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(54) IMPROVEMENTS IN OR RELATING TO DENTAL APPARATUS

(71) We, SIEMENS AKTIENGESSELLSCHAFT, a German company, of Berlin and Munich, 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 dental apparatus.

In German Patent Specification 1296302 there is described a mobile dental apparatus which is particularly suitable for a seated mode of working by the dentist and for accommodation in a recess in the cabinet. The apparatus housing is kept narrow on purpose so that, particularly with a direct mode of working by the dentist (7 to 8 o'clock position), the handpieces can be moved as close as possible to the patient's chair and can be grasped by the dentist without him having to turn his body appreciably. The small structural height of the apparatus housing required for a seated mode of working, or the requirement for the apparatus to be accommodated in a cabinet recess means that there is a problem in accommodating the supply lines when the handpieces are not being used, since the supply line needs to be long enough to ensure sufficient freedom of movement and also range for its respective handpiece and consequently the length of the supply line cannot readily be reduced in order to save space.

According to the present invention there is provided a dental apparatus which comprises a housing having a front which accommodates a first group of storage devices which are movably attached to the housing and in which primary dental handpieces connected to the housing by supply lines may be stored, and below said first group of storage devices a second group of storage devices which are movably attached to the housing and in which secondary dental handpieces attached to the housing by supply lines may be stored; wherein the arrangement of said first and second groups of storage devices is such that, in order to alter the accessibility to dental handpieces stored therein, each of the first and second groups of storage devices may be

moved independently of the other group, and/or each storage device in the first and/or the second group can be moved independently of the other storage devices in its group.

Conveniently the width of the front of the housing is less than the height of the housing; preferably the width is less than half the height.

Conveniently the housing is a substantially orthogonal parallelepiped with in use one axis disposed vertically.

Preferably each supply hose, at least for the primary dental handpieces, is guided by two or more rollers one of which is constrained to move vertically and is weighted so as to help return the supply hose to the stored position when the respective dental handpiece is replaced into its storage device. Conveniently the first group of storage devices and the rollers, nearest the end of the supply hoses which are attached to the handpieces, are located immediately below the top of the housing.

Advantageously at least one of the two groups of storage devices can be pushed or folded into the housing into a non-use position.

Preferably the first group of storage devices is rotatable about a horizontal axis and is disposed so that it is movable into various positions which are at an angle to the horizontal.

Conveniently the first and second groups of storage devices are spaced apart so that the first group of storage devices with the associated primary handpieces can be folded downwards into the housing into a non-use position.

Conveniently the first group of storage devices and the rollers nearest the end of the supply hoses attached to the dental handpieces are rotatable about a common axis.

Advantageously the second group of storage devices for the secondary handpieces is disposed so that it is foldable into the housing into a non-use position with the free ends of the storage devices pointing downwards.

Preferably the second group of storage

devices is disposed on the inside of a wall of the housing which is rotatably mounted about an axis near the base of the housing.

Advantageously the first and second groups of storage devices are mechanically coupled by means of a connection member. The coupling member can be such that, in use, when the first group of storage devices is pushed or folded in, the second group is moved out into a readiness position and *vice versa*. The coupling member can be a dividing wall within the housing.

Conveniently beneath the first group of storage devices, there is disposed a control panel which may be rotated about a horizontal axis out of the apparatus housing and which accommodates control members for the dental handpieces. The control panel can form a dividing wall of the housing, when in a non-use position. Preferably the control panel and the first group of storage devices are rotatable about a common axis.

Advantageously the first group of storage devices, in the non-use position can be covered by a cover, which can be rotated about a horizontal axis near the top side of the housing and which can then be pushed under the top side of the housing so as to permit access to the first group of storage devices and/or handpieces stored therein.

Conveniently there is a cover, capable of displacement, on the inside of the lower apparatus front wall which can be rotated out, which cover, when the lower apparatus front wall is folded in, can be drawn out parallel to the apparatus front wall and in the drawn out position covers the first group of storage devices.

Preferably the first group of storage devices for the primary handpieces can be pushed substantially horizontally into the housing into a non-use position by means of a displacement device.

Conveniently, in order to maintain the larger part of each supply line for a primary handpiece hanging vertically, there are stationary rollers or the like on which the supply lines bear when the first group of storage devices are pushed into the housing.

The arrangement of the primary handpieces immediately beneath the top edge of the apparatus means that the available height of the apparatus is fully utilized. Thus, when weighted rollers constrained to move vertically tension each supply hose, at least for the primary handpieces, the usable length of hose is substantially twice the height of the housing. The arrangement of the secondary handpieces underneath does not generally have any drawbacks affecting the primary handpieces with regard to the extension length to be obtained, as the secondary handpieces usually require considerably thinner and thus more flexible supply lines, which are considerably lighter and require

less space than the relatively thick and rigid supply lines of the primary handpieces, while having the same length.

For a better understanding of the present invention and to show more clearly how the same may be carried into effect reference will now be made, by way of example, to the accompanying drawings in which:

Figure 1 shows a perspective view of an embodiment of a dental apparatus according to the present invention;

Figure 2 shows the dental apparatus of Figure 1, on an enlarged scale, with first and second groups of storage devices in the use position;

Figure 3 shows a vertical section of the dental apparatus shown in Figures 1 and 2;

Figure 4 shows a vertical section orthogonal to the vertical section of Figure 3;

Figure 5 shows a detail of Figure 1 on an expanded scale;

Figure 6 shows a perspective view of another embodiment of the present invention.

Figure 7a shows a vertical section of a third embodiment of the invention with the first group of storage devices in the use position;

Figure 7b shows the same section as Figure 7a with the storage devices in the non-use position; and

Figure 8 shows a perspective view of the apparatus shown in Figure 7b.

Figure 1 shows a dental apparatus with a housing 1 which is approximately table height (70 to 90 cm) and relatively narrow (about 25 to 40 cm), carried by a swivel arm 2 which may be of one or multi-section design depending on the desired mobility of the apparatus and which is rotatably mounted with its free end either close to a treatment chair or in a recess. The housing 1 has two vertical side walls and its front is closed by two housing parts 3 and 4. The housing part 3, as shown in Figure 2, is rotatable outwardly about a horizontal axis 5; this movement is indicated by the arrow 6 in Figure 1. The housing part 4 is designed as a door and is rotatable about a similar horizontal axis 7 in the direction of the arrow 8 in Figure 1. Having been rotated upwards, the part 4 can then be pushed back inside the apparatus housing by means of guide rails denoted 9 (as shown in Figure 5) beneath the top 10 of the housing 1. A handle 11 enables the apparatus to be moved and storage devices to be moved from a non use into a use position.

Figure 2 shows the apparatus in the opened position. A control panel 12 is rotatable about the axis 7 disposed immediately beneath the top 10 of the apparatus housing 1 from a vertical position into a position pointing obliquely downwards. The control panel 12 is rotated by turning the handle 11 about the axis 7. Disposed on the

front of the control panel 12 are several adjustment and operating members 13 for handpieces 18 to 21 mounted above the control panel in storage devices 14 to 17. Handpiece 18 is a spray handpiece, whilst handpieces 19 to 21 are drill handpieces. These handpieces are used by the dentist in frequent alternation, i.e. for virtually every treatment; hereinafter they are therefore called primary handpieces. In contrast, the handpieces 22 to 25 located beneath the primary handpieces 19 to 21 are required less frequently by the dentist or only for specific work and hereinafter they are called secondary handpieces. The secondary handpieces 22 to 25 are, from left to right in Figure 2, an HF surgery handpiece, a less frequently used drill handpiece, an ultrasonic scaler handpiece and a cold light handpiece.

A group of storage devices 14 to 17 for the upper primary handpieces are rotatable about the same axis 7 around which the control panel 12 is rotatable. The storage device 17 is more sharply inclined upwards relative to the remaining storage devices, which means the spray handpiece 18 stored therein can be removed more easily from the storage device. In contrast with the usual handpiece mounting, the position of the remaining handpieces pointing downwards has the advantage that immediately after a handpiece is removed, the hand is at once clear of the remaining handpieces which represent a danger as they carry very pointed and sharp edged instruments. Staggering of the handpieces, as represented in Figure 2, can be achieved by means of suitable cams cooperating with the axis 7.

Referring to Figure 3, each of the handpieces 18 to 24 is connected to a supply line conveying the energy means (water, air, electric current). Guiding of the supply lines for primary handpieces is shown by the example of the spray handpiece 18. The supply line 26 connected to the spray handpiece 18 first runs via a deflection roller 27, rotatable about the axis 7, from there to a guide roller 28 located close to the base of the housing 1 and from there back again to a position beneath the top 10 where it is connected to a fixed fitting 29. The guide roller 28 is mounted in a weighted bearing part 30 which is guided by two vertical rods 31. When the handpiece 18 is withdrawn from the storage device 17, the guide roller 28 with the bearing part 30 is moved upwards along the guide rods 31.

The supply lines of the secondary handpieces are wound in known manner on reels. Only hose reels 32 and 33 for the handpieces 24 and 25 are shown in Figure 3.

A wall 35 covering the rear part of the housing interior is coupled to a cam part 36 of the housing part 3 and is securely connected to the shaft 7. The coupling is made

such that when the control panel 12 is folded out by rotating the handle 11 (see Figure 1 and 2) the lower housing part 3 with handpieces 22 to 25 is folded outwards about the axis 5. To compensate for relative movements between parts 35 and 36, the cover wall 35 contains an oblong hole 37 on both sides at the coupling point.

Figure 4 shows a rear view of the arrangement of the rollers for the supply lines to the handpieces 18 to 21.

In the embodiment of Figure 6, the four storage devices 42 to 45 for primary handpieces, not denoted specifically, are mounted immediately beneath the top 40 of an apparatus housing 41, and are capable of rotating about a horizontal axis 46. The separate storage devices can each be individually staggered and point obliquely upwards. The position shown in which they are suspended downwards pointing towards the ground, is the non-use position. Guiding of the supply lines for the handpieces stored in them is effected in a suitable manner, for example as shown in Figure 3. The group of secondary handpieces located beneath in the storage devices 47 to 50 is similarly suspended downwards in the non-use position and is rotatable individually or together about the axis 51 and is movable into the use position shown. Guiding and mounting of the supply lines for this handpiece group may also be done according to the manner shown in Figure 3, i.e. via reels or the like. The primary handpieces folded downwards allow the secondary handpieces to be grasped and stored and to be freely withdrawn without obstruction by the primary handpieces. In the same way as the first embodiment described hitherto, the primary handpieces may be rotated or folded out by a handle 52 disposed on the side of the housing 41.

Closing of the apparatus housing is effected by means of a roll shutter 54 guided in rails 53, or the like.

In the embodiment of Figures 7 and 8, the storage devices 55 of the primary handpieces, if the handpieces stored in them are not required, can be pushed into the apparatus housing 57 by means of a displacement device 56 disposed horizontally. Figures 7a and 7b show in diagrammatic representation the in-use position (Figure 7a) in which the storage devices are fanned out for removal of the handpieces and a rest or non-use position (Figure 7b) in which the storage devices are moved into the housing interior. When the storage devices 55 are pushed in, the supply lines 59 guided firstly via rollers 57 can bear on rollers 60. The rollers 60 are disposed on a frame part denoted 61 and securely connected to the housing 57. Weighted rollers 62 ensure vertical alignment of the supply lines. For better guiding of these deflection rollers vertical rods or such like can be provided if

necessary, as shown for example in Figure 3.

Figure 8 shows details of the horizontally disposed device 56. This consists of two guide rods 63 attached to the frame parts 61. The guide rods 63 pass through bushes sideways in a carrier part 64, and the storage devices 55 and the deflection rollers 58 are mounted in the carrier part 64. The rollers 60 are mounted on bearing brackets 65 which can be a component part of the frame parts 61 or be separate components connected to it. To make insertion and withdrawal of the handpieces easier there is a bracket or handle 66 provided, expediently attached to the carrier part 64.

For the sake of clarity, the secondary handpieces are not shown in the Figures 7a and 7b. These may be mounted beneath the primary handpieces as in either of the first two embodiments.

WHAT WE CLAIM IS:—

1. A dental apparatus which comprises a housing having a front which accommodates a first group of storage devices which are movably attached to the housing and in which primary dental handpieces connected to the housing by supply lines may be stored, and below said first group of storage devices a second group of storage devices which are movably attached to the housing and in which secondary dental handpieces attached to the housing by supply lines may be stored; wherein the arrangement of said first and second groups of storage devices is such that, in order to alter the accessibility to dental handpieces stored therein, each of the first and second groups of storage devices may be moved independently of the other group, and/or each storage device in the first and/or the second group can be moved independently of the other storage devices in its group.

2. A dental handpiece as claimed in claim 1, wherein the width of the front of the housing is less than the height of the housing.

3. A dental apparatus as claimed in claim 2, wherein the width of the housing is less than half the height of the housing.

4. A dental apparatus as claimed in claim 1, 2 or 3, wherein the housing is a substantially orthogonal parallelepiped with in use one axis disposed vertically.

5. A dental apparatus as claimed in claim 1, 2, 3 or 4, wherein each supply hose, at least for the primary dental handpieces, is guided by two or more rollers one of which is constrained to move vertically and is weighted so as to help return the supply hose to the stored position when the respective dental handpiece is replaced into its storage device.

6. A dental apparatus as claimed in claim 5, wherein the first group of storage devices and the rollers nearest the end of the

supply hoses which are attached to the handpieces, are located immediately below the top of the housing.

7. A dental apparatus as claimed in any preceding claim, wherein at least one of the two groups of storage devices can be pushed or folded into the housing into a non-use position.

8. A dental apparatus according to any preceding claim, wherein the first group of storage devices is mounted so as to be rotatable about a horizontal axis.

9. A dental apparatus as claimed in claim 8, wherein the first group of storage devices is disposed so that it is movable into various positions which are at an angle to the horizontal.

10. A dental apparatus as claimed in any preceding claim, wherein the first and second groups of storage devices are spaced apart so that the first group of storage devices with the associated primary handpieces can be folded downwards into the housing into a non-use position.

11. A dental apparatus as claimed in any one of claims 8 to 10 when appendant to claim 5 or 6, wherein the first group of storage devices and the rollers nearest the end of the supply hoses attached to the dental handpieces are rotatable about a common axis.

12. A dental apparatus as claimed in any preceding claim, wherein the second group of storage devices for the secondary handpieces is disposed so that it is foldable into the housing into a non-use position with the free ends of the storage devices pointing downwards.

13. A dental apparatus as claimed in any preceding claim, wherein the second group of storage devices is disposed on the inside of a wall of the housing which is rotatably mounted about an axis near the base of the housing.

14. A dental apparatus as claimed in any preceding claim, wherein the first and second groups of storage devices are mechanically coupled by means of a connection member.

15. A dental apparatus as claimed in claim 14, wherein the coupling member is such that, in use, when the first group of storage devices is pushed or folded in, the second group is moved out into a readiness position and *vice versa*.

16. A dental apparatus as claimed in claim 14 or 15, wherein the coupling member is a dividing wall within the housing.

17. A dental apparatus as claimed in any preceding claim, wherein, beneath the first group of storage devices, there is disposed a control panel which may be rotated about a horizontal axis out of the apparatus housing and which accommodates control members for the dental handpieces.

18. A dental apparatus as claimed in

claim 17, wherein the control panel forms a dividing wall of the housing when in a non-use position.

5 19. A dental handpiece as claimed in claim 18, wherein the control panel and the first group of storage devices are rotatable about a common axis.

10 20. A dental apparatus as claimed in any preceding claim, wherein the first group of storage devices, in the non-use position, can be covered by a cover, which can be rotated about a horizontal axis near the top side of the housing and which can then be pushed under the top side of the housing so as to
15 permit access to the first group of storage devices and/or handpieces stored therein.

21. A dental apparatus as claimed in any one of the preceding claims, wherein there is a cover, capable of displacement, on the
20 inside of the lower apparatus front wall which can be rotated out, which cover, when the lower apparatus front wall is folded in, can be drawn out parallel to the apparatus front wall and in the drawn out position
25 covers the first group of storage devices.

22. A dental apparatus as claimed in any one of claims 1 to 7 or any one of claims 10 to 21 when appendant to any one of claims 1 to 7, wherein the first group of storage devices
30 for the primary handpieces can be pushed substantially horizontally into the housing into a non-use position by means of a displacement device.

23. A dental apparatus as claimed in claim 22, wherein, in order to maintain the larger part of each supply line for a primary handpiece hanging vertically, there are stationary rollers or the like, on which the supply lines bear when the first group of
35 storage devices are pushed into the housing.

24. A dental apparatus substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

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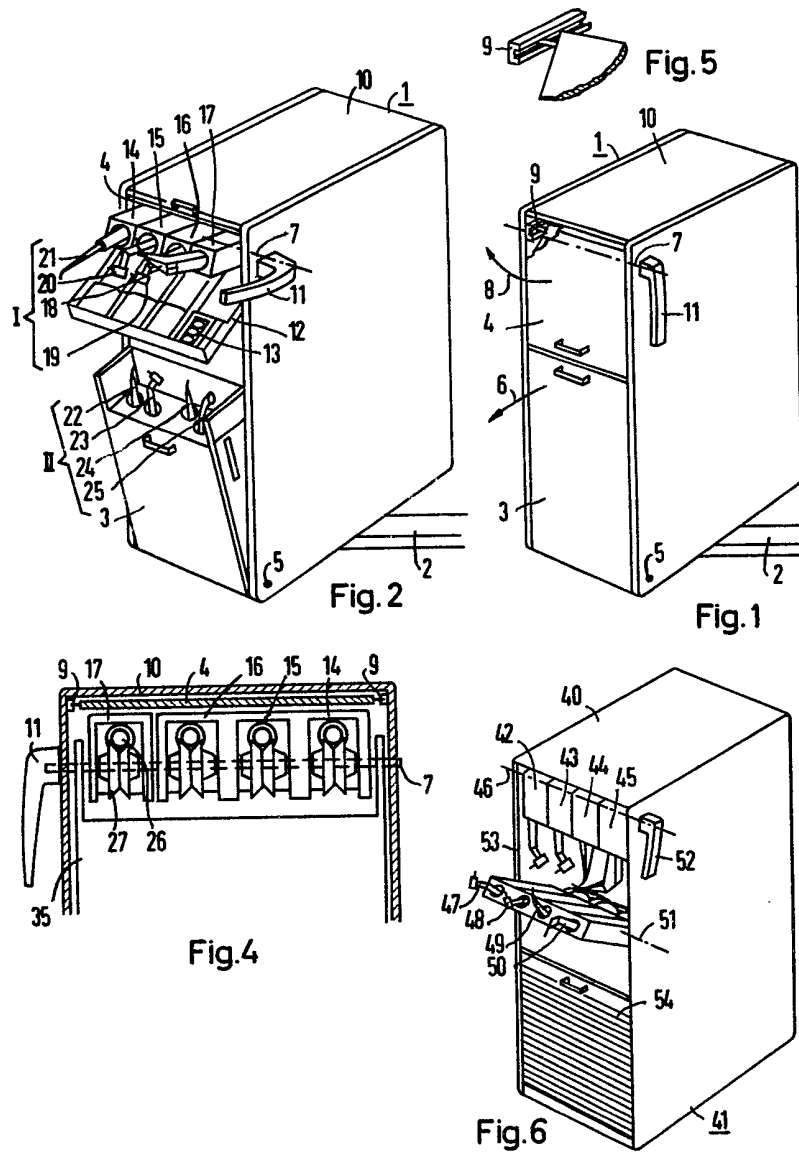




Fig. 3

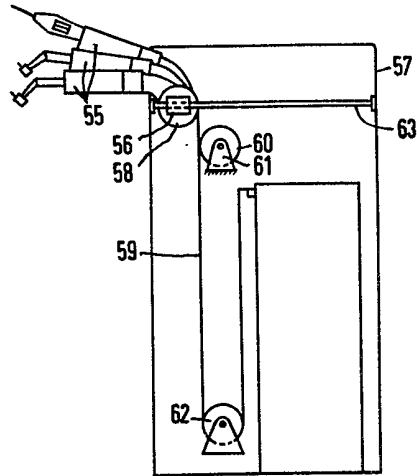


Fig. 7a

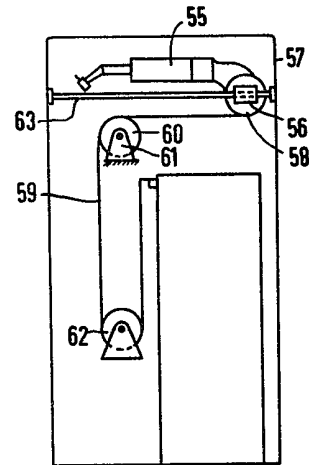


Fig. 7b

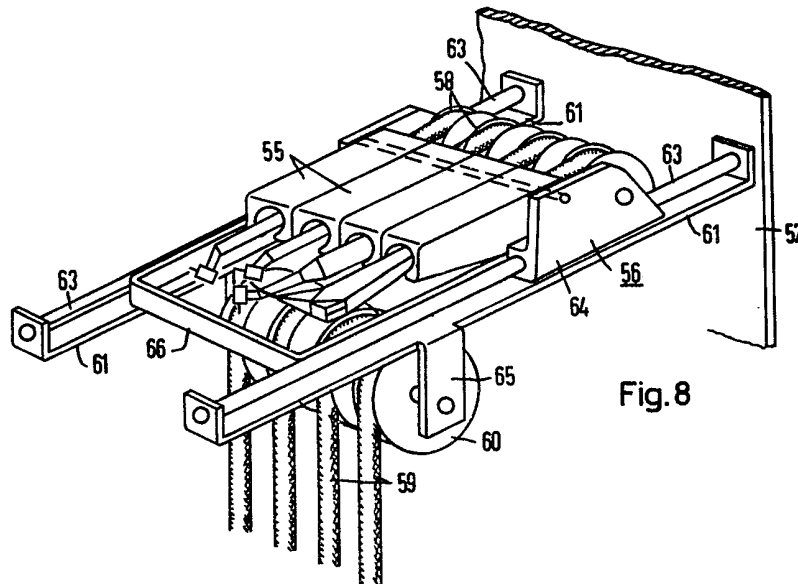


Fig. 8