaust chamber, a combined exhaust and intake valve assembly 43a is provided, such assembly being in the nature of a self-aligning valve and having spherical intake and exhaust portions 44 and 45 respectively. The assembly is yieldingly maintained in the position shown in Fig. 1, that is with the intake valve closed against a seat 46 formed in the member 34, as by means of a spring 47 carried by member 34. In the normal position, the exhaust valve 45 is normally spaced from an exhaust valve seat 46a formed in the plunger 29, the latter being yieldingly maintained in the position shown as by means of an expansible spring 47a seated against member 34 and the plunger. With the parts occupying their normal position as above indicated, the outlet chamber 24 and outlet cavity 38 communicate directly with exhaust chamber 21 through the open exhaust valve, passages 32 and 31. Upon downward movement of the plunger 29, however, it will be understood that this communication is interrupted as soon as the exhaust valve seat 46a contacts the exhaust valve 45. Additional downward movement of the plunger 29 will effect a movement of the valve assembly 43a to unseat the intake valve 44, thereby permitting fluid to flow from the intake chamber 42 directly into the outlet cavity 38. This fluid is distributed to the power gear-shifting mechanism through the proper conduit which is associated with the outlet chamber 24, the latter being in constant communication at all times with the outlet cavity 38 through ports 37.

It is desired to particularly point out that each of the fluid-sealing washers 28 and 33 is provided with an internal peripheral cupped portion 48 which has a substantial surface in engagement with the plunger 29. It will be observed that the washers are so cupped that the pressure of the fluid within passages 31 and outlet cavity 38 will serve to increase the sealing engagement between the washers and the plunger. The washer 28 thus eliminates the possibility of fluid exhausting upwardly through bore 30, while the washer 33 not only avoids leakage along plunger 29 but also eliminates leakage of fluid from the outlet cavity along the wall of bore 19, the latter resulting from the firm sealing engagement between the washer 33 and the wall of said bore through the cooperation of surfaces 35 and 36.

A further highly desirable feature of the valve assembly heretofore described resides in the utilization of the sealing washer 40 which when tightly engaged by the ring 41 is expanded outwardly into firm fluid-sealing engagement with the wall of the bore 19, thus effectively preventing any leakage from the intake chamber 42 to the outlet cavity 38 when the intake valve 44 is closed.

In order to maintain the above described valve parts in proper relationship within each of the valve-receiving bores, after assembly of the various valve elements, a base 49 is forced upwardly into engagement with the bottom of the body member 11 in order to properly position the valve parts and effect efficient fluid sealing as heretofore described, and is secured in position as by means of a plurality of screws 50. This plate is provided with an intake port 51 communicating with the intake chamber 42, and a port 52 communicating with the exhaust passage 20.

Novel means is provided for connecting the various conduit connections to the control valve unit, and, as shown, such means is constituted by a plate 53, secured to the body member in a manner which will appear more fully hereinafter and which is provided with an intake connection 54 and an exhaust connection 55, the former regis-

tering with port 51 and the latter registering with port 52. The plate 53 is also provided with suitable connections for the conduits leading from the various valve outlet chambers to the remotely-positioned power-operating mechanism.

In order to selectively operate the various valves 12, 13, 14 and 15, the control lever 16, referred to heretofore, is universally mounted in the body member 11, such mounting being constituted by a socket 56 formed centrally in said body member and adapted to receive the spherically-shaped end portion 57 of the control lever. The latter also carries a valve actuator 58 which is adapted to actuate the various valve mechanisms through interposed balls 59, the said actuator having an exterior spherical surface with which a retaining nut 60 is adapted to adjustably coact. The nut 60 is adjustably threadedly received in the body portion 11 and is so adjusted that all looseness or play between the bottom of the control lever and the socket 56 is eliminated while permitting easy relative movement between the actuator 58 and the nut during valve-actuating movement of the control lever.

In control valve constructions of the general type described herein, that is those particularly adapted for use in connection with remotely controlling a gear-shifting mechanism, it is often desirable to provide some means for releasably latching the control lever in its extreme positions. This avoids unintended return of the control lever to neutral position and consequent neutralization of the gears of the transmission. In the form of the invention illustrated, a novel construction is provided for this purpose and includes a detent 61 in the form of a poppet carried by the control lever and resiliently urged outwardly as by means of a spring 62. In the neutral position, the parts occupy the relative positions indicated in Fig. 1 of the drawings. However, if movement of the control lever 16 is effected in either direction in slot 17, the detent 61 will be resiliently forced into position within sockets 63 formed in the cap 19a at the extremities of the slot 17. Similar sockets are formed at the extremities of slot 18 and will releasably latch the control lever in either extremity of its movement in said last named slot. Preferably, a reverse lockout is associated with the cap 19a in order to prevent unintentional operation of the valve controlling the establishment of reverse gear relation. As shown, such lockout is constituted by an abutment member 64 oscillatably mounted as by means of rod 65 in cap 19a and normally resiliently urged against a stop 66 and obstructing the right-hand portion of the slot 17, see Fig. 2. If it is desired to effect operation of the valve 14 to establish reverse gear relation, it is only necessary for the operator to move the member 64 in a clockwise direction about its pivot 65, as viewed in Fig. 2, and against stop 67, thus permitting unobstructed movement of the control lever to the right-hand extremity of the slot 17.

After assembly of the various parts of the control valve structure heretofore described, a novel means is employed for securing the cap 19 to the body member 11 and the latter to the plate 53. In the form of the invention illustrated, such means not only effects a connection between the above described members but also serves to lock the nut 60 in its adjusted position within the body member 11. Referring more particularly to Figs. 1, 3 and 6, such securing means is constituted by a plurality of studs 68 threadedly received in bosses 69 formed on the cap 19a, such studs passing through body member 11, base 49 and plate 53, these parts being securely held together as by means of nuts 70 threaded upon the studs. As will appear more particularly from Fig. 3, the studs 68 engage one or another of a plurality of notches 71 formed in the periphery of the adjusting nut 60, it being readily appreciated that after assembly, the nut 60 is thus firmly locked in its adjusted position. In the event that it is desired to adjust the nut 60 to a different position, in order to take up any play existing in the control lever mounting, it is only necessary to withdraw the studs 68 from the body member 11, adjust the nut 60 to a new position and again connect the cap 19a to the body member through the studs 68, the latter engaging a new notch 71 in the nut 60. With such an arrangement, the assembly of the various parts is effected in an easy manner and by a single means, the cap, body and base plates being connected together and the adjusting nut for the lever mounting being maintained in a securely locked position, thus resulting in a compact and rigidly-assembled structure.

There is thus provided by the present invention a compact and efficiently-operable valve assembly arranged for complete control through the use of the single manually-operable control member. The utilization of the common locking means for the body member, cap and control member adjusting nut enables rapid assembly and disassembly of the unit with a minimum number of operations, which, it will be appreciated, greatly facilitates the installation and maintenance. A further feature resides in the provision of a single diameter bore for receiving the constituent parts of each valve, this arrangement simplifying the problems of manufacture of the valve parts as well as enabling a more efficient manner of preventing leakage of fluid pressure from one valve chamber to another.

While the one embodiment of the invention illustrated in the drawings has been described with considerable particularity, it is to be understood that the invention is not restricted thereto as the same is capable of receiving a variety of mechanical expressions, some of which will now readily suggest themselves to those skilled in the art, while changes may be made in the details of construction, arrangement and proportion of parts, and certain features used without other features, without departing from the spirit of the invention. Reference is therefore to be had to the claims appended hereto for a definition of the limits of the invention.

What is claimed is:

1. A control valve assembly comprising a body member having a plurality of bores formed therein, a valve positioned within each of said bores, a cap associated with said body member, a control lever for selectively operating said valves, a socket formed in said body member for mounting said lever for universal movement, means including a nut adjustably threadedly received by said body member for maintaining said lever in said socket, and common means for locking said nut and for securing said cap to said body member.

2. A control valve assembly comprising a body member having a plurality of bores formed therein, a valve positioned within each of said bores, a cap associated with said body member, a control lever for selectively operating said valves, said cap being formed with right-angu-

larly disposed intersecting slots for guiding said lever, means formed in said body member for mounting said lever for universal movement, means including a nut adjustably threadedly received by said body member for maintaining said lever in said mounting means, and common means for locking said nut and for securing said cap to said body member.

3. A control valve assembly comprising a body member having a plurality of bores formed therein, a valve positioned within each of said bores, a cap associated with said body member, a control lever for selectively operating said valves, a socket formed in said body member for mounting said lever for universal movement, means including a nut adjustably threadedly received by said body member for maintaining said lever in said socket, a base secured to said body member adapted to maintain said valves within said bores, and common means for locking said nut and for securing said cap to said body member.

4. A control valve assembly comprising a body member having a plurality of bores formed therein, a valve positioned within each of said bores, a cap associated with said body member, a control lever for selectively operating said valves, a socket formed in said body member for mounting said lever for universal movement, means including a nut adjustably threadedly received by said body member for maintaining said lever in said socket, a base secured to said body member adapted to maintain said valves within said bores, a plate associated with said base and provided with fluid-conducting passages, and common means for securing said cap and plate to said body member.

5. A control valve assembly comprising a body member having a plurality of bores formed therein, a valve positioned within each of said bores, a cap associated with said body member, a control lever for selectively operating said valves, said cap being formed with right-angularly disposed intersecting slots for guiding said lever, means formed in said body member for mounting said lever for universal movement, means including a nut adjustably threadedly received by said body member for maintaining said lever in said mounting means, a plate associated with said body member oppositely of said cap, and common means for securing said plate and cap to said body member for locking said nut in adjusted position.

6. A control valve assembly comprising a body member having a plurality of bores formed therein, a valve positioned within each of said bores, a cap associated with said body member, a control lever for selectively operating said valves, said cap being formed with right-angularly disposed intersecting slots for guiding said lever, means formed in said body member for mounting said lever for universal movement, means for maintaining said lever in said mounting means, and means for releasably latching said lever at the extremities of movement thereof in opposite directions in said slots comprising a resiliently-actuated detent carried by said lever and coacting with recesses formed in said cap adjacent the extremities of said slots.

7. In a control valve mechanism having a body formed with a bore extending partially therethrough, a valve-operating plunger slidably mounted in said body member and extending into said bore, an apertured fluid-sealing member seated against the end of said bore and having its interior peripheral portion in sealing engagement with said plunger, a guiding member for said plunger positioned within sad bore and having one face in contact with said sealing member, a second apertured fluid-sealing member seated against the other face of said guiding member and having its interior peripheral portion in sealing engagement with said plunger, an intake valve seat member positioned within said bore and having one face thereof seated against said second sealing member, and means including a base plate secured to said body member for maintaining said sealing members, guiding member and seat member in fluid-sealing assembled position within said bore.

8. In a control valve mechanism having a body formed with a bore extending partially therethrough, three apertured rings positioned within said bore, the upper and lower rings respectively forming exhaust and intake chambers, while the intermediate ring forms an outlet chamber, a combined exhaust and intake valve assembly carried by said intermediate ring, said assembly including interconnected intake and exhaust ball valves, resilient means associated with said intermediate ring for normally maintaining said valve assembly in closed position, a valve-operating plunger slidably received in said upper ring and formed with an exhaust passage normally spaced from said exhaust valve, a pair of apertured sealing washers disposed on either side of said upper ring and having sealing engagement with the wall of said bore and said valve-operating plunger, and a base plate secured to said body member adjacent said lower ring for maintaining said ring and washers in assembled position.

9. A control valve assembly comprising a body member having a plurality of bores formed therein, a valve positioned within each of said bores, a cap associated with said body member, a control lever for operating said valves, said cap being formed with a plurality of slots for guiding said lever, means for mounting said lever in said body member for universal movement, means including a nut adjustably threadedly received by said body member for maintaining said lever in said mounting means, and means passing through said body member for locking said nut in adjusted position and for securing said cap to said body member.

10. In a control valve mechanism having a body formed with a bore extending partially therethrough, three apertured rings positioned within said bore, the upper and lower rings respectively forming exhaust and intake chambers, the intermediate ring forming an outlet chamber, a valve assembly carried by said intermediate ring and including interconnected ball exhaust and intake valves respectively positioned in said outlet and intake chambers, a valve-operating plunger slidably received in said upper ring and formed with an exhaust passage communicating with said exhaust chamber and normally spaced from said exhaust valve, sealing washers interposed between said rings, and means secured to said body member adjacent said lower ring for maintaining said rings and washers in assembled position.

STEPHEN VORECH.