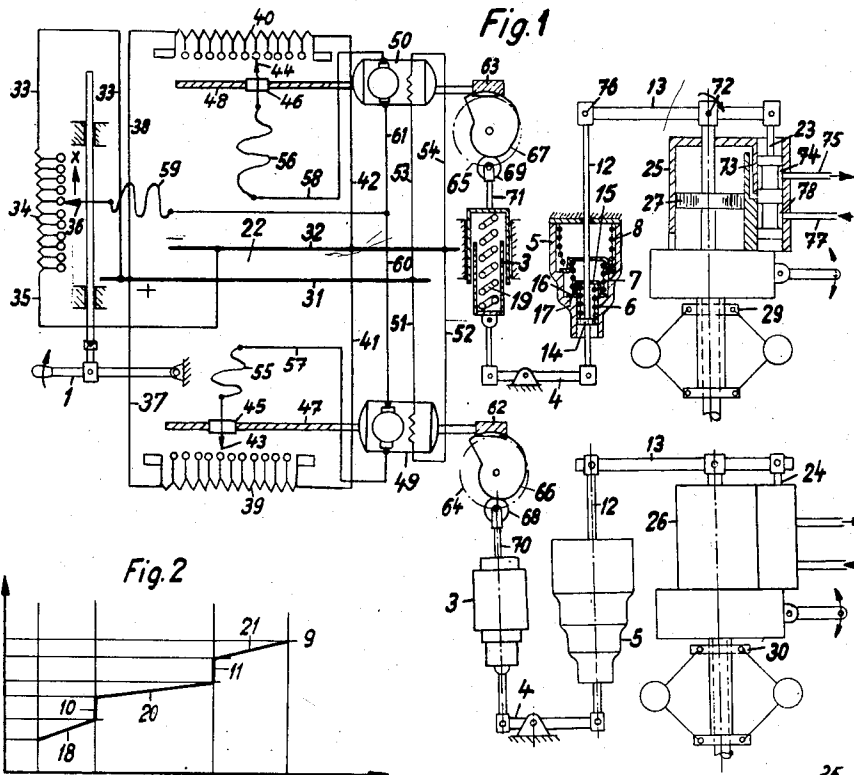
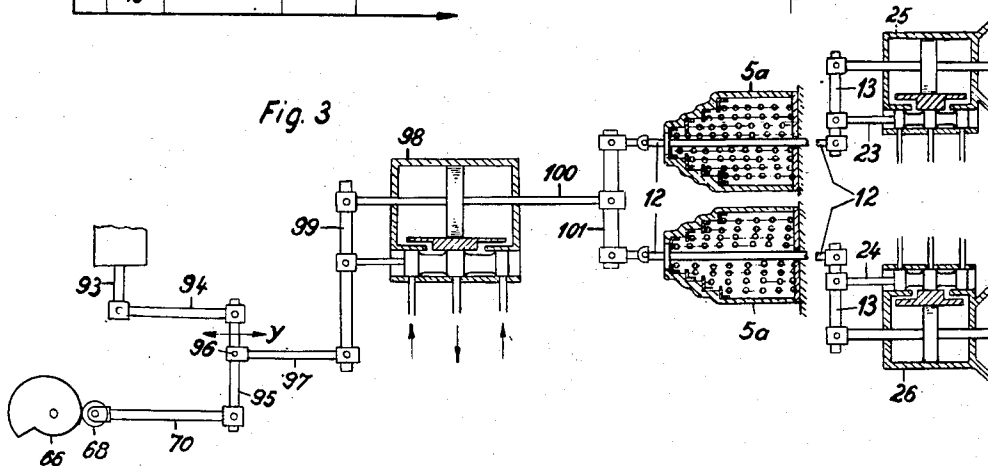


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REMOTE CONTROL MECHANISM, ESPECIALLY
FOR VEHICLES WITH FLUID DRIVE
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REMOTE CONTROL MECHANISM, ESPECIALLY FOR VEHICLES WITH FLUID DRIVE

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The present invention relates to remote control mechanisms, and although not limited to; is of particular advantage for use in connection with fluid drives.

Prior to the present invention, a remote control mechanism had been suggested which was developed particularly for use in connection with vehicles in which the power transmission is effected by means of a fluid drive. In this known device, the receiver side comprises adjusting elements for a precise adjustment of individual control values; whereas a precise adjustment is not required at the transmitter side. According to this known remote control mechanism, a pressure controlled adjusting element at the receiver side is adjusted from the transmitter side by effecting a change in pressure of the fluid pressure means; while for instance, compressed air or water under pressure was used as fluid pressure means. This arrangement is, however, vulnerable in several respects. Thus, the transmitting means which generally consists of rubber hoses to convey the pressure fluid means from one vehicle to another vehicle may relatively easily be damaged. Furthermore, difficulties are frequently encountered when connecting or disconnecting said hoses, particularly when liquids are used as pressure fluid means.

It is, therefore, an object of the present invention to provide a remote control mechanism which will overcome the above-mentioned drawbacks.

It is another object of the present invention to provide a remote control mechanism in which the remote control is effected by purely mechanical or electro-mechanical means.

It is a still further object of this invention to provide a remote control mechanism which allows to effect a relatively great number of precisely controlled strokes or adjustments while, on the other hand, it is relatively simple in construction and operation and easy to handle.

These and other objects and advantages of the invention will appear more clearly from the following specification in connection with the accompanying drawings in which:

Figure 1 illustrates in a diagrammatic manner a first embodiment of the present elevation partly in view and partly in section.

Figure 2 represents a graph indicating the different control steps in connection with the control spring means shown in Figure 1.

Figure 3 is a second embodiment of the invention and illustrates in vertical section a remote control mechanism according to which one trans-

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mitter controls the pumping blades of two fluid drives operating independently of each other.

General arrangement

As indicated above, the present invention relates to remote control mechanisms adapted at the receiver side to effect precise adjustments, whereas no corresponding precise control movements are required at the transmitter side. While devices of this general character have been known heretofore, the present invention differs from the heretofore known devices of this type in that the transmitter and the receiver are connected with each other by a stroke control mechanism and by means cooperating therewith, said means constructed and arranged so that they will remain stationary within the range of precise control values, even if the stroke control mechanism continues to move.

Structural arrangement

Referring to the drawings in detail, and Figure 1 thereof in particular, the construction shown therein comprises a transmitter in form of an adjusting lever 1 which is connected by means of an electric stroke control arrangement 22 which is based on the principle of Wheatstone's bridge. According to this arrangement, two receivers 23, 24, arranged to operate independently of each other, are controlled by the adjusting lever 1. The receivers 23, 24 are represented by control members pertaining to amplifiers 25, 26. The working pistons 27, 28 of these control members are connected by spring means (not shown in the drawings) with the governor sleeves 29, 30 respectively pertaining to motors not shown in the drawings. The electric control arrangement 22 receives its voltage from a plus line 31 and a minus line 32. Connected to the plus line 31 through a conductor 33 is an electric resistor 34, which latter, through a conductor 35 is connected with the minus line 32 and is adapted to be varied by a slidable contact 36 positively connected with the adjusting lever 1. Also connected with the plus line 31 through a conductor 37, 38 are electric resistors 39, 40 respectively which, through conductors 41, 42 are connected with the minus line 32 and control the receivers 23, 24, respectively. Each resistor 39, 40 has associated therewith an adjustable sliding contact 43, 44 respectively mounted on a threaded bushing 45, 46. The bushings or nuts 45, 46 are respectively movably mounted on spindles 47, 48 forming the end of a shaft pertaining to a separately excited shunt motor 49, 50 respectively receiving its exciting current from conduits 51,

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52 and 53, 54 connected to the lines 31 and 32. Connected to one brush of the armature of each shunt motor 49 and 50 through a movable conductor 55, 56 and a stationary conductor 57, 58 is the respective slidable receiver contact 43, 44. Connected to the other brush of the armature of each motor 49 and 50 is a movable conduit 59, coming from an emitter contact 36, and a stationary forked conductor 60, 61 connected to the conductor 59.

When the adjusting lever 1 is moved in clockwise direction from its rest position shown in Figure 1 in which no currents flow, the emitter contact 36 moves in the direction of the arrow X of Figure 1. As a result thereof, the steps of the resistor 39, 40 of each of the two shunt motors 49, 50 are respectively connected with steps of different voltage of the emitter resistor 34. The difference in voltage causes a current to flow, which current brings about rotation of the motor 49, 50 in one or the other direction depending on the direction of flow of the current. This, in turn, changes the position of the contacts 43, 44 pertaining to the receiver resistors 39, 40 respectively until the contacts occupy the same position as the adjusted emitter contact 36.

The free ends of the motor shafts 47, 48 have connected thereto a worm 62, 63 respectively meshing with a worm wheel 64, 65. Respectively rigidly connected with the worm wheel 64, 65 is a cam 66, 67 which is connected to the cylinder piston arrangement 3, which latter is operatively connected through a two-arm lever 4 with a second spring controlled cylinder piston arrangement generally designated 5. The springs 6, 7 and 8 of the cylinder piston arrangement 5 produce a spring characteristic or graph 9 with steps 10, 11 as indicated in Figure 2. In contact with the cam areas of the cams 66, 67 are rollers 68, 69 respectively carried by rod-shaped supporting members 70, 71 of a cylinder piston arrangement 3. The cylinder piston arrangement 3 is again connected with the control member 13 of the receivers 23, 24 by means of a two-arm lever 4 and a connecting rod 12, which latter pertains to the cylinder piston arrangement 5 housing the springs 6, 7 and 8. When the adjusting lever 1 is moved in clockwise direction, current flows from the plus line 31 through the elements 33, 34, 36, and 59, the elements 60, 49, 57, 55, 43, 39 and 41, the members 61, 50, 58, 56, 44, 40 and 42 respectively to the minus line 32 and causes the shafts of the motors 49 and 50 to turn leftwardly until the contacts 43, 44 have moved toward the right by the same distance by which the emitter contact 36 was moved by the adjusting lever 1 in the direction of the arrow X. When the emitter contact 36 is moved in opposite direction, opposite movements will be effected. The rotation of the shafts pertaining to the motors 49, 50 causes a rotation of the cam discs 66, 67, thereby causing the rollers 68, 69 in contact therewith to perform a stroke in the direction of the supporting members 70, 71 corresponding to the stroke of the adjusting lever 1. The cylinder piston arrangement 3 will be moved. As a result thereof, the connecting rod 12 and the control member 13 connected therewith and pertaining to the receiver will be adjusted against the thrust of the springs 6 to 8. The weakest spring 6 abuts with one of its ends a collar 14 of the connecting rod 12, while the other end of said spring abuts against the bottom of a cup 15. The open end of the cup 15 is provided with a flange 16 which is pressed by the next stronger spring 7 against

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an abutment 17 of the casing or cylinder pertaining to the cylinder piston arrangement 5. The springs 7 and 8 are mounted in a corresponding manner. The forces transmitted through the control members 13 are amplified by the amplifier pistons 27, 28 of the amplifying cylinders which are open at the bottom.

When, by turning the adjusting lever 1 clockwise, for instance, the cam disc 67 is rotated in the same sense, the roller 69 moves downwardly with regard to Figure 1 and the control member 13 likewise rotates clockwise about its pivot 72, which latter is provided at the free end of the rod pertaining to the amplifier piston 27. As a result thereof, the control spool of the receiver 23 moves downwardly with regard to Figure 1 so that pressure fluid may escape from the space above the amplifier piston 27 through channel 73 and annular chamber 74 of the spool into a discharge conduit 75. The spring effect between the working piston 27 and the governor sleeve 29 presses the piston 27 upwardly. In this way, the control member 13 is rotated around the pivot 76 on the rod 12 in anti-clockwise direction, and the spool of the receiver 23 is returned upwardly. When the adjusting lever 1 is rotated in opposite direction, opposite movements will be effected. When the spool 23 is moved upwardly, pressure fluid flows from an inlet conduit 77 through a second annular chamber 78 and the channel 73 into the space in front of the working piston 27, thus, effecting a return of the same downwardly.

The individual steps of the operation of the device shown in Figure 1 are represented in the graph of Figure 2. Marked off on the ordinate of this graph are the counter-thrusts of the springs 6, 7 and 8, whereas on the abscissa there are marked off the compressions of the springs or what amounts to the same, the controlled stroke of the control member 13 pertaining to the receiver.

It will be clear that by moving the adjusting lever 1 clockwise with regard to Figure 1, the spring 6 will be compressed in conformity with line 10 of the graph 9. If the compression stroke of spring 6 is exhausted, a further movement of the adjusting lever 1 in the same direction as before will cause the spring 19 in the cylinder piston arrangement 3 to compress, whereas the connecting rod 12 remains stationary in its respective position. This step is represented in Figure 2 by the vertical step line 10. In this way, it is possible to realize a precise value, for instance, the idling step, the full load step or the overload step of an internal combustion engine, even though the adjustment at the transmitter side lacks precision.

As soon as the pre-tension of the spring 7 has been overcome, the steps just described in connection with spring 6 will repeat themselves for spring 7. The graph 13 of the spring 5 in Figure 2 has its equivalent in the line 20 of spring 7, while the step line 10 of spring 6 has its equivalent in the step line 11 of spring 7.

When the pre-tension of the spring 8 has been overcome, the spring 8 with its graph 21 becomes effective. If desired, the step line 10 may represent the idling step and the step line 11 may represent the full load step. Deviations or lack of precision in the adjustment at the transmitter side which, as to value, are within the spring thrusts at the lower and upper ends of the lines of the graph sections 10 or 11, therefore, do not affect the precision of the adjustment of definite controlling or adjusting values at the receiver

side. The difficulties encountered when applying a pressure fluid, particularly when the pressure means is to be conveyed over larger distances will be avoided.

Referring now to Figure 3, this figure illustrates an arrangement according to which, by means of a transmitter impulse, the adjustable pumping blades of two fluid drives adapted to work independently of each other, may be so adjusted that again precise control values will be maintained. The transmitter impulse is composed of a shifting movement of an adjusting lever not shown which movement is conveyed to a cam disc 66 according to Figure 1. The transmitter impulse, furthermore, comprises a movement of a lever 93 adapted to be moved by a governor lever system (not shown) pertaining to a likewise not shown diesel engine. The lever 93, by means of a connecting rod 94, is pivotally connected with a two-arm lever 95, whereas cam disc 66 is connected with the two-arm lever 95 by means of a roller 68 and a rod 70. The pivot point 96 of the lever 95 is adapted to move in the direction of the arrows Y. The two-arm lever 95 forms the common transmitter and simultaneously represents the end of the control stroke arrangement. The two-arm lever 95 is, by means of a rod 97, pivotally connected with a lever 99 controlling the amplifier 98. Pivotally connected to the free end of the rod 100 pertaining to the amplifier piston is a two-arm distributing lever 101 adapted to control the two blade adjustments of the fluid drive. Each end of the lever 101 is pivotally connected with a spring means containing cylinder piston assembly 5a having a spring characteristic with steps. The rod 12 of this arrangement is adapted to influence the adjusting member 13 of the receivers 23, 24 respectively. Similar to the first embodiment of Figure 1, the receivers 23, 24 are formed by a valve member of an amplifier 25, 26 respectively which, however, in contrast to the embodiment of Figure 1 acts upon the lever system of a blade adjustment not shown. The laws according to which the blades are adjusted may be the same or may be different from each other although both are being controlled by one and the same common transmitter 95. If the common transmitter 97 which represents the common stroke adjustment, adjusts one fluid drive faster than the other one, there will be effected a balance at those places where a precise adjustment of the two transmissions is required. This is effected through the cylinder-piston arrangement 5a by causing the element which was adjusted too fast to remain stationary at those places until the member which was adjusted too slowly has reached the corresponding equivalent value representing position. Only then again the two members may be adjusted together. In other words, the adjusting elements which are in parallel arrangement equalize each other.

In the arrangement of Figure 3, the amplifier 98 constitutes the second yielding member corresponding to the spring link 3 of Figure 1, its piston remaining stationary notwithstanding displacement of its control valve, during the periods of dwell of the devices 5a.

It is, of course, understood that the present invention is by no means limited to the particular structure shown in the drawings but, also, comprises any modifications within the scope of the appended claims.

What I claim is:

1. A remote control arrangement comprising in combination; a control member to be moved

into a plurality of precisely located positions, an abutment, a plurality of springs pre-tensioned to different initial thrusts arranged in series between said control member and said abutment, floating abutments interposed between said springs adapted for abutting as the springs therebetween are fully deformed, the pre-tension on each of the said springs being such that each of the said springs will be fully deformed before the next strongest of the said springs commences to deform, an adjustable member movable into a plurality of positions corresponding to the plurality of positions for the said control member, but each movement of the adjustable member from one position thereof to the next including a predetermined amount of overtravel beyond that required for moving the control member between its corresponding positions, and means connecting the adjustable member with the control member comprising a resilient element, said resilient element having a modulus such that it will deform between the thrust that will completely deform one of the springs associated with the control member and the thrust that will commence deformation of the next of said springs sufficiently to absorb the overtravel of said adjustable member.

2. A remote control arrangement comprising in combination; a control member to be moved into a plurality of precisely located positions, an abutment, a plurality of compression springs pre-tensioned to different initial thrusts arranged in series between said control member and said abutment, floating abutments interposed between said springs adapted for abutting as the springs therebetween are fully compressed, the pre-tension on each of the said springs being such that each of the said springs will be fully compressed before the next strongest of the springs commences to deform, an adjustable member movable into a plurality of positions corresponding to the plurality of positions for the said control member, but each movement of the adjustable member from one position thereof to the next including a predetermined amount of overtravel beyond that required for moving the control member between its corresponding positions, and means connecting the adjustable member with the control member comprising a resilient element, said resilient element having a modulus such that it will deform between the thrust that will completely collapse one of the springs associated with the control member and the thrust that will commence deformation of the next strongest of said springs sufficiently to absorb the overtravel of said adjustable member.

3. A remote control arrangement comprising in combination; a pair of control members to be moved into a plurality of precisely located positions, an abutment for each said member, a plurality of compression springs pre-tensioned to different initial thrusts arranged in series between each said control member and its abutment, floating abutments interposed between the springs of each group adapted for abutting as the springs therebetween are fully compressed, the pre-tension on each of the said springs being such that each of the said springs in each group will be fully compressed before the next strongest of the said springs commences to deform, an adjustable member movable into a plurality of positions corresponding to the plurality of positions for the said control members, but each movement of the adjustable member from one position thereof to the next including

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a predetermined amount of overtravel beyond that required for moving the control members between their corresponding positions, and means connecting the adjustable member with the control members, each said connection comprising a resilient element, said resilient element having a modulus such that it will deform between the thrust that will completely collapse one of the springs associated with the control members and the thrust that will commence deformation of the next strongest of the said springs sufficiently to absorb the overtravel of the said adjustable member.

4. A remote control arrangement comprising in combination, transmitter means including adjustable means operable to produce adjusting impulses, receiver means, controlling means adapted for being associated with said receiver means for effecting a precise adjustment thereof for each adjusting impulse directed to said receiver means from said adjustable means via said controlling means, stroke control means interposed between said transmitter means and said controlling means, first yielding means having a spring characteristic with steps and being operatively connected between said stroke control means and said controlling means, and second yielding means interposed between said first yielding means and said stroke control means and being yieldable within the range of the steps of said spring characteristic, said first and second yielding means being operable to absorb excessive adjusting movements of said adjustable means within predetermined limits beyond the respective exact adjusting positions thereof corresponding to the desired precise adjusted positions of said controlling means to thereby prevent transmission of said excessive adjusting movements to said receiver means and enabling a definite precise adjustment of said controlling means, and, therefore, said receiver means, without necessitating a corresponding precise adjustment of said adjustable means.

5. A remote control arrangement according to claim 4 in which said first and second yielding means are formed by cylinder-piston arrangements including springs acting between the piston means and the cylinder means respectively of said cylinder-piston arrangements so as to continuously urge the same away from each other.

6. A remote control arrangement as set forth in claim 4 which includes a two-arm lever interposed between and operatively connected with said cylinder-piston arrangements.

7. A remote control arrangement according to

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claim 4 in which said stroke control means includes positively acting mechanical motion conveying means.

8. A remote control arrangement according to claim 4 in which said stroke control means includes electrically controlled motion conveying means.

9. A remote control arrangement according to claim 4 which includes power amplifier means interposed between said receiver means and said controlling means to thereby allow reduction of the controlling force to be conveyed from said transmitter means to said controlling means.

10. A remote control arrangement according to claim 4 in which each of said controlling means, receiver means, stroke control means, and first and second yielding means includes at least two separate members operable to act independently of each other in conveying and receiving said adjusting impulses produced by a common adjustable means.

11. A remote control arrangement according to claim 4 in which each of said controlling means, receiver means, and first yielding means includes at least two separate members operable to act independently of each other in conveying and receiving said adjusting impulses produced by a common adjustable means and conveyed by a distributing mechanism associated to a common second yielding means.

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