

The present invention relates to a water closet having flush cistern and an automatic cleaning apparatus functionally coupled to the inflow of the flush cistern, for cleaning and disinfecting the rotatably mounted toilet seat which is also automatically rotated during the inflow and cleaning phase in the peripheral direction by at least 360° and which passes the cleaning apparatus over its entire periphery, the cleaning apparatus extending over a segment of the annular seat and having members for supplying water and/or disinfectant liquid acting predominantly on the upper side of the toilet seat and for drying.

Such a water closet is described and illustrated in EP-A-0 035 962. A segment of the seat is surrounded by a transporting and cleaning body. Nozzles for the water and disinfectant cleaning are provided in this body, including a wiper for drying off the seat surface. The said body surrounds the seat also in the rest position. The rotation of the seat, required for cleaning, is achieved by means of a water driving wheel, the inflow of the flush water being used for driving. The seat is mounted between at least one support roller and at least one driving roller, which is arranged below the seat.

This apparatus is functional but has the disadvantage that the transporting and cleaning body surrounds the rear segment of the toilet seat even in the rest state, which impedes use of the water closet and is shown to be unhygienic.

The present invention has the object of providing an apparatus for automatic cleaning of a seat of a water closet, which does not have the disadvantages of the known apparatus and which leaves the entire surface of the seat free of cleaning parts and parts driving the latter when not in the cleaning phase, that is to say in the rest position.

This object is achieved in a water closet of the type mentioned at the outset, in that the said members are incorporated in a displaceable common sliding housing which is permanently connected to a preferably rear part (compare reference numeral 16) of the water closet remote from the user, and which adopts a position behind or away from the toilet seat

when not in the cleaning phase, and in that furthermore adjustment members are provided to automatically shift the sliding housing out of its rest position over the toilet seat upper side at the start of the cleaning phase, again coupled with the flush cistern inflow.

The main advantage of this new apparatus resides in the fact that the entire seat surface is free in the rest and use phase, and in that the sliding housing is only placed on a preferably rear segment of the seat, remote from the user, in the cleaning phase, and this is done automatically, with the subsequent measures for cleaning and drying also being carried out automatically, including the return of the sliding housing into its rest position. Here, the automatic functioning of the cleaning apparatus and its members, including its displacement into the cleaning phase, is preferably carried out on the basis of an electrical control with corresponding control members. The electrical energy required for this is preferably generated by means of the inflow water streaming into the flush cistern under pressure after the flush, that is to say during the cleaning phase, during which the inflow water acts on a turbine which in turn drives a small current generator.

In the simplest case, the seat is only rotated by 360° , during which it is sprayed, where appropriate wetted and at the same time dried with at least one wiper. It is also possible to rotate the seat by 360° twice, spraying or wetting with the liquids taking place during the first rotation and drying off during the second rotation. This is in particular advantageous in most countries, where the seat has an oval shape. Circular seats are increasingly being used, for example in the U.S.A. In this case, of course, the rotation does not have to be only by 360° because the rest position can be anywhere. For example, a rotation by 400° could be provided, the place on the surface of the seat which is most under load then being moved during a plurality of rotations in the peripheral direction of the seat. In this case, for example, spraying and wetting with the liquids could take place during the rotation by 360° , only drying off being operative during the remaining 40° . Thus, the possibility

of the zero position below the sliding housing becoming wetter than the other parts is prevented. An air stream may also be used for drying.

Furthermore, it is advantageous if, during the movement of the sliding housing forwards, at least one valve for spraying the water and/or the disinfectant liquid is opened by means of at least one movable part and is kept in the open state for the front working position. This technical solution has the advantage that one or two valves are actuated automatically and mechanically by the movement of the sliding housing, for example by means of parallel pivot arms which carry the sliding housing.

In accordance with a further development, the sliding housing and the seat are driven by means of electric motors. This solution is very economical, because in this case no complicated mechanical gearing systems are required, the necessary electric motors being mass produced, and thus also making this solution economical.

It is advantageous if the electrical energy for driving the electric motors and a control electronics unit is gained by means of a turbine driven by means of the water flowing into the flush water reservoir after the opening of a valve of a floating body, and that a current generator is mechanically driven by this turbine. This further development has several advantages. No external energy is required, for example from the mains supply, although of course it is possible, as mentioned above, to use this source directly without the said turbine and the said power generator, especially in the case of new installations and when a low-voltage source is already present for other reasons. A further advantage is to be seen in the fact that the function of the turbine and thus of the current generator is directly connected in the first instance to the re-filling of the flush water reservoir and that the kinetic flushing energy of the flush water is thus not reduced.

It is particularly advantageous if individual operating stages are instigated manually by means of a lever of the flush water reservoir and are further automatically controlled by the control electronics unit. In this way, cleaning is only put into

operation when the lever of the flush water reservoir is pressed manually, that is to say when the water closet is no longer being used. Instigation of the operating stages is thus also not dependent on removing the load from the seat, although additional safety measures are provided for this.

In accordance with a variant, the valves for piping the cleaning water and/or the disinfectant liquid are also controlled by the control electronics unit. This variant can replace the solution already described above, in which the valves are controlled mechanically by at least one movable part. It is for the constructor to decide which of the solutions described is used.

In addition, it is advantageous if the control electronics unit is supplied with information about the position of the seat by means of a contact arrangement. Advantageously, two contact pairs are used which give a signal regarding the position of the seat. They supply information to the electronics unit as to whether the seat is under load or has already been lifted free without load. Most toilet seats are not circular but constructed to be elliptical at least in their internal diameter. With this shape of seat, it is also important whether the seat is in the so-called zero position, that is to say the narrow parts of the seat are at front and back, after its peripheral movement. Thus, the safety of the process is increased and the possible injury of the user, particularly a child, prevented.

To dry off the seat, the seat is wiped by at least one radially extending wiper and at least one wiper extending in the peripheral direction of the seat during the rotational movement of the seat and the reverse movement of the sliding housing. It has been shown that, considering that only a small quantity is sufficient for moistening the seat surface and a quick-drying liquid can be used as the disinfectant liquid, a radially extending wiper is sufficient to adequately dry the surface of the seat.

It is advantageous if the wiper extending in the peripheral direction of the seat is secured to a tilt lever which is held in the upper inactive position by means of a solenoid and is

lowered onto the seat on the backward movement of the sliding housing and wipes the seat. Thus, the result is that the wiper is only lowered shortly before the backward movement of the sliding housing and that it then dries off well with adequate pressure any line of moisture remaining on the surface of the seat.

In accordance with another variant, the surface of the seat is dried by means of an air stream. This variant is particularly favourable in connection with already existing hygienic apparatus on toilets which already have an air stream or hot-air stream source.

Advantageously, the apparatus for carrying out the process is constructed such that the sliding housing is set slidably on guide rails and is drawn outwards by means of a helical spring. This construction makes it possible for the apparatus also to be usable with elliptical shapes of the seat without problems.

Advantageously, the sliding housing is provided with support rollers. These support rollers have vertical axes and support by means of their peripheral surfaces the inner profile of the seat. Thus, the sliding housing also follows this profile, with the sliding housing being drawn outwards by means of the helical spring, as mentioned above, and thus contact of the support rollers with the seat ensured.

The source of disinfectant liquid is constructed as a container in which the disinfectant liquid is under gas pressure. Here, of course, one of the known environmentally friendly propellants can be used, or the container can be closed by means of a pump valve known per se which guarantees sufficient air pressure above the disinfectant liquid during the cleaning, in a manner known per se. It is also possible for the liquid outflow to reach the places to be disinfected at a given time, through a difference in level as a result of gravitational force.

In order to facilitate rotation of the seat during cleaning, the seat is set on steel balls which are rotatably inserted in a compressible resilient ring. By this simple means, the seat can be rotated in the peripheral direction with a small force in the unloaded state of the seat, while in the loaded state the

seat bears against hard parts which prevent the possibility of rotation through the force of friction.

In accordance with an advantageous further development, arranged on the sliding housing is a wetting member which contains a sponge inlay which is provided with a fabric inlay and is intended for wetting the seat with the disinfectant liquid. This solution is particularly suitable for quick-drying disinfectant liquids, the desired surface of the seat being well wetted by means of the disinfectant liquid.

The electrical circuit is advantageously constructed such that the electric motor for driving the sliding housing is connected to the energy source via an advance logic unit, a reverse logic unit and via two power stages. In this manner, both the advance and the reverse movement are controlled methodically.

It is advantageous if the power stages contain sub-stages for full power and sub-stages for reduced power of the electric motor. In this manner, the motor is supplied by the correct energy, that is to say not too much and not too little, so that on the one hand the correct and error-free movement of the sliding housing is ensured and on the other hand the movement is controlled by only the minimum amount of power in order that no injuries may be caused, particularly with children.

In accordance with a favourable embodiment, the at least one electric motor for driving the seat is connected to the energy source via a control logic unit and an amplifier stage. This measure too ensures only the necessary supply of energy.

In accordance with an advantageous further development, the electrical circuit contains two memories which register the position of the safety switches and the information from the time function element. The safety switches give a signal regarding the position of the seat and prevent the possibility of an incorrect actuation of the cleaning arrangement.

It is advantageous if an end position monitoring switch contains three functional units of which the first unit is connected to the advance logic unit, the first memory and to a time function element, the second unit is connected to the

reverse logic unit and finally the third unit is connected on the one hand to the control logic unit for the electric motors turning the seat and on the other hand via a time function element and an amplifier stage to a solenoid. The three functional units advantageously monitor the three different movements, that is to say the advance and reverse movement of the sliding housing and the rotation of the seat.

The invention is described in more detail with reference to the drawings. Like functional parts are given like reference numerals in all drawings.

In the drawings:

Fig. 1 shows a perspective view of the apparatus according to the invention, having a partially sectional illustration in the rear region,

Fig. 2 shows a section through the seat with its base layer and its driving means,

Fig. 3 shows a perspective view of the sliding housing with support rollers in partially sectional illustration,

Fig. 4 shows a section through the sliding housing of Fig. 3, with cleaning nozzles and further additional parts from Fig. 1,

Fig. 5 shows a diagrammatic overview in which the individual operating stages I-XI of the cleaning process are illustrated,

Fig. 6 shows a variant of a sliding housing developed further from Fig. 3, having a wetting member for disinfection,

Fig. 7 shows a section through the sliding housing of Fig. 4, additionally with an electromagnetically controlled wiper for the radial direction,

Fig. 8 shows a longitudinal section through the wetting member from Fig. 6, with the wetted seat in section,

Fig. 8a shows the same section through the wetting member but in its rear rest position which prevents drying out,

Fig. 9 shows details of the electromagnetically controlled wiper for the radial direction, in accordance with Fig. 7,

Fig. 10 shows the simplified circuit diagram of the electrical control of the overall apparatus, and

Fig. 11 shows a time-dependent graph of the apparatus in

practice.

Figure 1 illustrates a flush water reservoir 1 in partial section, provided with a lever 2 and a cover 3. In the interior of the flush water reservoir 1 is a flush valve 4 (known per se) which is connected by means of a lever 5 to the manually actuatable lever 2 of the flush water reservoir 1. In the interior of the flush water reservoir 1 is a floating body 6 which is connected by means of a lever 6' to the valve 7. The valve 7 is connected to a water supply line 8 which is fixed in the wall of the flush water reservoir 1 by means of a nut 9. Connected upstream of the valve 7 of the floating body 6 is a line 10 of the cleaning water, so that the latter is always under water pressure. A water turbine 11 is connected by means of a supply line to the valve 7. This supply line 12 and the water turbine 11 are used for re-filling of the flush water reservoir 1. A current generator 13, in this example a low-voltage d.c. generator, is mechanically connected to the water turbine 11 by means of a shaft 14. A flush water line 15 is connected to the flush valve 4 and is used for the flushing (known per se). A carrier plate 16 is arranged in the horizontal position below the flush water reservoir 1. Secured to this carrier plate 16 is, among other things, the control electronics unit 17 in a housing. Parallel pivot arms 18 are driven by an electric motor 19 and are rotatably mounted in a holder 20. The external ends of the parallel pivot arms 18 carry a frame 21 in which one end of a helical spring 22 is secured. A container 23 with a disinfectant liquid is also secured on the carrier plate 16. This container is provided with a closure 24, which may also be constructed as a pump valve, so that no propellant is required for the container 23. A pair of guide rails 25 is connected with high stability to the frame 21. A sliding housing 26 is guided along these guide rails 25. The seat is given the reference numeral 27. A protective housing 28 is arranged on the carrier plate 16 and the driving and braking elements of the seat 27, which will be described below, are located in this protective housing 28. Two electric motors 29 are intended for driving the seat 27. The seat 27 moves during cleaning in the direction R. The electric

motors 29 are provided with toothed wheels 30 which engage in a toothed track 31 which is circular and made in the lower surface of the seat 27. Below the seat 27 is a pan 32 (known per se). It goes without saying that the components illustrated, such as the control electronics unit 16, the pivot arms 18, the frame 21 and the helical spring 22 including the container 23, are covered by a housing (not shown) in order to prevent any damage through vandalism or injury to curious users.

The section shown in Figure 2, through part of the seat 27 and the electric motor 29, shows in more detail the driving and fixing of the seat 27. This seat 27 has a seat extension 27' and an annular contact strip 27". Similarly, the protective housing 28 is provided with contact strips 28', which correspond to the contact strips 27" of the seat 27 and, when the seat 27 is in the loaded position, are in mutual contact and prevent the possibility of rotation of the seat 27. Figure 2 shows the seat in an unloaded state, that is to say that the said contact strips 27" and 28' are not touching. The seat 27 was raised by a resilient ring 34 which is in turn supported on a rubber ring 35. In order to facilitate rotation of the seat, a plurality of steel balls 36 are provided which are held in a bearing ring 37. The electric motor 29 has a resilient base layer 33 which makes it possible to incline the axis of the electric motor 29 when the seat 27 is under load. This measure is necessary because the seat 27 is driven with the toothed wheel 30 of the electric motor 29 via the toothed track 31 in the lower surface of the seat 27. Between the seat extension 27' and the bearing 40 in the lower part of the protective housing 28 are arranged two diagrammatically illustrated switches 38, 39, in the open state for example the upper switch 38 signalling the unloaded position of the seat 27 and the lower switch 39 the tilted-up position of the seat 27.

In accordance with Figure 3, the line 41 for disinfectant liquid is provided with a valve 43 and the line 10 for cleaning water is provided with a valve 42. The guide rails 25 are held in rollers 44, arranged in pairs. The rollers 44 are rotatably mounted on shafts 45, these shafts being secured in side walls

of the sliding housing. A nozzle body 46 is intended for spraying the water, and another nozzle body 47 is intended for spraying the disinfectant liquid. A wiper 48 is held in a carrier 49 connected to the sliding housing 26. This mechanical wiper 48 may also be replaced by a drying air stream or hot-air stream. This further possibility is advantageous if an air stream or hot-air stream source is already present for another hygienic apparatus in the toilet. A wiper 48' (Fig. 4) running in the perpendicular direction with respect to the wiper 48 is also secured in the sliding housing and serves for wiping during the reverse movement of the sliding housing 26 into the rest position. In the lower part of the sliding housing 26 are secured support rollers 50 which have vertical axes and which come into contact with the inner edge of this seat 27 during rotational movement thereof. The shafts of the support rollers 50 are given the reference numeral 51.

Figure 4 shows a section through the apparatus according to the invention, in the region of the cleaning means. A contact plate 52 is inserted in a rear parallel pivot arm 18 and presses down a control pin 53 during the cleaning phase and thus opens the valve 43 of the disinfectant liquid. The other valve 42 for the cleaning water is not visible in this section. The parallel pivot arms 18 are mounted on arbors 54. Two nozzles 55 from which two liquid jets 56 spray are arranged in the nozzle body 47 for spraying the liquid.

With reference to Figure 5, the mode of function of the apparatus will now be described precisely as individual operating stages I to XI of the process. In Figure 5, the individual parts are provided with the same reference numerals as were already indicated above. Only an off-flow 57 from the pan 32 is drawn in in addition to these.

Stage I The lever 2 of the flush water reservoir 1 is used to open the flush valve 4 and the water flows through the flush water line 15 into the pan 32 and away through the off-flow 57.

- Stage II The flush water reservoir 1 empties and the floating body 6 sinks downwards.
- Stage III With this, the lever 6' of the floating body 6 opens the valve 7 and the water begins to flow into the flush water reservoir 1.
- Stage IV The water flows through the supply line 12 and the turbine 11, which drives the low-voltage d.c. generator via the shaft 14.
- Stage V The low-voltage d.c. generator 13 supplies current for the control electronics unit 17.
- Stage VI The contact pairs 38, 39 supply the control electronics unit 17 with information on the position of the seat.
- Stage VII The control electronics unit 17 processes the information from Stage VI and switches the electric motors 19, 29 on.
- Stage VIII The electric motor 19 moves the sliding housing 26 over part of the seat 27.
- Stage IX Thereupon, the valves 42, 43 are also actuated with the sliding housing and the water and/or the disinfectant liquid spray onto the surface of the seat 27.
- Stage X The control electronics unit 17 switches the electric motor 29 on, and this drives the seat 27 in the rotational direction R (cf. Fig. 1). During the rotational movement of the seat 27 the wiper 48 is also operative and dries the surface of the seat 27.

Stage XI

After the seat 27 has been turned through 360° during cleaning, the control electronics unit 17 withdraws the sliding housing 26 backwards away from the seat 27, the last part of the seat surface being dried off by the second wiper 48'. At the same time, both valves 42, 43 for water and disinfectant liquid are also closed and the cleaning cycle comes to an end.

The throughflow profiles and water quantities are dimensioned such that the water still streams through the valve 7 and thus also the turbine 11 even when the cleaning cycle has already ended. However, this does not mean that the cleaning cycle begins again automatically. Time-lag members which prevent this are incorporated in the control electronics unit.

The above-mentioned operating stages relate to the example shown in the drawings and can also be made otherwise within the scope of the invention. The sliding housing 26 can also be guided in a rocking guide instead of by parallel pivot arms 18. In the example shown, the parallel pivot arms 18, the holder 20 and the frame 21 form two parallelograms so that the sliding housing 26 is moved in the same horizontal position and in an arc-shaped path. The rocker guide which may be used can, in contrast to this, specify any path for movement of the sliding housing 26. Instead of the mechanical control of the valves 42, 43, the electrical control already mentioned above can also be used. Similarly, it is possible for the second wiper 48' extending in the peripheral direction of the seat 27 not to be connected to the sliding housing 26 but to a separate tiltable resilient carrier. It is also possible to use only one nozzle 55, which is then supplied with water which is mixed with a disinfectant.

A preferred exemplary embodiment of a variant of a further development of the apparatus according to the invention is described below. Like functional parts are again designated by like reference numerals.

In accordance with Fig. 6, the sliding housing has certain

peculiarities by comparison with that in Fig. 3. This housing slides on two round guide rails 25' in similar cylinders. The cleaning water is again controlled via a valve 42 on the line 10. The line 41 for disinfectant liquid has no valve, is constructed as an overflow line and connected to the container 23, which this time is not under pressure and which contains the disinfectant liquid. In the front part, facing the seat, a first and a second wiper 48, 48' for the peripheral direction of the seat are located below the cover of the sliding housing 26. These wipers are in turn connected to carriers, the second carrier 49' being extended downwards and additionally carrying a support roller 50'. This support roller 50 is placed on a shaft 51' supported on both sides and secured in the manner of a support to a carrier 51". In the rear part of the sliding housing 26 is a wetting member 70 which replaces the spraying apparatus for the disinfectant liquid (Figs. 3 and 4). This wetting member is supplied by the container 23 not under pressure when the wetting member 70 is on a lower level than the liquid level in the container 23, that is to say in the cleaning and disinfecting position of the sliding housing 26.

The remaining mechanical arrangement of the sliding housing 26 corresponds to the solution of Fig. 3. Return of the sliding housing to the rest position is again performed by a helical spring 22.

In the sectional illustration of Fig. 7 the other details can be seen, for example the nozzle body 47 for spraying the cleaning water by means of two nozzles 55 from which two liquid jets are sprayed.

In accordance with Figs. 7 and 9, an electromagnet 60 with a solenoid (SOL) (not shown in these figures) is in the sliding housing 26 at the front, this solenoid being controlled by the electronic circuitry of Fig. 10. The armature 61 of the electromagnet 60 holds in the rest position a lever 62 which is mounted on one side and in which it engages in a bore 64 of its angled piece 63. At the end of the cleaning process, the solenoid (SOL) is briefly triggered so that the armature 61 withdraws and the lever 62 tips downwards as a result of gravity,

about the axis of rotation 65. At the end of the angled piece 63 is arranged in this case a wiper 48" which bears on the seat and which, during the backwards movement of the sliding housing 26 brought about by the spring 22, wipes off the water line caused by the wipers (for the peripheral direction).

The lever 62 is arranged in the sliding housing 26 such that, in the rest position of the housing 26, it is mechanically returned to its starting position with the armature 61 latched in. This mode of functioning can easily be seen from Fig. 9, where the lever 62 with angled piece 63, its bore 64 and the wiper 48" are illustrated by dotted lines in their position tipped downwards.

The wetting member 70 (Figs. 6, 8, 8a) comprises a slightly U-shaped profile 71 of sheet metal in which a sponge inlay 72 is inserted which is provided with disinfectant liquid, in the appropriate position, through the line 41. This sponge inlay 72 moistens a fabric layer 73 of coarse synthetic cloth which substantially surrounds the seat 27 and disinfects the latter. On the edge, the fabric layer 73 is provided with two tension means 74 comprising a rubber band, so that a form-fitting layer is guaranteed in the case of a corresponding contact pressure around the seat 27. Fig. 8a shows the wetting member 70 in its rear rest position, where it is pressed onto an elevation 32' of the pan 32 and thus drying out of the sponge inlay is substantially restricted.

The fabric layer 73 can very easily be removed from the U-shaped profile 71 with its two tension means 74; it is merely pressed in, so that in the course of normal toilet cleaning work, the latter can be replaced in the simplest manner.

With reference to Figs. 10 and 11, the mode of functioning of an electrical circuit for controlling the described apparatus is explained in detail.

In the block circuit diagram of the electronic control unit of Fig. 10, the output of the low-voltage d.c. generator 13 is connected via a filter F to an initiating current circuit INIT. The output thereof is on the one hand connected to two memories M_1 , M_2 and on the other hand to a time function element T_1

whereof the output is in turn connected to the memory M_2 . A respective output of the memories M_1 , M_2 is guided to an advance logic unit LA which controls the electric motor 19 such that the sliding housing 26 is moved forwards, that is to say in the direction of the seat 27. The output of the memory M_1 is further guided to a reverse logic unit LR which moves the electric motor 19 in the opposite direction, that is to say away from the seat 27. The outputs of the advance and reverse logic units LA, LR are connected via a time function element T_4 to two power stages TRA and TRV respectively, via which the generator 13 for selectively triggering the electric motor 19 is switchable in one direction of rotation or the other. The two power stages TRV and TRA each contain two sub-stages TR_1 , TR_2 and TR_3 , TR_4 respectively. On activation of the stages TR_1 and TR_3 , full power is supplied to the electric motor 19, while on activation of the stages TR_2 and TR_4 a reduced power is supplied.

An end position monitoring switch contains three functional units, of which the first unit FCA is connected to the advance logic unit LA, the memory M_1 and to a time function element T_2 , the second unit FCR is connected to the reverse logic unit LR and finally the third unit FCL is connected on the one hand to the control logic unit LE for the electric motors 29 turning the seat 27 and on the other hand via a time function element T_3 and an amplifier stage TR_5 to a normal winding (solenoid) SOL. Between the control logic unit LE and the electric motors 29 there is arranged a further amplifier stage TRL. The control logic unit LE is connected on the input side in addition to the time function element T_2 , the memories M_1 , M_2 , the switching circuit containing the two switches 38, 39 and is connected on the output side to the advance and reverse logic units LA, LR. Moreover, the output of the time function element T_3 is connected to the reverse logic unit LR.

The switching circuit containing the two switches 38, 39 is connected to the two memories M_1 , M_2 and to the reverse logic unit LR and the control logic unit LE.

The mode of functioning of this control unit in cooperation with the apparatus described with reference to Figs. 1 to 4 is

as follows.

When the lever 2 of the flush water reservoir 1 is actuated, the valve 4 is opened and the water flows through the flush water line 15 into the pan 32. During this, the floating body 6 sinks downwards, as a result of which the valve 7 is opened via the lever 6'. On this, water flows through the supply line 12 to the turbine 11 and drives the latter. Consequently, the low-voltage d.c. generator 13 generates a voltage in accordance with the very top of Fig. 11. This figure shows further voltage curves within the arrangement which are interesting in this context and which occur in normal operation, the same reference numerals as in Fig. 10 having been used.

When the control process is instigated, the time function elements T_1 and T_4 are set in operation. The electric motor 19, via the amplifier stage TR_1 , is made to bring the sliding housing 26 into the operating position, above the seat 27. A fraction of a second after the start of this process, the function FCR (monitoring of movement of the sliding housing 26 in the reverse direction) is instigated. Once the time function element T_4 has run, the sliding housing 26 lies directly over the seat 27, whereupon a reduced power is supplied to the electric motor 19 via the amplifier stage TR_2 and a resistor R_1 , so that the sliding housing 26 is placed on the seat 27 and the sliding housing 26 moves further inwards as gently as possible. This reduced power of the motor 19 is maintained during rotation of the seat 27 too in order to press the wiper 48 continuously onto the seat 27 with a particular force. As soon as the sliding housing 26 has reached its operating position above the seat 27, the function FCA (monitoring of movement of the sliding housing 26 in the forward direction) is inactivated, which brings about setting of the time function element T_2 , whereupon rotation of the seat 27 is instigated. At the same time, via the control logic unit LE and the amplifier stage TRL, the two electric motors 29 are made to turn the seat 27 through 360 degrees. Once rotation has ended, the previously switched on monitoring function FCL is reset again, whereupon the motors 29 are switched off and the time function element T_3 is set. While the time

function element T_3 is running, the voltage at the generator 13 may increase to a value which causes the winding SOL to release the lever 62 of the wiper 48". This happens at the end of the time interval T_3 via the amplifier stage TR_5 . Then, the polarity of the voltage supplied to the motor 19 is reversed and the sliding housing 26 - as described above for the movement into the operating position - is returned to its rest position again at two different speeds, with corresponding triggering of the power stage TRA by the time function element T_4 . Once the rest position has been reached, the function FCR is reset and triggering of the motor 19 prevented. The process described can only begin again when the generator 13 has been set in operation again after standstill by actuating the lever 2.

If, at the point in time of instigating the control process by the circuit arrangement shown in Fig. 10, at least one of the two switches 38 and 39 (Fig. 2) is open, the control process cannot begin. However, if the switches 38, 39 close before the time span T_1 has expired, the process runs normally.

If one of the two switches 38, 39 opens after the control process has already begun, the following modified sequences are provided.

If one of the two switches 38, 39 opens while the sliding housing 26 is moving in the direction of the seat 27 but before the rotational movement of the seat 27 has been instigated, then the sliding housing 26 is brought back into its rest position. If one of the two switches 38, 39 opens before the time function element T_1 has run, the above-mentioned processes proceed as described; if, on the other hand, one of the two switches 38, 39 opens only after the time function element T_1 has run, then the cleaning process for this phase of filling the flush water reservoir 1 is prevented, since the time required for cleaning is no longer sufficient.

If one of the two switches 38, 39 is opened during the rotational movement of the seat 27, the rotational movement is aborted and the sliding housing 26 returns to the rest position. If one of the two switches 38, 39 opens while the sliding housing 26 is moving back into its rest position, this has no influence

on this reverse movement. If a voltage drop occurs during the sequence described, then this is interrupted and only completed once the lever 2 has been actuated again.

The apparatus according to the invention is suitable both for new installations and for adaptation of existing water closets. The turbine drive of the low-voltage d.c. generator 13 is an advantageous solution independent of the mains supply. As indicated above, if a low-voltage source is present the latter can be used to drive the control electronics unit 17 and the electric motors 19, 29 and thus fulfil all possible safety requirements.

The subject of the invention represents an important advance in social hygiene without resulting in pollution of the environment.

Claims

1. Water closet having flush cistern (1) and an automatic cleaning apparatus (26) functionally coupled to the inflow of the flush cistern, for cleaning and disinfecting the rotatably mounted toilet seat (27) which is also automatically rotated during the inflow and cleaning phase in the peripheral direction by at least 360° and which passes the cleaning apparatus (26) over its entire periphery, the cleaning apparatus (26) extending over a segment of the annular seat (27) and having members (48, 55, 70) for supplying water and/or disinfectant liquid acting predominantly on the upper side of the toilet seat (27) and for drying, characterized in that the said members (48, 55, 70) are incorporated in a displaceable common sliding housing (26) which is permanently connected to a preferably rear part (compare reference numeral 16) of the water closet remote from the user, and which adopts a position behind or away from the toilet seat (27) when not in the cleaning phase, and in that furthermore adjustment members (18) are provided to automatically shift the sliding housing (26) out of its rest position over the toilet seat upper side at the start of the cleaning phase, again coupled with the flush cistern inflow.
2. Water closet according to Claim 1, characterized in that the members (including 18, 48, 55, 70) required for the automatic displacement and functioning of the cleaning apparatus (26) are operated electrically.
3. Water closet according to Claim 1 or 2, characterized in that the sliding housing (26) is mounted to be approximately horizontally pivotal and, like the seat (27), is movable by means of electric motors (19, 29).
4. Water closet according to one of Claims 1 to 3, characterized in that the electrical energy for operating the motors (19, 29), a control electronics unit (17) and where appropriate further members for carrying out the cleaning phase is gained by means of a turbine (11) coupled to a current generator (13) and driven by means of the water flowing into the flush cistern (1) after the opening of a valve (7) as a floating



body (6).

5. Water closet according to one of Claims 1 to 4, characterized in that individual operating stages (I to XI) are instigated manually by means of a lever (2) of the flush water reservoir (1) or flush cistern and are further automatically controlled by the control electronics unit (17).

6. Water closet according to one of Claims 1 to 5, characterized in that the valves (42, 43) for piping the cleaning water and/or the disinfectant liquid are also controlled by a control electronics unit (17) and are opened during the cleaning phase.

7. Water closet according to one of Claims 1 to 6, characterized in that the control electronics unit (17) is supplied with information about the position of the seat (27) by means of a contact arrangement (38, 39).

8. Water closet according to one of Claims 1 to 7, characterized in that the cleaning apparatus (26) is equipped with at least one radially extending wiper (48) and at least one wiper (48") extending in the peripheral direction of the seat (27) which are active during the rotational movement of the seat (27) and the reverse movement of the sliding housing (26).

9. Water closet according to one of Claims 1 to 8, characterized in that the wiper (48") extending in the peripheral direction of the seat (27) is secured to a tilt lever (62) which is held in the upper inactive position by means of a solenoid (SOL, 60) and is lowered onto the seat (27) on the backward movement of the sliding housing (26) for the purposes of wiping.

10. Water closet according to one of Claims 1 to 9, characterized in that the cleaning apparatus (26) has means in order to dry the upper surface of the seat (27) by means of an air stream.

11. Water closet according to one of Claims 1 to 10, characterized in that the sliding housing (26) is set slidably on guide rails (25) and is provided with a flat coil spring (22) for return to the rest position.

12. Water closet according to one of Claims 1 to 11, characterized in that the sliding housing (26) is provided with



support rollers (50).

13. Water closet according to one of Claims 1 to 12, characterized in that the source of the disinfectant liquid is constructed as a container (29) in which the disinfectant liquid is under gas pressure.

14. Water closet according to one of Claims 1 to 13, characterized in that the seat (27) is set on steel balls (36) which are rotatably inserted in a compressible resilient ring (34).

15. Water closet according to one of Claims 1 to 14, characterized in that arranged on the sliding housing (26) is a wetting member (70) which contains a sponge inlay (72) which is provided with a fabric inlay (73) and is intended for wetting the seat (27) with the disinfectant liquid.

16. Water closet according to one of Claims 2 to 15, characterized in that the electric motor (19) for driving the sliding housing (26) is connected to the energy source (13) via an advance logic unit (LA), a reverse logic unit (LR) and via two power stages (TRV, TRA).

17. Water closet according to Claim 16, characterized in that the power stages (TRV, TRA) contain sub-stages (TR_1 , TR_3) for full power and sub-stages (TR_2 , TR_4) for reduced power of the electric motor (19).

18. Water closet according to one of Claims 2 to 15, characterized in that the at least one electric motor (29) for driving the seat (27) is connected to the energy source (13) via a control logic unit (LE) and an amplifier stage (TR_L).

19. Water closet according to Claim 16 and 17, characterized in that the control electronics unit contains two memories (M_1 , M_2) which register the position of the safety switches (38, 39) and the information from the time function element (T_1).

20. Water closet according to Claim 19, characterized in that an end position monitoring switch contains three functional units (FCA, FCR, FCL) of which the first unit (FCA) is connected to the advance logic unit (LA), the first memory (M_1) and to a time function element (T_2), the second unit (FCR) is connected to the reverse logic unit and finally the third unit (FCL) is connected



on the one hand to the control logic unit (LE) for the electric motors (29) turning the seat (27) and on the other hand via a time function element (T_3) and an amplifier stage (TRS) to a solenoid (SOL, 60).



* C L M S *

List of Reference Numerals

1	=	Flush water reservoir
2	=	Lever of the flush water reservoir 1
3	=	Cover of the flush water reservoir 1
4	=	Flush valve
5	=	Lever of the flush valve 4
6	=	Floating body
6'	=	Lever of the floating body 6
7	=	Valve of the floating body 6
8	=	Water supply line
9	=	Nut
10	=	Line for cleaning water
11	=	Water turbine
12	=	Supply line to water turbine 11
13	=	Current generator; low-voltage d.c. generator
14	=	Shaft of the low-voltage d.c. generator 13
15	=	Flush water line
16	=	Carrier plate
17	=	Control electronics unit, in a housing
18	=	Parallel pivot arms
19	=	Electric motor for driving the parallel pivot arms
20	=	Holder of the parallel pivot arms 18
21	=	Frame
22	=	Helical spring
23	=	Container with a disinfectant liquid
24	=	Closure of the container 23
25	=	Guide rails (flat)
25'	=	Guide rails (round)
26	=	Sliding housing
27	=	Seat
R	=	Direction of rotation of the seat 27
27'	=	Seat extension
27"	=	Contact strip of the seat 27
28	=	Protective housing
28'	=	Contact strip of the protective housing 28
29	=	Electric motor for driving the seat 27



30	=	Toothed wheels
31	=	Toothed track
32	=	Pan
32'	=	Elevation
33	=	Resilient base layer of the electric motor 29
34	=	Resilient ring
35	=	Rubber ring
36	=	Steel ball
37	=	Bearing ring of the steel ball 36
38	=	First switch
39	=	Second switch
40	=	Bearing of the contact pairs 38, 39
41	=	Line for disinfectant liquid from the container 23
42	=	Valve of the line 10 for cleaning water
43	=	Valve of the line 41 for disinfectant liquid
44	=	Rollers for guide rails 25
45	=	Shafts of the rollers 44
46	=	Nozzle body for spraying the water
47	=	Nozzle body for spraying the disinfectant liquid
48	=	Wiper for the peripheral direction
48'	=	Wiper for the radial direction (fixed)
48"	=	Wiper for the radial direction (movable)
49	=	Carrier of the wiper 48
50	=	Support rollers
50'	=	Support rollers
51	=	Shafts of the support rollers 50
51'	=	Shaft of the support rollers 50'
51"	=	Carrier of the roller 50'
52	=	Contact plate
53	=	Control pin
54	=	Arbors
55	=	Nozzles
56	=	Liquid jets
57	=	Off-flow
60	=	Winding of the electromagnet (SOL)



61	=	Armature of the electromagnet 60
62	=	Lever
63	=	Angled piece
64	=	Bore
65	=	Axis of rotation
70	=	Wetting member
71	=	U-shaped profile of sheet metal
72	=	Sponge inlay
73	=	Fabric layer
74	=	Tension means (rubber band)
I - XI	=	Individual operating stages of the process
F	=	Filter
INIT	=	Initiating circuit
M ₁ , M ₂	=	Memories
T ₁ - T ₄	=	Time function elements
LA	=	Control logic unit of the motor 19 for advance movement
LR	=	Control logic unit of the motor 19 for reverse movement
LE	=	Control logic unit of the motor 29
TRA/TRV	=	Power stages
TR ₁ - TR ₄	=	Sub-stages for full or reduced power
TR _L	=	Amplifier stage for the motor 29
SOL	=	Solenoid
FCA	=	End position monitoring switch for the advance logic unit LA
FCR	=	End position monitoring switch for the reverse logic unit LR
FCL	=	Monitoring switch for the rotational movement of the seat 27

