

Description

BACKGROUND

The present invention relates to an improved mechanism for connection to an actuator for a valve or a choke which can be operated mechanically to cause the reversal of the position of the valve member.

U. S. Patent No. 4,194,718 Baker et al is an example of the prior art of such override mechanisms as applied to a choke and which can be operated by a handwheel. It includes means for releasably connecting the manual operator to the gate to manually move the gate and for releasing the manual operator from the gate to allow such movement.

U. S. Patent No. 3,378,224 to Boyle discloses a gate valve which is piston actuated together with a handwheel having a sleeve threaded on the shaft which extends through the piston. Rotation of the handwheel causes movement of both the piston and the valve member.

U. S. Patent No. 4,189,980 discloses a manual control apparatus which has a split drive nut and a camming system which coacts with the rotation system for bringing the split drive nut into engagement with the threaded drive screw and rotating the split nut to move the drive screw and the valve member connected thereto.

U. S. Patent No. 3,628,397 discloses a valve member having a ball nut secured to the upper portion of the piston and a ball shaft secured to the top of the bonnet and mounted so that its rotation causes movement of the piston and valve member. During normal operation, movement of the piston will cause rotation of the ball shaft.

U. S. Patent No. 4,213,480 discloses an override mechanism for a valve in which a nut is threaded onto the drive stem and is engaged by a drive sleeve which telescopes onto the nut and splines connect the sleeve to the nut. Rotation of the sleeve rotates the nut which contacts one of the abutment surfaces and then causes movement of the gate.

An object of the present invention is to provide an improved override mechanism for a valve which is easy to operate.

According to the present invention there is provided a valve comprising a body having an inlet, an outlet, a valve chamber in communication with the inlet and the outlet, a valve member positioned in said valve chamber for moving therein to open and close flow between said inlet and said outlet, an actuator having a moving portion and a non-moving portion, a stem connecting from said valve member to said moving portion of said actuator, means for preventing rotation of the moving portion of said actuator and driving means connected to the outer end of said stem for rotating said stem, characterised in that the stem has

a portion which extends through the moving portion, the connection between said stem and said moving portion of said actuator is a threaded connection, and the stem portion is arranged such that it can move axially with the moving portion or be rotated in relation thereto by operation of said driving means, the arrangement being such that rotation of said stem within said moving portion of said actuator causes axial movement of said stem and said valve member with said moving portion remaining in its axial position.

The invention will be described now by way of example only, with particular reference to the accompanying drawings. In the drawings:

FIGURE 1 is an axial sectional view of an override mechanism in accordance with the present invention which is in one position.

FIGURE 2 is another axial sectional view of the override mechanism shown in FIGURE 1 but with the mechanism in its opposite position to illustrate the axial movement which may be imparted to a valve member when the mechanism is operated independently of the actuator.

FIGURE 3 is a sectional view of the anti-rotation pins used to prevent rotation of the actuator piston responsive to rotation of the stem.

FIGURE 4 is a sectional view of the anti-rotation pins between the drive sleeve surrounding the override stem and such stem.

FIGURE 5 is a sectional view of a valve having the override mechanism attached to and controlling the operation of the valve stem.

DESCRIPTION OF THE PREFERRED EMBODIMENT

An override mechanism 10 is shown in FIGURES 1 and 2 in its two extreme positions. The components thereof are described with respect to their position as shown in FIGURE 1 initially and then their change of position is described with respect to FIGURE 2. Mechanism 10 includes actuator 12, override stem 14, mechanism driving means 16 and lower head 18 on which actuator is mounted and which includes internal threads 20 for connecting to a valve 22 as hereinafter described with respect to FIGURE 5.

Actuator 12 is shown to be a pressure responsive actuator but may be any other type of actuator such as a mechanical, electrical or other suitable type of actuator. Actuator 12 includes cylinder sleeve 24 which is suitably secured and sealed to the lower head 18, lower annular spring plate 26, inner sleeve 28, upper annular spring plate 30, springs 32 and 34, piston 36 and upper head seal member 38 which is threaded into and sealed within the upper interior of sleeve 24. Port 39 extends through sleeve 24 into the annular space between the upper surface of piston 36 and the lower surface of head 38. Lower annular spring plate 26 is supported within sleeve 24 by snap ring 40

which is positioned within groove 42 on the interior of sleeve 24. The interior of inner sleeve 28 includes inward projection 44 forming upwardly facing shoulder 46. Upper annular spring plate 30 abuts against the lower end of piston 36 so that the force of springs 32 and 34 are exerted thereon to bias piston toward its upper position. Piston 36 includes annular upwardly extending sleeve 48 which includes internal threads 50 which are in engagement with threads 52 on the exterior of override stem 14. Anti-rotation pins 54 are secured partially within external axially extending slots 56 on sleeve 48 by snap ring 58 and partially within axially extending slots 60 on the interior of upper head seal member 38 to prevent rotation of piston 36 with the rotation of override stem 14. The relationship of pins 54 with respect to sleeve 48 and member 38 is best seen in FIGURE 3.

Override stem 14 includes threads 52 which engage within threads 50 on the interior of piston sleeve 48, upper axially extending slots 62, lower downwardly facing shoulder 64 and lower threads 66 which engage valve member coupler 68. Valve member coupler 68 includes lower transverse slot 70 in which a circular T-shaped projection 72 of valve member stem 74 engages to provide the connection between override stem 14 and valve member stem 74. Projection 72 and valve member stem 74 are seen in FIGURE 5.

Mechanical driving means 16 includes driving member 76 having outer solid portion 78 on which suitable engaging means 80, such as a hex nut is engaged, and sleeve portion 82 which includes inner slots 84 in which anti-rotation pins 86 are positioned and held therein by snap ring 88 and upper stop surface 90 formed by solid portion 78 within sleeve portion 82. A handwheel or a remote operated vehicle is slipped into engagement with engaging means 80 and then driving means 16 is rotated. With reference to the outer end of stem 14, and presuming right hand thread engagement between stem 14 and piston sleeve 48, a counter clockwise rotation will cause stem 14 to thread upwardly through piston sleeve 48 to move valve member of valve 22 to its upper or other position without any movement of piston 36. This movement is stopped by the engagement of the outer end of stem 14 with stop surface 90. If the movement of stem 14 is clockwise, then it will thread downwardly through piston sleeve 48 until stem shoulder 64 comes into engagement with inner sleeve shoulder 46. Cap 92 is threaded onto the outer end of upper head seal member 38 and has outer inwardly extending flange which closely surrounds the exterior of sleeve portion 82 of driving means 16. Suitable bearing means 94 is provided between the interior of cap 92 and outwardly facing shoulder 96 on sleeve portion 82 of driving means 16. Skirt 98 is secured to head member 38 by threaded pins 100 and extends outwardly in surrounding relationship to driving means 16 for protection thereof but spaced sufficiently radially outward

from engaging means 80 to allow reasonable engagement thereof by a handwheel hub or a remotely operated tool (not shown).

Valve 22 includes body 102 having ports 104 and 106 defining the inlet and outlet of valve 22 and communicating with valve chamber 108 in which valve member of gate 110 is positioned between suitable sealing bushings 112 for movement so that its port 114 either registers with ports 104 and 106 to allow flow through valve 22 or is out or registry with ports 104 and 106 so that is blocked by valve 22. Bonnet 116 is secured to body 102 and threads into threads 20 on the interior of lower head 18. Valve member stem 74 is secured to gate 110 and includes T-shaped projection 72 which engages within slot 70 in valve coupler member 68.

During normal operations, actuator 12 functions responsive to pressure fluid and spring force to move gate 110 to its desired position at all times. If at any time actuator 12 fails to function properly a handwheel or a suitable tool of a remote operated vehicle (for underwater applications) can be engaged with engaging means 80 and then the proper rotation of driving means 16 will rotate override stem 14 to cause gate 110 to move within valve body 102 to its desired position. The engagement of the outer end of stem 14 with stop surface 90 provides the indication that gate 110 has completed its movement in one direction and the engagement of stem shoulder 64 with shoulder 46 on inner sleeve 28 provides the indication that gate 110 has completed its movement in the opposite direction. It is noted that this mechanism is easy to operate and provides a positive movement of the valve member even under conditions in which the actuator piston has become locked in its position. This mechanism is easy to operate under water as a diver can readily attach a handwheel and rotate it to change the valve position or an ROV may engage and operate the mechanism easily and quickly.

Claims

1. A valve (22) comprising a body (102) having an inlet (104), an outlet (106), a valve chamber (108) in communication with the inlet (104) and the outlet (106), a valve member (110) positioned in said valve chamber (108) for moving therein to open and close flow between said inlet (104) and said outlet (106), an actuator (12) having a moving portion (36) and a non-moving portion (24, 38), a stem (14, 74) connecting from said valve member (110) to said moving portion (36) of said actuator (12), means (54) for preventing rotation of the moving portion (36) of said actuator (12) and driving means (80) connected to the outer end of said stem (14, 74) for rotating said stem (14, 74), characterised in that the stem has a portion (74) which



which is positioned within groove 42 on the interior of sleeve 24. The interior of inner sleeve 28 includes inward projection 44 forming upwardly facing shoulder 46. Upper annular spring plate 30 abuts against the lower end of piston 36 so that the force of springs 32 and 34 are exerted thereon to bias piston toward its upper position. Piston 36 includes annular upwardly extending sleeve 48 which includes internal threads 50 which are in engagement with threads 52 on the exterior of override stem 14. Anti-rotation pins 54 are secured partially within external axially extending slots 56 on sleeve 48 by snap ring 58 and partially within axially extending slots 60 on the interior of upper head seal member 38 to prevent rotation of piston 36 with the rotation of override stem 14. The relationship of pins 54 with respect to sleeve 48 and member 38 is best seen in FIGURE 3.

Override stem 14 includes threads 52 which engage within threads 50 on the interior of piston sleeve 48, upper axially extending slots 62, lower downwardly facing shoulder 64 and lower threads 66 which engage valve member coupler 68. Valve member coupler 68 includes lower transverse slot 70 in which a circular T-shaped projection 72 of valve member stem 74 engages to provide the connection between override stem 14 and valve member stem 74. Projection 72 and valve member stem 74 are seen in FIGURE 5.

Mechanical driving means 16 includes driving member 76 having outer solid portion 78 on which suitable engaging means 80, such as a hex nut is engaged, and sleeve portion 82 which includes inner slots 84 in which anti-rotation pins 86 are positioned and held therein by snap ring 88 and upper stop surface 90 formed by solid portion 78 within sleeve portion 82. A handwheel or a remote operated vehicle is slipped into engagement with engaging means 80 and then driving means 16 is rotated. With reference to the outer end of stem 14, and presuming right hand thread engagement between stem 14 and piston sleeve 48, a counter clockwise rotation will cause stem 14 to thread upwardly through piston sleeve 48 to move valve member of valve 22 to its upper or other position without any movement of piston 36. This movement is stopped by the engagement of the outer end of stem 14 with stop surface 90. If the movement of stem is clockwise, then it will thread downwardly through piston sleeve 48 until stem shoulder 64 comes into engagement with inner sleeve shoulder 46. Cap 92 is threaded onto the outer end of upper head seal member 38 and has outer inwardly extending flange which closely surrounds the exterior of sleeve portion 82 of driving means 16. Suitable bearing means 94 is provided between the interior of cap 92 and outwardly facing shoulder 96 on sleeve portion 82 of driving means 16. Skirt 98 is secured to head member 38 by threaded pins 100 and extends outwardly in surrounding relationship to driving means 16 for protection thereof but spaced sufficiently radially outward

from engaging means 80 to allow reasonable engagement thereof by a handwheel hub or a remotely operated tool (not shown).

Valve 22 includes body 102 having ports 104 and 106 defining the inlet and outlet of valve 22 and communicating with valve chamber 108 in which valve member of gate 110 is positioned between suitable sealing bushings 112 for movement so that its port 114 either registers with ports 104 and 106 to allow flow through valve 22 or is out or registry with ports 104 and 106 so that is blocked by valve 22. Bonnet 116 is secured to body 102 and threads into threads 20 on the interior of lower head 18. Valve member stem 74 is secured to gate 110 and includes T-shaped projection 72 which engages within slot 70 in valve coupler member 68.

During normal operations, actuator 12 functions responsive to pressure fluid and spring force to move gate 110 to its desired position at all times. If at any time actuator 12 fails to function properly a handwheel or a suitable tool of a remote operated vehicle (for underwater applications) can be engaged with engaging means 80 and then the proper rotation of driving means 16 will rotate override stem 14 to cause gate 110 to move within valve body 102 to its desired position. The engagement of the outer end of stem 14 with stop surface 90 provides the indication that gate 110 has completed its movement in one direction and the engagement of stem shoulder 64 with shoulder 46 on inner sleeve 28 provides the indication that gate 110 has completed its movement in the opposite direction. It is noted that this mechanism is easy to operate and provides a positive movement of the valve member even under conditions in which the actuator piston has become locked in its position. This mechanism is easy to operate under water as a diver can readily attach a handwheel and rotate it to change the valve position or an ROV may engage and operate the mechanism easily and quickly.

Claims

1. A valve (22) comprising a body (102) having an inlet (104), an outlet (106), a valve chamber (108) in communication with the inlet (104) and the outlet (106), a valve member (110) positioned in said valve chamber (108) for moving therein to open and close flow between said inlet (104) and said outlet (106), an actuator (12) having a moving portion (36) and a non-moving portion (24, 38), a stem (14, 74) connecting from said valve member (110) to said moving portion (36) of said actuator (12), means (54) for preventing rotation of the moving portion (36) of said actuator (12) and driving means (80) connected to the outer end of said stem (14, 74) for rotating said stem (14, 74), characterised in that the stem has a portion (74) which



extends through the moving portion (36), the connection between said stem (14, 74) and said moving portion (36) of said actuator (12) is a threaded connection (50, 52), and the stem portion (74) is arranged such that it can move axially with the moving portion (36) or be rotated in relation thereto by operation of said driving means (80), the arrangement being such that rotation of said stem (14, 74) within said moving portion (36) of said actuator (12) causes axial movement of said stem (14, 74) and said valve member (110) with said moving portion (36) remaining in its axial position.

2. A valve (22) according to claim 1, wherein said rotation preventing means (54) includes facing slots (56, 60) in said moving portion (36) and said non-moving portion (24, 38) of said actuator (12), and a pin (54) positioned partially in each of the slots (56) of said moving portion (36) and partially in the facing slots (60) of said non-moving portion (24, 38) to allow axial movement of said moving portion (36) and prevent rotation of said moving portion (36) of said actuator (12).
3. A valve (22) according to claim 1, wherein said actuator (12) is a pressure responsive actuator and said moving portion (36) is a piston (36) through which said stem (14, 74) is threaded.
4. A valve (22) according to claim 3, including stop means (46, 64, 90) limiting the axial movement of said stem responsive to rotation thereof.
5. A valve according to claim 4 wherein said stop means (46, 64, 90) includes a shoulder (64) on said stem (14, 74), an internal shoulder (46) on said actuator (12), and said stem shoulder (64) adapted to engage said internal actuator shoulder (46) at the desired end of its axial movement responsive to rotation in one direction, a stop surface (90) on said driving means (80), means (98) connecting said driving means (80) to said non-moving portion (24, 38) of said actuator (12), the end of said stem (14, 74) engaging said stop surface (90) on said driving means (80) at the desired end of its axial movement responsive to rotation in the second direction.

Patentansprüche

1. Ventil (22) mit einem Ventilkörper (102) mit einem Einlaß (104), einem Auslaß (106), einer Ventilkammer (108), die mit dem Einlaß (104) und dem Auslaß (106) in Verbindung steht, einem Ventilbauteil (110) in der Ventilkammer (108) zur Bewegung darin, um eine Strömungsverbindung zwischen dem Einlaß (104) und dem Auslaß (106) zu

öffnen und zu schließen, einem Betätigungsorgan (12) mit einem Bewegungsabschnitt (36) und einem nicht-Bewegungsabschnitt (24, 38), einer Stange (14, 74), die das Ventilbauteil (110) mit dem Bewegungsabschnitt (36) des Betätigungsorgans (12) verbindet, einer Einrichtung (54) zur Verhinderung einer Drehung des Bewegungsabschnitts (36) des Betätigungsorgans (12) und einer Antriebseinrichtung (80), die mit dem äußeren Ende der Stange (14, 74) zur Drehung der Stange (14, 74) verbunden ist,

dadurch gekennzeichnet,

daß die Stange einen Abschnitt (74) hat, der sich durch den Bewegungsabschnitt (36) erstreckt, daß die Verbindung zwischen der Stange (14, 74) und dem Bewegungsabschnitt (36) des Betätigungsorgans (12) eine geschraubte Verbindung (50, 52) ist, und daß der Stangenabschnitt (74) so angeordnet ist, daß er axial mit dem Bewegungsabschnitt (36) bewegbar oder im Verhältnis zu diesem durch Betätigung der Antriebseinrichtung (80) gedreht wird, wobei die Anordnung so ist, daß die Drehung der Stange (14, 74) in dem Bewegungsabschnitt (36) des Betätigungsorgans (12) eine axiale Bewegung der Stange (14, 74) und des Ventilbauteils (110) hervorruft, wobei der Bewegungsabschnitt (36) in seiner axialen Position verbleibt.

2. Ventil (22) nach Anspruch 1, wobei die Rotationsverhinderungseinrichtung (54) gegenüberliegende Schlitz (56, 60) in dem Bewegungsabschnitt (36) und dem nicht-Bewegungsabschnitt (24, 38) des Betätigungsorgans (12) und einen Stift (54) aufweist, der teilweise in jedem der Schlitz (56) des Bewegungsabschnitts (36) und teilweise in den zugewandten Schlitz (60) des nicht-Bewegungsabschnitts (24, 38) positioniert ist, um eine axiale Bewegung des Bewegungsabschnitts (36) zuzulassen und eine Drehung des Bewegungsabschnitts (36) des Betätigungsorgans (12) zu verhindern.
3. Ventil (22) nach Anspruch 1, wobei das Betätigungsorgan (12) ein auf Druck ansprechendes Betätigungsorgan ist und wobei der Bewegungsabschnitt (36) ein Kolben (36) ist, durch den die Stange (14, 74) geschraubt ist.
4. Ventil (22) nach Anspruch 3, mit einer Anschlagvorrichtung (46, 64, 90), die die axiale Bewegung der Stange bei deren Drehung beschränkt.
5. Ventil nach Anspruch 4, wobei die Anschlagvorrichtung (46, 64, 90) eine Schulter (64) an der Stange (14, 74), eine innere Schulter (46) an dem Betätigungsorgan (12), wobei die Stangenschulter (64) an der inneren Betätigungsorganschulter



(46) an dem gewünschten Ende der axialen Bewegung entsprechend der Drehung in einer Richtung anliegen kann, und eine Anschlagfläche (90) an der Antriebseinrichtung (80) aufweist, wobei eine Einrichtung (98) die Antriebseinrichtung (80) mit dem nicht-Bewegungsabschnitt (24, 38) des Betätigungsorgans (12) verbindet und das Ende der Stange (14, 174) an der Anschlagfläche (90) an der Antriebseinrichtung (80) an dem gewünschten Ende der axialen Bewegung entsprechend der Drehung in der zweiten Richtung anliegt.

Revendications

1. Vanne (22) comprenant un corps (102) présentant une entrée (104), une sortie (106), une chambre de vanne (108) communiquant avec l'entrée (104) et la sortie (106), un obturateur (110) disposé mobile dans la chambre de vanne (108) pour établir et couper l'écoulement entre l'entrée (104) et la sortie (106), un actionneur (12) comportant une partie mobile (36) et une partie non mobile (24, 38), une tige (14, 74) reliant l'obturateur (110) à la partie mobile (36) de l'actionneur (12), un moyen (54) pour empêcher la rotation de la partie mobile (36) de l'actionneur (12) et un dispositif d'entraînement (80) relié à l'extrémité extérieure de la tige (14, 74) et servant à tourner cette tige (14, 74), caractérisée en ce que la tige possède une portion (74) qui s'étend à travers la partie mobile (36), la liaison entre la tige (14, 74) et cette partie mobile (36) de l'actionneur (112) est une liaison filetée (50, 52) et ladite portion de tige (74) est agencée de manière qu'elle puisse se déplacer axialement avec la partie mobile (36) ou puisse être tournée par rapport à celle-ci par la commande du dispositif d'entraînement (80), l'agencement étant tel que la rotation de la tige (14, 74) dans la partie mobile (36) de l'actionneur (12) provoque le mouvement axial de la tige (14, 74) et de l'obturateur (110) pendant que la partie mobile (36) conserve sa position axiale.
2. Vanne (22) selon la revendication 1, dans laquelle le moyen (54) pour empêcher la rotation comporte des rainures (56, 60) qui se font face dans la partie mobile (36) et la partie non mobile (24, 38) de l'actionneur (12), ainsi qu'une cheville (54) disposée partiellement dans chacune des rainures (56) de la partie mobile (36) et partiellement dans les rainures (60) situées en regard d'elles de la partie non mobile (24, 38), afin de permettre le déplacement axial de la partie mobile (36) tout en empêchant la rotation de cette partie mobile (36) de l'actionneur (12).
3. Vanne (22) selon la revendication 1, dans laquelle l'actionneur (12) est un vérin actionné par un fluide de pression et la partie mobile (36) est un piston à travers duquel est vissée la tige (14, 74).
4. Vanne (22) selon la revendication 3, comportant des moyens de butée (46, 64, 90) pour limiter le mouvement axial de la tige sous l'effet de sa rotation.
5. Vanne selon la revendication 4, dans laquelle les moyens de butée (46, 64, 90) comprennent un épaulement (64) sur la tige (14, 74), un épaulement interne (46) sur l'actionneur (12), l'épaulement (64) de la tige étant conçu pour venir s'appliquer contre l'épaulement interne (46) de l'actionneur à la fin désirée du mouvement axial de la tige par suite de sa rotation dans un sens, une face de butée (90) prévue sur le dispositif d'entraînement (80) et un moyen (98) reliant le dispositif d'entraînement (80) à la partie non mobile (24, 38) de l'actionneur (12), l'extrémité de la tige (14, 74) s'appliquant contre ladite face de butée (90) prévue sur le dispositif d'entraînement (80) à la fin désirée du mouvement axial de la tige par suite de sa rotation dans le deuxième sens.