

PATENT SPECIFICATION

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(54) CONTROL UNIT FOR SUPPLYING FLUID MEDIUM TO A DENTAL INSTRUMENT

(71) We, KALTENBACH & VOIGT, a German Kommanditgesellschaft, of 795 Biberach/RiB Bismarckring 39 Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a control unit for supplying fluid medium to a dental instrument.

According to the invention there is provided a control unit comprising an assembly of a control block adapted to supply fluid medium to a dental instrument, a further block coupled with said control block, passage means passing through said blocks for the supply of said fluid medium, a diaphragm disposed in sealing relationship between said blocks, a control chamber provided in said further block on one side of the diaphragm so as to control the movement of the diaphragm, and a valve arrangement provided in said control block on the other side of the diaphragm and arranged to be responsive to movement of the diaphragm so as to control the supply of fluid medium through the passage means to said dental instrument.

The invention will now be described in more detail, by way of example only, with reference to the accompanying drawings in which:—

Figure 1 is a perspective view, in exploded form, of a control unit according to the invention;

Figure 2 is a vertical sectional view of two adjacent control blocks of the control unit;

Figure 3 is a sectional view taken along the line III—III in Figure 2; and

Figure 4 is a diagrammatic illustration of an arrangement for the supply of control-air to the control unit.

Referring now to the drawings, there is shown a control unit comprising a plurality (in the illustrated case two) of control blocks 1, 2 which are adapted for the individual,

controlled, supply of fluid medium to dental instruments. The control blocks 1 and 2 are held together in assembled form by further blocks in the form of an inlet block 3 at one end of the assembly, and an end block 4 at the other end of the assembly, by means of screws 5 passed through the blocks.

The whole control unit is provided with passage means passing through the blocks and in the form of channels 6, 7, 8, extending through all the control blocks 1 and 2 and carrying supply media for dental instruments. The supply medium for the channel 6 passes through an inlet branch 9, the supply medium for the channel 7 passes through an inlet branch 11 and the supply medium for the channel 8 passes through an inlet branch 10 into the inlet block 3. The channel 6 may carry the air for driving dental instruments, the channel 7 cooling water, for example for a spray, and the channel 8 cooling air, for example for cooling instrument motors.

A diaphragm 12 for sealing purposes may be situated between the control blocks 1 and 2, also between the control block 1 and the end block 4, and the control block 2 and the inlet block 3.

In each of the control blocks 1 and 2, a branch channel 6', 7', 8' branches off from the channels 6, 7, 8.

As is apparent more particularly from Figure 2, which illustrates the path of the branch duct 6', the diaphragm 12 is disposed in the path of flow of the branch channel. Situated on that side of the diaphragm 12 which is further from the branch channel 6' is a control chamber 13 to which control air can be admitted by way of a compressed-air duct 14.

A diaphragm 12 is at the same time provided as a sealing means between adjacent blocks 1, 2, 3 and 4.

In accordance with Figure 2, the control chamber 13 is provided in the control block 1, while there is provided on that side of the diaphragm 12 which is further from the

control chamber 13, in the other control block 2, a valve arrangement including a valve chamber 15 which is open towards the diaphragm 12 and which has a seat 16 for a
5 freely movable valve body 17 adapted to be actuated in the closing sense by the diaphragm 12.

The valve body 17 is constructed as a valve plate and has a guide stem 18 which extends in the incoming part 6'' of the branch channel 6'. Provided below the valve body 17 constructed as a valve plate is a sealing ring 19. In addition, there is provided in association with the valve body 17 a compression
10 spring 20 which acts in the direction away from the valve seat 16.

That part 6''' of the branch channel 6' which extends from the valve chamber 15 communicates with a cylindrical space 21 in which there is disposed a piston 24 which, when the flow through the branch channel 6' is freed, influences an actuating member 22, constructed in the form of a pin, of an electric switch 23.

As is illustrated in Figure 3, there is also provided a throttle screw 25 which influences the cross-section of the branch duct 6' and by rotation of which the operating pressure of the respective supply medium can be
25 regulated.

As is apparent from Figure 4, the duct 14 through which the control air is passed to the control chamber 13 branches off from a connecting duct 26' which connects a compressed-air source 26 to a closure valve 27, the latter being adapted to be closed by a dental instrument which is disposed in an indicated receiving device 28 when in its inoperative position, and to be opened by
40 the air pressure coming from the compressed-air source 26 when the instrument is removed. In addition, a throttle valve 26'' is provided between the compressed-air source 26 and the branch of the duct 14 leading to the control chamber 13. Hence, when the closure valve 27 is open, no control air flows through the control chamber 13.

In the embodiment of the control unit illustrated in the drawings, the control block 1 is provided both with a valve arrangement which is controlled by the diaphragm 12 provided between the control block 1 and end block 4 (this diaphragm in turn being controlled by a control chamber 13 in end block 4), and the control block 1 is also provided
50 with a control chamber 13 for controlling the diaphragm 12 provided between control block 1 and control block 2. This latter diaphragm controls a valve arrangement provided in the control block 2. However, the control block 2, unlike control block 1, is not provided with a control chamber 13 since the control block 2 is not intended to exert any controlling function on the inlet block 3. Therefore, the diaphragm 12 between control block
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2 and inlet block 3 only has a sealing function.

The manner of operation is as follows:

When a dental instrument is taken from the receiving device 28, the closure valve 27 opens, as mentioned, so that the control chamber 13 is relieved of pressure. The supply medium present in the branch duct 6' causes the valve body automatically to be raised from its seat 16, so that the supply medium can flow through the outgoing part 6''' of the branch duct 6' to the dental instrument. The piston 24 is thus also shifted outwards, so that the switch 23 is operated. The operating pressure in the outgoing part 6''' of the branch duct 6' can then be read from a manometer 29. Although Figures 2 and 3 show only one branch duct 6', it is emphasised that the control air passing through the compressed-air duct 14 also loads, or relieves of pressure, the corresponding control chambers of the branch ducts 7' and 8'.

When the dentist returns the instrument on to the receiving device 28 after having completed the treatment, the closure valve 27 is simultaneously closed, so that the control air flows through the compressed-air duct 14 into the control chamber 13 which has hitherto been pressure-less, whereafter the diaphragm 12 in Figure 2 is downwardly deflected and presses the valve body 17 on to its seat 16 so that the throughflow of supply medium is cut off. In this case, all the handpieces have been deposited on their respective receiving devices, so that all the valves of the branch ducts 6', 7' and 8' are closed.

In the preferred embodiment of the invention described above with reference to the drawings, an extremely simple construction of control unit is obtained by virtue of the fact that the diaphragm between individual control blocks act simultaneously as a sealing means in addition to exercising a control function, so that no additional sealing means are required between individual control blocks. Moreover, since the control blocks can be of integral construction, rather than of two part construction as known from German Offenlegungsschrift No. 2,151,512, each control block may be constructed with relatively small overall dimensions, so that the entire control unit takes up less space than in the case of the known construction. This is particularly important having regard to the small dimensions of the instrument housings now employed in dental practice.

With regards to the valve arrangement, an extremely accurate and rapid control action of the valve arrangement is obtained when the valve body (17, 18) is constructed as a valve plate having a guide stem extending in the incoming path of the branch channel of the passage means.

The provision of sealing means between the valve body 17 and the valve seat 16 improves the operation of the valve arrangement. A further feature which is particularly advantageous in the case of channels provided by the provision of a spring in association with the valve body to bias the valve body in a direction away from the valve seat. When the control chamber is not loaded by control air, this spring positively holds the valve body in the open position. This is particularly important if water for cooling the dental instrument, for example in the form of a drilling instrument, flows through the respective channel together with the associated branch channel and this water is sucked back by a special return flow device when the instrument is switched off, in order to prevent it from subsequently dripping.

The feature that part of the branch channel which extends away from the valve chamber, and communicates with a cylindrical space in which there is disposed a piston which influences an actuating member of an electric switch when the branch channel is freed, enables an electric switch to be simultaneously actuated by the release of the flow through the associated branch channel when a particular dental instrument handpiece is set in operation so that a corresponding electric signal can be generated. Such a signal can set in operation, for example, an electric micro-motor provided in the dental instrument, a heating device or the like.

A particularly simple construction is obtained by the feature that the duct which carries the control air to the control chamber branches-off from a connecting duct which connects a compressed-air source to a closure valve, the latter being adapted to be closed by a dental instrument situated in an inoperative position on a receiving or holder device, and is openable by the air pressure set up when the instrument is removed, because no special duct for the discharge of the control air is required when the handpiece is set in operation.

WHAT WE CLAIM IS:—

1. A control unit comprising an assembly of a control block adapted to supply fluid medium to a dental instrument, a further block coupled with said control block, passage means passing through said blocks for the supply of said fluid medium, a diaphragm disposed in sealing relationship between said blocks, a control chamber provided in said further block on one side of the diaphragm so as to control the movement of the diaphragm, and a valve arrangement provided in said control block on the other side of the diaphragm and arranged to be responsive to

movement of the diaphragm so as to control the supply of fluid medium through the passage means to said dental instrument.

2. A control unit according to claim 1, in which said further block is a control block adapted to supply fluid medium to a respective dental instrument.

3. A control unit according to claim 1, in which said further block is an inlet block for admitting said supply of fluid medium to the assembly.

4. A control unit according to claim 1, in which the assembly comprises at least a pair of control blocks coupled together, an inlet block at one end of the assembly for admitting said supply of fluid medium to the assembly, an end block provided at the opposite end of the assembly, and a diaphragm disposed in sealing relationship between the adjacent surfaces of each pair of blocks.

5. A control unit according to any one of the preceding claims, including a plurality of passage means passing through said blocks, each passage means being intended to convey a particular respective fluid medium.

6. A control unit according to any one of the preceding claims, in which the valve arrangement comprises a valve chamber open towards the diaphragm on the side remote from said control chamber, a valve seat, and a valve body movable to a closed position on the valve seat by the diaphragm.

7. A control unit according to claim 6, in which the valve body is constructed as a valve plate and has a guide stem extending in an intake part of the passage means.

8. A control unit according to claim 6 or 7, in which sealing means is provided between the valve body and the valve seat.

9. A control unit according to any one of claims 6 to 8, including spring means provided to bias the valve body in a direction away from the valve seat.

10. A control unit according to any one of claims 6 to 9, in which the passage means includes a piston-operated switch, the piston being communicable with the valve chamber for operating the switch when the valve body is off the valve seat.

11. A control unit according to any one of the preceding claims, including a compressed air source for the supply of control air to the or each control chamber, valve means for controlling the supply of control air, and a dental instrument holder arranged to close said valve means when a dental instrument is held in an inoperative position by the holder, said valve means being openable by the pressure of the control air when the dental instrument is removed whereby control air pressure is removed from the or each control chamber thereby to permit supply of fluid medium to the dental instrument.



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The provision of sealing means between the valve body 17 and the valve seat 16 improves the operation of the valve arrangement. A further feature which is particularly advantageous in the case of channels provided to carry liquid supply media is provided by the provision of a spring in association with the valve body to bias the valve body in a direction away from the valve seat. When the control chamber is not loaded by control air, this spring positively holds the valve body in the open position. This is particularly important if water for cooling the dental instrument, for example in the form of a drilling instrument, flows through the respective channel together with the associated branch channel and this water is sucked back by a special return flow device when the instrument is switched off, in order to prevent it from subsequently dripping.

The feature that part of the branch channel which extends away from the valve chamber, and communicates with a cylindrical space in which there is disposed a piston which influences an actuating member of an electric switch when the branch channel is freed, enables an electric switch to be simultaneously actuated by the release of the flow through the associated branch channel when a particular dental instrument handpiece is set in operation so that a corresponding electric signal can be generated. Such a signal can set in operation, for example, an electric micro-motor provided in the dental instrument, a heating device or the like.

A particularly simple construction is obtained by the feature that the duct which carries the control air to the control chamber branches-off from a connecting duct which connects a compressed-air source to a closure valve, the latter being adapted to be closed by a dental instrument situated in an inoperative position on a receiving or holder device, and is openable by the air pressure set up when the instrument is removed, because no special duct for the discharge of the control air is required when the handpiece is set in operation.

WHAT WE CLAIM IS:—

1. A control unit comprising an assembly of a control block adapted to supply fluid medium to a dental instrument, a further block coupled with said control block, passage means passing through said blocks for the supply of said fluid medium, a diaphragm disposed in sealing relationship between said blocks, a control chamber provided in said further block on one side of the diaphragm so as to control the movement of the diaphragm, and a valve arrangement provided in said control block on the other side of the diaphragm and arranged to be responsive to

movement of the diaphragm so as to control the supply of fluid medium through the passage means to said dental instrument. 65

2. A control unit according to claim 1, in which said further block is a control block adapted to supply fluid medium to a respective dental instrument.

3. A control unit according to claim 1, in which said further block is an inlet block for admitting said supply of fluid medium to the assembly. 70

4. A control unit according to claim 1, in which the assembly comprises at least a pair of control blocks coupled together, an inlet block at one end of the assembly for admitting said supply of fluid medium to the assembly, an end block provided at the opposite end of the assembly, and a diaphragm disposed in sealing relationship between the adjacent surfaces of each pair of blocks. 75

5. A control unit according to any one of the preceding claims, including a plurality of passage means passing through said blocks, each passage means being intended to convey a particular respective fluid medium. 80

6. A control unit according to any one of the preceding claims, in which the valve arrangement comprises a valve chamber open towards the diaphragm on the side remote from said control chamber, a valve seat, and a valve body movable to a closed position on the valve seat by the diaphragm. 85

7. A control unit according to claim 6, in which the valve body is constructed as a valve plate and has a guide stem extending in an intake part of the passage means. 90

8. A control unit according to claim 6 or 7, in which sealing means is provided between the valve body and the valve seat. 95

9. A control unit according to any one of claims 6 to 8, including spring means provided to bias the valve body in a direction away from the valve seat. 100

10. A control unit according to any one of claims 6 to 9, in which the passage means includes a piston-operated switch, the piston being communicable with the valve chamber for operating the switch when the valve body is off the valve seat. 105

11. A control unit according to any one of the preceding claims, including a compressed air source for the supply of control air to the or each control chamber, valve means for controlling the supply of control air, and a dental instrument holder arranged to close said valve means when a dental instrument is held in an inoperative position by the holder, said valve means being openable by the pressure of the control air when the dental instrument is removed whereby control air pressure is removed from the or each control chamber thereby to permit supply of fluid medium to the dental instrument. 110 115 120 125



12. A control unit according to claim 1 and substantially as hereinbefore described with reference to, and as shown in the accompanying drawings.

13. A dental instrument provided with a control unit according to any one of the preceding claims.

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HASELTINE, LAKE & CO.,

28 Southampton Buildings,

Chancery Lane,

London, WC2A 1AT,

and

9 Park Square,

Leeds LS1 2LH.