ATTACHMENT FOR HYDRAULICALLY OPERATED DENTAL CHAIRS AND THE LIKE

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My invention relates to an attachment for hydraulically operated dental chairs and the like and relates particularly to a device adapted to convert a manually operated chair of this type into a motor actuated chair without requiring material alterations and changes in the chair structure.

Prior to my invention hydraulically operated chairs used principally by dentists and barbers have consisted essentially of a hydraulically actuated lift consisting of a piston reciprocable in a cylinder and moved therein by the pressure of a hydraulic fluid. The fluid is drawn from a fluid chamber or reservoir and pressures are built up upon the fluid by means of a manually actuated pump usually operated by a hand lever or a foot pedal. In the case of such devices used as dental chairs, it has been found to be impractical to operate the chair, either to raise or lower the chair, while the dentist is in the operating position facing the patient. The result has been that inconvenient and time-consuming operations are necessary in either raising or lowering the chair slightly from a position other than the operating position. Frequently it is necessary to make such adjustments several times before securing the proper position of the chair relative to the dentist.

Considerable time also is consumed in raising chairs of the conventional type by the operation either of the hand lever or of the foot pump to build up the pressure upon the hydraulic fluid. Much of this time can be saved by an attachment embodying my invention.

The large number of manually operated chairs now in use particularly in dental offices and barber shops, may be motorized by means of an attachment embodying my invention. It is essential, however, that such attachments make suitable provision to limit the operation of the motor automatically when the chair has reached a predetermined point in its upward movement.

It is, therefore, an object of my present invention to provide an attachment for hydraulically operated chairs and the like which is adapted to convert a manually actuated chair to a motor actuated chair without requiring material alterations in the structure of the chair.

It is a further object of my present invention to provide an attachment of this nature which permits operation of the chair from the operating position in such a manner that the chair may be moved to the required position without a loss of time incident upon the improper adjustment of the chair.

It is a further object of my present invention to provide an attachment which is so constructed as to stop the movement of the chair automatically after it reaches a predetermined point in its upward movement.

These, and various other objects, features of arrangement, construction and operation, are plainly shown and described and will be best understood by reference to the accompanying drawings in which:

Fig. 1 is a fragmentary elevational view with parts broken away, showing an attachment embodying my invention secured to the pedestal base of a dental chair (not shown);

Fig. 2 is a section taken on the line 2—2 of Fig. 1;

Fig. 3 is a section taken on the line 3—3 of Fig. 1;

Fig. 4 is a plan view partially in section taken on the line 4—4 of Fig. 1;

Fig. 5 is a plan view of a motor base taken on the line 5—5 of Fig. 1;

Fig. 6 is a fragmentary section taken on the line 6—6 of Fig. 5;

Fig. 7 is a fragmentary elevational view with parts broken away, showing an automatically operated switch utilized in the construction of an attachment embodying my invention.

Fig. 8 is a fragmentary elevational view with parts broken away, showing a foot operated pump of a conventional design.

Fig. 9 is a sectional view taken on the line 9—9 of Fig. 8, showing connection of the delivery conduit leading from the motor actuated pump.

Referring more in detail to the drawings, and particularly to Fig. 1, 10 designates the pedestal base portion of any conventional type of hydraulically operated chair (not shown), such as a dental chair, barber chair, or the like. Within the pedestal base portion 10 there is enclosed a hydraulically operated lift member 11 which consists essentially of a plurality of telescoping supporting members 12 secured to the bottom of the chair. Within the member 12 is a hydraulic chamber 13. A plug 14 provided with sealing rings 15 closes the open end of the chamber 13. A conduit 16 extends through the plug 14 and
communicates with the interior of the chamber 13.

The specific details of this construction may vary in conventional types of such chairs, but the essential features of the telescoping supporting member 12 moved by fluid pressure built up in the chamber 13 by means of fluid under pressure passing through the conduit 16, will be found to exist in all known types of such chairs.

A manually operated part of one conventional type includes a manually actuated pump connected with the conduit 16 and operated by means of a foot actuated pedal 17 (Figs. 4 and 5) which pump operates to force a hydraulic fluid under pressure through the conduit 16 and into the chamber 13 to cause movement of the supporting member 12, said fluid being drawn from the reservoir generally located in the base of the pedestal 10. Fig. 8 shows the details of construction of said pump, and referring thereto the same comprises a cylinder 80 in which there is slidably fitted a reciprocable piston 81 carried by the rod 82 adapted to engage a crank 83 secured to a suitably supported shaft having said foot pedal 17 secured thereto. In the bottom of said cylinder 80 there are provided two check valves 84 and 85. Valve 84 is adapted to open into said cylinder 80 in opposition to the action of a coil spring 86, and it operates to admit the fluid into said cylinder 80 through the conduit 87, while valve 85 is adapted to open into said cylinder 80 in opposition to the action of a spring 88, and it operates to close said cylinder 80 and to permit the fluid to pass through the conduit 89 as the piston 81 rises creating partial vacuum in said cylinder. The ball check valve 85 is adapted to open outwardly from the cylinder 80 in opposition to the action of a coil spring 89 tending to maintain the ball valve in its closed position. Thus, alternative reciprocations of the piston 81 cause the fluid to open the valve 81 and enter said cylinder, valve 85 being closed, whereupon lowering of said piston 81 causes closing of the valve 84 and opening of the valve 85. Thus permitting the piston 81 to pump the fluid into the conduit 91 and thence from the conduit 16 into the chamber 13. Return movement of the piston 81, caused by any suitable means such as by a spring (not shown) causes closing of the valve 85 and pumping of a corresponding amount of fluid through the conduit 81 into the cylinder 80, as described, for the next succeeding delivery into the chamber 13.

Means for releasing the pressure in said chamber 13 and for draining the fluid therefrom thus permitting lowering of the chair, are usually exemplified by a release valve, such as a valve 93. In the structure shown, the valve 93 closes a drain hole 94 permitting the fluid to escape into the storage reservoir, and it is kept closed by the coil spring 95. By pressing a release pedal 96, the valve 93 is opened and the fluid passes from the chamber 13 into the storage reservoir, the size of the hole 94 determining the rate of said passing and, consequently, the speed at which the chair is lowered.

My invention resides in an attachment to chairs of the type just described. It attaches to such chairs without requiring reconstruction of the operating mechanism and does not interfere with the manually operated mechanism used to operate the fluid pump and to release the fluid from the fluid chamber.

The attachment embodying my invention consists essentially of an electric motor 20 adapted to drive a constant pressure pump 21 through a drive pulley 22 secured to the shaft of the motor 20, and a driven pulley 23 secured to an operating shaft of the pump 21, the drive being through a belt 24. The pump 21 and the motor 20 are mounted on a base member 25, which is held in position relative to the pedestal base 10 by means of a removable band 26 clamped on the upper portion of the pedestal base 10. The band 26 is provided with lugs 27 and 28. Supporting arms 29 and 30 are secured to the base 25 and at one end are fastened to the lugs 27 and 28. A bracket 31 is secured to the arm 29 and provides a support for a valve 32, secured to the base 25 between the pump 21 and the motor 20 is a sump 33 adapted to hold a quantity of hydraulic fluid in addition to the quantity of hydraulic fluid contained in the fluid receptacle in the base of the pedestal. Fluid is withdrawn from the sump 33 by the pump 21 through a conduit 34, and is pumped under pressure through a conduit 35 leading from the pump 21 to the valve 37.

A spring-pressed ball check valve 38 is unseated by the fluid under pressure from the conduit 35 and the fluid is permitted to enter the valve chamber 37. A conduit 39 leads from the valve chamber 37 and extends inside the pedestal base 10 to a point 34 where it connects with the conduit 16. A release valve 40 is placed in the valve chamber 37 and is provided with an extending rod 41. A conduit 42 (Fig. 2) leads from the valve 32 to an adjustable check 43. A plug 44 is provided, having a restricted port 46 as the piston 43 rises creating partial vacuum in said cylinder. The ball check valve 45 is adapted to open outwardly from the cylinder 40 in opposition to the action of a coil spring 46, and it operates to admit the fluid into said cylinder 40 through the conduit 47, while valve 45 is adapted to open into said cylinder 40 in opposition to the action of a spring 48, and it operates to close said cylinder 40 and to permit the fluid to pass through the conduit 49 as the piston 43 rises creating partial vacuum in said cylinder. The ball check valve 45 is adapted to open outwardly from the cylinder 40 in opposition to the action of a coil spring 49 tending to maintain the ball valve in its closed position. Thus, alternative reciprocations of the piston 43 cause the fluid to open the valve 43 and enter said cylinder, valve 45 being closed, whereupon lowering of said piston 43 causes closing of the valve 45 and opening of the valve 46. Thus permitting the piston 43 to pump the fluid into the conduit 50 and thence from the conduit 16 into the chamber 13. Return movement of the piston 43, caused by any suitable means such as by a spring (not shown) causes closing of the valve 46 and pumping of a corresponding amount of fluid through the conduit 50 into the cylinder 40, as described, for the next succeeding delivery into the chamber 13.

Means for releasing the pressure in said chamber 13 and for draining the fluid therefrom thus permitting lowering of the chair, are usually exemplified by a release valve, such as a valve 53. In the structure shown, the valve 53 closes a drain hole 54 permitting the fluid to escape into the storage reservoir, and it is kept closed by the coil spring 55. By pressing a release pedal 56, the valve 53 is opened and the fluid passes from the chamber 13 into the storage reservoir, the size of the hole 54 determining the rate of said passing and, consequently, the speed at which the chair is lowered.

A spring-pressed check 54 with the sump 33 and permits a return of the fluid thereto. A conduit 55 is provided as a safety measure to carry away any surplus of fluid in the sump 33 and to discharge it into the fluid reservoir (not shown) in the pedestal base 10.

As shown in Fig. 2, the conduit 42 leads from the valve 32 to the adjustable check valve 43. As here shown, the check valve 43 consists of a casing 45 having a removable band 46 clamped on. A partition member 48 divides the chamber 47 into two portions, one of which the conduit 42 is connected and from the other of which leads the conduit 44. A restricted opening 49 is provided in the partition and is regulated by an adjustable needle valve 50. The release valve 40 is opened by movement of the rod 41. Movement of the rod 41 is caused by a pivotally mounted arm 51, which contacts with a rotatable shaft 52. Secured to the rotatable shaft 52 is a release pedal 53, which is adapted to cause partial rotation of the shaft 52 when pressure is exerted on the pedal 53. As shown in Fig. 4 the shaft 52 is journaled in depending members 55 which are attached to lugs 54 carried on the removable band 26.

In order to insure a tightness in the belt 24 at all times and a quietness in operation, the motor 20 is mounted on the base 25 in a cushioned mounting shown in detail in Figs. 5 and 6.

As here shown, this mounting consists of a pair of horizontally extending members 60 and 61 and a pair of cross members 62 and 63. The base of the motor 20 is secured to the members 62 and 63 by bolts or similar means. The members 62 and 63 are connected with the members 60 and 61 at the ends of the respective members. The members 60 and 61 are secured to the base 25 by bolts or similar means 65 passing through slots 66. Thus the entire motor support is adjusted.
To lower the chair, the telescoping supporting member 12 is permitted to return toward its inti-
mal position by actuation of the release valve 40. This is accomplished by operation of the foot
release pedal 53, which causes a partial rotation of the shaft 52 and movement of the arm 51.
This contacts the end of the rod 41 and opens the release valve 40. The fluid is then free
return through the valve 32 to the conduit 42 and through it to the check valve 43.
The adjustment of valve 50 regulates the size of the opening 49 and determines the
speed at which the amount of fluid can pass through the chamber 47 to the conduit 44 and its
return to the sump 33. Thus the speed of the re-
turn of the chair may be regulated by adjust-
ment of the needle valve 50.

To further regulate the rate of the return of
the fluid to the sump 33, I provide the plug 42a at the point of connection between the conduit 42 and
the valve 32. The restricted opening in this plug
prevents the entire body of returning fluid from
jumping directly on the partition 48 of the check
valve 43 and eliminates a knocking which other-
wise may occur in the check valve 43.

If the switch 14 should be kept closed until
the telescoping supporting member 13 has reached
the safe limit of its upward travel, the member
78 contacts with one end of the arm 71 and raises
the arm to such an extent as to move the lever 16
and break the flow of current to the motor 20. In
the construction here shown, when this condition is set up, the motor 20 is stopped and can be start-
ed again only by manual movement of the arm 71
in the downward direction and the actuation of
the switch 15 to establish a connection to permit
a flow of current to the motor 20.

While I have illustrated a preferred embodi-
ment of my invention many modifications may be
made without departing from the spirit of the
invention, and I do not wish to be limited to the
precise details of construction as herein set forth,
but desire to avail myself of all changes within
the scope of the appended claims.

Having thus described my invention, what I
claim is new and desire to secure by Letters Pat-
cnt of the United States is:

1. In an elevating chair, a base casing, a hy-
draulic jack and system mounted in the casing,
a ped operated pump housed in the casing and
communicating with the system, a power driven
auxiliary unit mounted externally of the casing
and communicating with said hydraulic jack in-
dependently of said ped operated pump and
system, said unit comprising a power driven pres-
sure pump, a pump communicating with said
dump, communicating conduits leading from said
dump to said jack and from said jack to said
dump, and check valves in said conduits exter-
nally of said base casing controlling the flow of
fluid to and from said jack through said conduits.

2. In an elevating chair, the combination of a
base casing, a hydraulic jack and system mount-
ed in the casing, a ped operated pump housed in
the casing and communicating with said hy-
draulic jack independently of said ped operated
pump and system, said unit including a motorized
pump, said pump for operating the hydraulic fluid
operatively connected with said pump, a feed-
ing system operatively connecting said motorized
pump to said jack and including a valve chamber,
a spring-pressed ball check and a manually oper-
able release valve adapted to release pressures within said chamber, a conduit leading from said pump to said valve chamber, said ball check clos-
ing said conduit and adapted to be unseated by predetermined pressure therein, thereby allowing the fluid to enter said chamber, a second con-
duit leading from said valve chamber to said jack, a foot actuated lever for releasing said release valve, a switch adapted to control the op-
eration of said motorized pump, a safety switch actuated by said jack and adapted to control the operation of said motorized pump, and an ad-
justable restriction operatively connected with said release valve and adapted to control release of pressures from said release valve, thereby to regulate the speed of return of said jack.

3. In an elevating chair, the combination of a base casing, a hydraulic jack and system mounted in the casing, a pedal operated pump housed in the casing and communicating with the system, a power driven auxiliary unit mounted externally of the casing and communicating with said hydraulic jack independently of said pedal operated pump and system, said unit including an electrically operated motorized pump, a sump for con-
taining the hydraulic fluid operatively connected with said pump, a feeding system operatively con-
necting said motorized pump to said jack and in-
cluding a valve chamber, a conduit leading from said valve chamber to said jack, a pressure release valve in said chamber, a foot actuated lever adapted to release said release valve, a switch adapted to control the operation of said motorized pump, a stop switch mounted externally of said base casing and actuated by said jack to limit the upward movement of said jack including a le-
ver adapted to be actuated by said jack to break an electrical circuit and stop operation of the motor after the said chair reaches a predetermined point in its operation, and an adjustable restriction operatively connected with said release valve and adapted to control release of pressures from said release valve, thereby to regulate the speed of return of said jack.

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