A valve arrangement which is especially designed for district heating systems and can be laid in the ground comprises a valve (1) which should be possible to open and close by rotary movements. The bonnet (11) of the valve body and the valve stem (8) have connections (13, 15-17) which are located above the insulation (18), as is the stuffing box (14). The valve is combined with a bonnet extension (20) and a stem extension (21) which can be attached via the connections and which form a pressure-free upper part. The valve is thereby given a structural height such that it can be actuated and its position indicated at the plane (36) of the ground by means (22) at the upper end of the pressure-free part.
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A Valve Arrangement for District Heating Systems

The present invention relates to a valve arrangement for district heating systems and the like wherein pipelines with valves mounted in them and surrounded by insulation are laid in the ground, and where it should be possible to manoeuvre the valves from ground level between a closed and an open position by a rotary movement through a certain angle.

In such heating systems where valves, together with surrounding insulation, are laid in the ground there has existed the hitherto unsolved problem of how to arrange devices which are required for manoeuvring the valves so that the insulation work on the valve, which is carried out on site, can be effected irrespective of and before the said valve devices are finally mounted, which often requires individual adaptation of the overall structural height of the valve to the actual ground level.

Previously, there has been no alternative but to design district heating valves which are to be laid in the ground in one of the two following ways: A conventional valve with a standardised short structural height is mounted in the pipeline, while at the same time a specially adapted extension unit it fitted on the bonnet of the valve body so that manoeuvre shall be able to be effected from the imaginary level in the future shaft above the valve. Only after this can the insulating material which is to surround the valve body and the lower part of the extension unit on all sides be applied. Adjustment of the overall structural height of the valve at a later stage of the work, due to changed site conditions, for example, cannot be effected without the insulation being opened up or a difficult operation being carried out on the extension unit.

An alternative known arrangement is afforded in that a valve manufacturer keeps valves available in an embodiment with an extended
valve body bonnet. To the overall structural height this provides the customer has to adapt the level of the actuating devices relative to the ground, and possibly also the depth of the district heating pipeline. If this adaptation is not possible due to the nature of the ground or other local conditions it is necessary to have the valve "tailor-made" in the factory, since it is obviously not feasible to modify the structural height of the valve after the pipeline with the valve has already been laid on the site. In this alternative again, therefore, the final preparation of the actual pipeline with its insulation is dependent on other work at the site.

Another disadvantage which is inherent in the first alternative mounting method is that the stem seals or stuffing boxes which are, of course, located at the top of the bonnet of the valve body and are covered over during the insulation work, cannot be checked later during operation unless the upper part of the insulation is removed. Since with this alternative mounting method a leaking stuffing box can cause irreparable damage to the valve body, the poor inspection facility counts heavily against this alternative. If the other embodiment of the valve is selected instead, where the spindle seal is located in the non-insulated part of the extra long bonnet of the valve body, problems arise for the valve manufacturer both of holding a stock of valve body parts or complete valves with a wide selection of structural heights so as to be able to meet the varying demands from the installation firms, and also of providing the flexibility desired by the latter, allowing them to adapt a finished valve from stock without the risk of jeopardising the technical characteristics as verified by the manufacturer, when there is an unforeseen change in the installation work.

It is the object of the present invention to set aside disadvantages of this kind, and to provide an improved valve arrangement for district heating systems which itself provides the flexibility required in the installation.

These objects are achieved with the present invention, which is characterised by the combination of a valve body comprising a bonnet under
over-pressure from the medium in the valve body and extending at an angle relative to the pipeline, pointing upwards when the valve is mounted therein, its upper end being widened out in a radial direction to form an upwardly facing connecting element, the length of the bonnet being such that the connecting element is located above the insulation;

a valve stem, which extends through the bonnet, in the wall of which there is means for mounting the stem rotatably and sealing it against the over-pressure in the bonnet, and which has a coupling end projecting upwards from the connecting element;

a bonnet extension which is formed at its lower end to a downwards facing connecting element which fits against the connecting element of the bonnet and by means of which the bonnet extension can be fixed in a specific rotary position on the bonnet so that the valve body is provided with a part extending in a line with the bonnet and upwards towards ground level, which part is non-rotatable and is not under over-pressure from the medium;

a stem extension which is designed to be connected to the coupling end of the stem so that the stem extension extends upwards concentrically with the stem, through the bonnet extension and out through the upper end thereof, where the stem extension is guided;

means for restricting the rotation of the stem to the said angle;

and means on the stem extension and the bonnet extension for actuating the valve and indicating its position.

The invention will be explained in more detail below with reference to the accompanying drawing. Figure 1 shows, partly in section, the valve arrangement according to the invention after its installation in a district heating pipeline. Figure 2 is a longitudinal section which shows the structure of the valve in more detail. Figures 3 and 4 show the arrangement in a cross-section and in a view from above along the lines III-III and IV-IV, in Figure 2, respectively.

Ball valves are the type of shut-off valves which are most frequently used in district heating systems and the embodiment example shown on the drawing is therefore based on a valve of this type.
However, this does not mean that the invention cannot also be applied to the closely-related butterfly valves or to other types of valves which, incorporated in pipelines, can be laid in the ground and can be adapted to being opened and closed from ground level by rotary movement through a specific angle.

The valve 1 which is shown in an embodiment for welding has a valve body 2 composed of a central casing part 3 with two end-pieces 4 inserted therein which each have a seating ring 5 mounted in their inner ends, while the outer ends are used in the welding of the valve into the pipe 6 appertaining to a district heating system. A spherical valve member 7 is disposed in a conventional manner so that it can rotate through 1/4 of a revolution towards and away from the open position shown in Figure 2, in order to control the flow through the pipeline, in conjunction with the valve seats 5. For this purpose, the valve member is connected to a stem 8, the inner end of which is non-circular and is fitted in a corresponding cut-out in the valve member. The spindle is rotatably mounted by means of two concentric sleeves or guideways 10 disposed spaced apart in the direction of the axis of rotation 9 and forming part of a bonnet 11 extending perpendicularly upwards from the casing part 3. The upper end 12 of the bonnet is widened out in the radial direction to form an upwardly facing connecting flange or a similar connecting element 13. The stem is sealed here outwardly against the medium pressure in the bonnet of the valve body by means of a few O-rings 14 made of rubber or the like, which are held in place in a known way by support rings (not shown) which can be released from above if the sealing rings need to be changed.

The stem 8 extends some way beyond the bonnet 11, forming a coupling end 15 which is located above the connecting element 13 and is cylindrical in the example; it may be equipped for actuation purposes with a coupling pin 16 which passes through the stem, or alternatively a keyway or so-called splines. A pin 17 is driven into the connecting element 13 from above to form a stop to restrict the actuation movement.
The valve described here may be mass-produced by the manufacturer and after assembly and operating tests it can be held in stock as a basic embodiment specially designed for district heating systems. This differs from valves for other purposes in that the bonnet 11 is longer, which is advantageous in view of the insulation of the valve. As Figure 1 shows the end 12 of the bonnet is actually located outside the insulating material which is applied round the valve body 2 and the pipe 6, in prefabricated halves or in tubular form, for example. Even if it should be desired to place supplementary insulation round the bonnet 11 of the valve body, the upwardly facing connecting element 13 and the coupling end 15 on the stem will be accessible even after the insulation work, and it is also possible to check the functioning of the stuffing box or sealing rings 14 easily. A leak from the inside of the valve past the stem 8 will not be hidden by the insulation and the risk for external corrosion damage to the material of the valve body is eliminated thereby.

In order to be able to manoeuvre and indicate the position of valves in the pipeline system from a point at ground level or in a shaft dug down into the ground when the pipeline system has been covered with earth after insulation, this method of installation is now more usual than laying in culverts with special descent holes at the points where the valves are positioned—the valve in the above-described basic embodiment is combined, according to the characteristic features of the invention, with a bonnet extension 20, a stem extension 21 which is rotatable therein, and means 22 at the top of the bonnet and stem extensions for actuating and indicating.

As can most clearly be seen in Figure 2, the bonnet extension 21 comprises a tubular part 23 which is formed at the bottom to a downwards facing connecting element 24 which fits against the connecting element 13 on the bonnet 11 and which consists in the embodiment example shown of a counter-flange 24 welded onto the tubular part 23. The bonnet extension 21 can be fixed on the bonnet 11 by means of bolts 42 or other fixing devices on the said connecting element, in one distinct position determined, for example, by guide pins 41, so that the extension is
given a specific rotational position relative to the valve body and its seats while at the same time it is concentric with the axis of rotation of the valve body bonnet.

The bonnet extension terminates at the top in a head part 25 which is firmly welded onto the tubular part 23 and bears a disc 26 for indicating the position and which belongs to the said means 22. For this purpose the disc may be provided with markings at specific angular locations, exemplified in the Figure by the letters "S" and "Ö" which give an indication of the position, shut or open respectively, in which the valve is located.

At least at its lower end, the stem extension 21 consists of a tube or sleeve 27 which can be threaded on the coupling end 15 of the stem with a good fit, and can then be fastened thereon with the pin 16 or some other rotary-movement transmitting element. In addition, welded on at the lower end there is a plate 28 which has a recess of a certain depth in one quadrant, such that the fixed pin 17 which projects up from the flange 13 on the valve bonnet is accommodated in the recess when the valve stem 8 and the stem extension 21 are joined together, and at the same time, via the abutment surfaces 29 and 30 which are designed to be engaged in either direction by the pin, the recess limits the rotary movement of the valve stem 8 and therefore defines the shut and open positions of the valve. Welded in at the upper end of the sleeve 27 there is a short shaft 31 which should be guided in the head part 25, preferably by a bush or ring 32 pressed into the latter, and which is terminated at the top by a hexagonal head 33. On the latter there is an indicator needle 34 with a non-circular hole which is adapted to the hexagonal head and which is held thereon by a circlip 35 or similar, so that the indicator needle follows the rotary movement when the stem extension 21 is rotated and consequently, together with the fixed position markings on the disc 26, shows how the valve is being manoeuvred.

Since it must of course be possible to determine the position of the valve after installation unequivocally, solely with the aid of the indicating means described above, when the arrangement is assembled it must
be ensured that the indicator needle 34 moves from the "S" position into the "O" position when the valve is manoeuvred into its open position either directly via the hexagon on the spindle extension or by means of an actuator applied thereto, this end position being felt by the operator as the contact of the pin 17 against the surface 29 (see Figures 4 and 3).

It should be observed that the space in the bonnet extension 20 around the stem extension 21 is not sealed outwardly by any sealing element in the gap around the shaft 31, but the space should not be pressurised so that this gap, or a drainage hole provided for the purpose, will give "tell-tale" evidence during a subsequent inspection from above if the stuffing box 14 is not leak-tight.

When the valve according to the present invention is being laid in the ground the further advantage relating to the installation process is obtained that the overall structural height can be adapted flexibly and easily to the conditions which prevail at the working site. Due to the simplicity of the construction and the absence of stem sealing in the bonnet extension it is of course possible for the installation team to carry out this adaptation themselves. For this they can select the length which the tubular part 23 and the sleeve 27 need to have so that after assembly with the connecting element 24, the head part 25 and the plate 28 (which will preferably be obtainable from the valve manufacturer), and after the two extension parts are mounted on the bonnet 11 of the valve body and the valve stem 8 respectively, the actuation and indicating means 22 for the valve will come at the intended level relative to the plane 36 of the ground. This work by the installation team can naturally be facilitated if the tubular part and the sleeve are manufactured and stocked in certain very frequently occurring module lengths.

After the valve has been assembled, before back-filling with earth or similar filling material 37 is carried out, protection should be fitted around the upper parts of the valve in the form of a plastic tube 38 extending upwards from the insulation 18 as shown in Figure 1. Even if the shaft has a cement cover 39 it is preferable for the tube to be closed off with a protective cover 40 which screws onto it.
Claims

1. A valve arrangement for district heating systems and the like wherein pipelines with valves mounted in them and surrounded by insulation are laid in the ground, and where it should be possible to manoeuvre the valves from ground level between a closed and an open position by a rotary movement through a certain angle, characterised by the combination of a valve body (2) comprising a bonnet (11) under over-pressure from the medium in the valve body and extending at an angle relative to the pipeline, pointing upwards when the valve (1) is mounted therein, its upper end (12) being widened out in a radial direction to form an upwardly facing connecting element (13), the length of the bonnet being such that the connecting element is located above the insulation (18); a valve stem (8) which extends through the bonnet, in the wall of which there is means (10, 14) for mounting the stem rotatably and sealing it against the over-pressure in the bonnet, and which has a coupling end (15) projecting upwards from the connecting element (13); a bonnet extension (20) which is formed at its lower end to a downwards facing connecting element (24) which fits against the connecting element (13) of the bonnet and by means of which the bonnet extension can be fixed in a specific rotary position on the bonnet so that the valve body is provided with a part extending in a line with the bonnet and upwards towards ground level, which part is non-rotatable and is not under over-pressure from the medium; a stem extension (21) which is designed to be connected to the coupling end (15) of the stem so that the stem extension extends upwards concentrically with the stem, through the neck extension (20) and out through the upper end (25) thereof, where the stem extension is guided; means (17, 28-30) for restricting the rotation of the stem to the said angle, and means (22) on the stem extension (21) and the bonnet extension (20) for actuating the valve and indicating its position.
INTERNATIONAL SEARCH REPORT

International Application No PCT/SEB3/00132

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) *

According to International Patent Classification (IPC) or to both National Classification and IPC

F 16 K 31/44, 27/08

II. FIELDS SEARCHED

Minimum Documentation Searched *

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Documentation Search other than Minimum Documentation to the Extent that such Documents are Included in the Fields Search*

SE, NO, DK, FI classes as above

III. DOCUMENTS CONSIDERED TO BE RELEVANT 16

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<td>US, A, 2 827 914 (ALTERS) 25 March 1958</td>
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IV. CERTIFICATION

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Sven-Erik Bergdahl

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