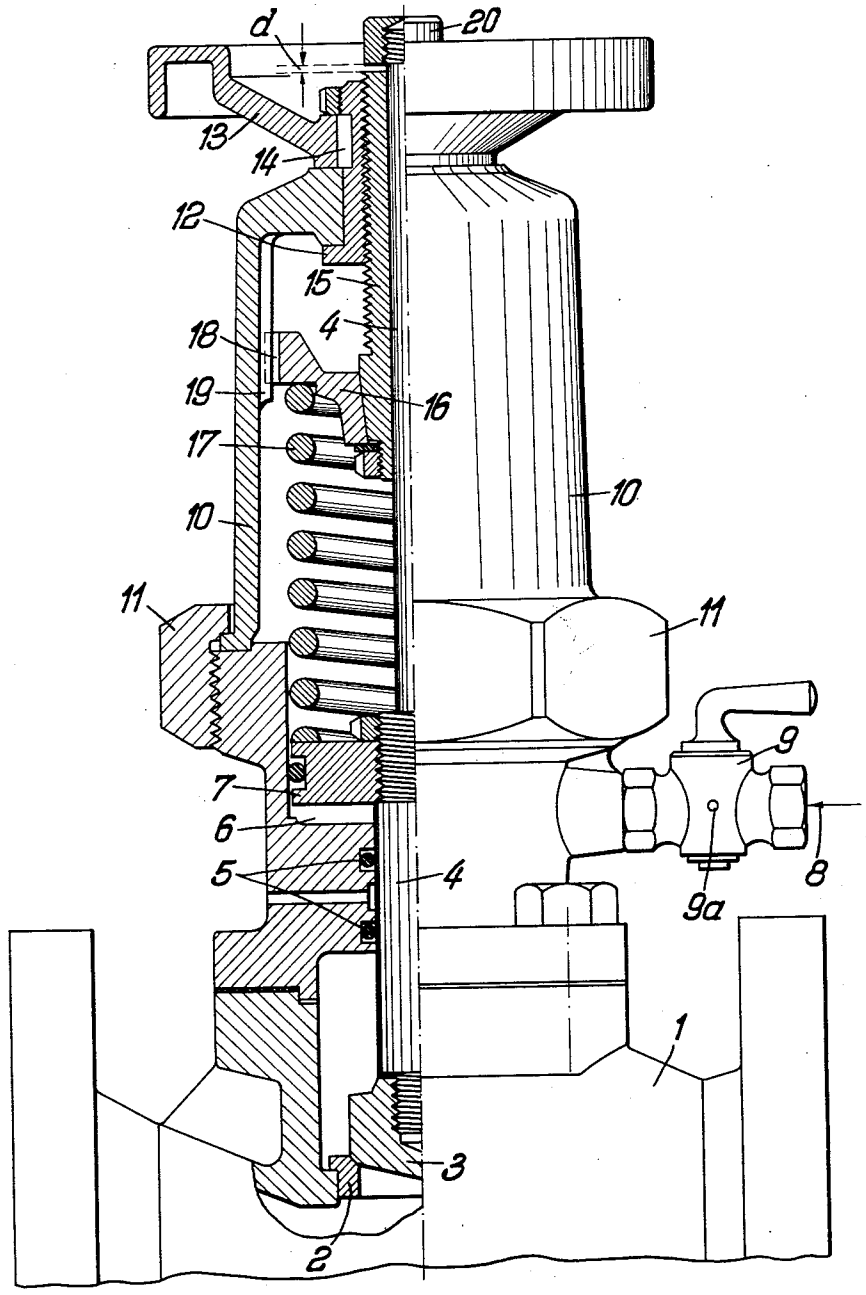
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REMOTE-CONTROL VALVE

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Inventor:

Elio R. Rossi

by: Michael S. Striker

Attorney

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REMOTE-CONTROL VALVE

Elio R. Rossi, Monthey, Switzerland, assignor to Ateliers de Constructions Metalliques et Mecaniques Giovanola Freres S.A., Monthey, Switzerland

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The present invention relates to a remote-control valve and more particularly to a valve equipped with a return spring.

In a commonly used type of remotely controllable valve, a movable closing element or valve head is actuated for movement in one direction by remotely controllable power such as compressed air, hydraulic fluid, or electricity and is made to return to the starting position by a spring when the remotely controllable actuating device is de-energized.

It is frequently desirable in valves of the afore-described type to provide manual emergency operating means for opening or closing the valve in the event of failure of the remotely controllable actuating means. It has been proposed to equip return-spring actuated valves with a spindle and hand wheel for respectively opening or closing the valve by moving the valve head against the restraint of the return spring. Such an arrangement, however, is of limited application. It is particularly inconvenient to use in large valves in which the power of the return spring is very substantial and the spring force increases rapidly, as the spring is compressed by the action of the hand-wheel-operated spindle.

An object of the invention is, therefore, to provide a return-spring activated valve having manual actuating means for movement of the valve head which does not involve compression of the spring during the manually operated movement.

It is another object of the invention to provide such a valve which is easy and reliable to operate.

Yet another object of the invention is the provision of a valve which is simple in structure and relatively maintenance-free.

A further object of the invention is the provision of such a valve which is inexpensive to manufacture.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawing in which:

The sole FIGURE illustrates a side elevation, partly in section, of a preferred embodiment of the invention.

In its more specific aspects, the invention contemplates the provision of a return-spring actuated valve with a spindle and hand wheel adapted to actuate the valve head in a direction opposite to the direction of movement actuated by the return spring, the spindle being connected with one of the abutments of the valve-actuating return spring, the other abutment being formed by a member connected to the valve head.

The spring abutment connected with the spindle is moved, therefore, together with the abutment connected to the valve head substantially without compression or expansion of the return spring when the valve head is manually actuated by the hand wheel in a direction contrary to the movement normally actuated by the return spring. The hand wheel not having to overcome the force of the spring is readily and easily movable.

According to a preferred feature of the invention, the hand-wheel actuated spindle is connected without play to one of the two elements enumerated above, namely the valve head and the spring abutment, in order to permit

spring-cushioned engagement of the valve head with the valve seat. The other element is connected to the spindle for common axial movement with a play preferably of the order of magnitude of a few millimeters. Until the spindle has moved through a distance corresponding to the play of one of the elements, the return spring holds the valve head in its spring-biased position. If the abutment of the return spring is connected to the spindle without play and the valve head is linked to the spindle with play, the return spring slightly expands or is slightly compressed during movement of the manually operated spindle through a distance corresponding to the play.

Referring now to the drawing, there is shown a side elevation, partially in section, of a preferred embodiment of a pneumatically controlled valve spring-biased towards the closed position, and actuated by compressed air for opening movement. The valve body **1** is provided with a horizontally arranged valve-seat ring **2** adapted for engagement with a vertically moving valve head **3**. The valve head is attached to a valve stem **4** which extends through a stuffing box **5** upward into a cylinder space **6** in which a piston **7** is fastened to stem **4**. The cylinder space **6** beneath the piston **7** is connected to a compressed air line **8** for operation in a well known manner. A stopcock **9** is arranged in compressed air line **8**. Stopcock **9** is provided with a lateral bore **9***a* and a three-way plug for connecting cylinder space **6** to the atmosphere while shutting off compressed air line **8**.

A bellshaped casing **10** is mounted coaxially on cylinder **6** and fastened thereto by a retaining nut **11**. A threaded bushing **12** is rotatably mounted in the top of bell-shaped casing **10** in axial alignment with stem **4**. The threaded bushing **12** is keyed to hand wheel **13** for common rotation by means of key **14**. A hollow spindle **15** engages the threaded central bore of bushing **12**. The abutment **16** of closing spring **17** is fixedly fastened to the lower end of spindle **15**. Radially extending elements **18** of abutment **16** are slidably guided between axial guiding ribs **19** on the tapering cylindrical walls of bell-shaped casing **10**. Engagement of elements **18** with ribs **19** permits axial movement of abutment **16** and of threaded spindle **15**, but prevents their rotation.

The lower end of spring **17** abuts against piston **7** and urges the latter together with the stem **4** and valve head **3** towards valve-seat ring **2**. The upper portion of valve stem **4** is slidably guided in the central bore of hollow spindle **15**. The upper end of stem **4** is threaded and a cap **20** is fastened thereon. Cap **20** serves as an external means for indicating the position of valve head **3** and also as an entraining element for connecting the valve head **3** by means of valve stem **4** with hollow spindle **15** when the spindle rises over a distance greater than the play *d* provided between the upper end of spindle **15** and the lower annular surface of cap **20** in the normal operating position of abutment **16**.

The valve illustrated is of the normally closed remotely controlled type. It is opened when air pressure is applied to the valve through line **8**. Such valves are commonly operated with compressed air having a gauge pressure of the order of magnitude of 60 pounds per square inch. Compressed air acting on the lower surface of piston **7** moves the piston upward against the pressure of closing spring **17**. When the pressure in line **8** is dropped to that of the atmosphere or to any pressure insufficient to overcome the force of the spring **17**, the spring returns the valve head to closed position.

In the event of failure of the remote control arrangement for any reason whatsoever, or whenever it is desired to control the valve manually, stopcock **9** is closed in such a manner that cylinder space **6** communicates with the atmosphere through lateral bore **9***a* in the stop-

cock. Spring **17** then either closes the valve, if it was open, or holds it in the closed position. When the hollow spindle **15** is raised by rotation of the threaded bushing **12** by means of hand wheel **13**, the abutment **16** of closing spring **17** starts moving upward.

During this initial upward movement of abutment **16** the spring is permited to expand slightly under its own tension. After a few turns, or possibly only one turn of hand wheel **13** depending on the pitch of the threads connecting bushing **12** and spindle **15**, the top of spindle **15** abuts from below against the lower annular surface of cap **20** on valve stem **4**. It is thereby coupled to valve head **3** for common movement in an axial direction. The abutment **16** then moves upward together with the piston **7** and valve head **3** without any further changes in the condition of spring **17**. The valve of the invention can, therefore, be manually opened without the need for overcoming any forces greater than those of friction inherent in the mechanism.

When it is desired to close the valve, piston **7** and abutment **16** with spring **17** fixedly held therebetween are moved downward by appropriate rotation of the hand wheel until valve head **3** engages valve-seat ring **2**. It is preferable to continue rotation of hand wheel **13** for approximately one turn in order to re-establish the play *d* between the lower surface of cap **20** and the upper end of spindle **15** and to engage the valve head **3** more firmly in valve-seat ring **2**. Since the spring is in its expanded position its force during this small downward movement of spindle **15** is overcome without serious difficulty. The increase in the force required to operate the wheel warns the valve operator that the closed position of the valve is reached.

While the invention has been illustrated by the example of a normally closed valve, that is, a valve in which the closing stroke of the valve head is spring-actuated while the opening stroke is actuated by remotely controlled means, it will be apparent to those skilled in the art that the device of the invention can be readily adapted to the operation of a normally open valve, that is, one in which the valve head is spring-biased towards the open position and is moved into the closed position by remotely controlled actuating means.

It should be understood, of course, that the foregoing disclosure relates to only a preferred embodiment of the invention and that it is intended to cover all changes and modifications of the example of the invention herein chosen for the purpose of the disclosure which do not constitute departures from the spirit and scope of the invention set forth in the appended claim.

What is claimed is:

A valve construction comprising, in combination, a valve housing formed with a valve seat; a valve member movable in axial direction with respect to the valve seat between a closed position in which said valve member engages said valve seat and an open position in which said valve member is spaced from said valve seat; a valve stem fixed to said valve member and projecting therefrom in axial direction beyond said housing; a cylinder mounted on said housing; a piston fixed to said valve stem and arranged in said cylinder for reciprocation; conduit means communicating with said cylinder for feeding pressure fluid thereinto at one side of said piston so as to move said piston and said valve member connected thereto in one direction; abutment means arranged coaxial with said valve stem spaced from said piston and comprising a hollow spindle having an outer threaded surface and an abutment member connected to said spindle for movement in axial direction therewith, said valve stem being slidably guided in said hollow spindle and projecting beyond the end of said spindle remote from said valve member; support means fixed to said valve housing and being formed with a bore extending in axial direction of said spindle and said spindle projecting through said bore; manually operable means mounted in said bore for rotation about the axis of said spindle and engaging said support means so as to be prevented from movement in axial direction, said manually operable means being formed with a screw thread engaging the threaded outer surface of said spindle so that upon turning of said manually operable means said spindle is moved in axial direction; means on said support means engaging said abutment member for preventing turning of said abutment member and said spindle during movement of said spindle in axial direction; spring means located between and abutting with opposite ends thereof respectively against said piston and said abutment member and tending to move said piston and the valve member connected thereto in a direction opposite to said one direction; and a shoulder member radially extending from said projecting portion of said valve stem for abutting engagement with said remote end of said valve spindle, whereby during movement of said spindle by said manually operable means in said one direction said piston with the valve member connected thereto and said abutment member will move jointly so that movement in this direction will not be impeded by the force of the spring, whereas movement of said spindle in the direction opposite to said one direction will result in compression of the spring assuring movement of said valve member in the other direction.

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