Oct. 31, 1961 S. S. BROWN 3,005,999

MOTOR DRIVE ARRANGEMENT FOR HOSPITAL BEDS AND THE LIKE

Filed Feb. 21, 1958

FIG-1

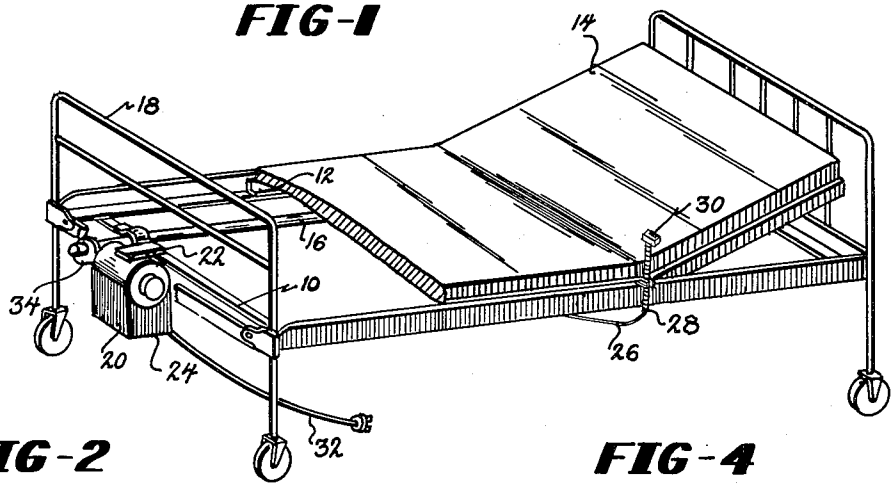


FIG-2

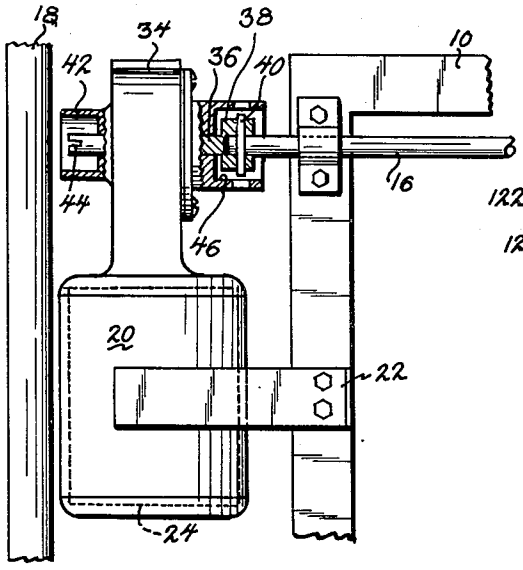
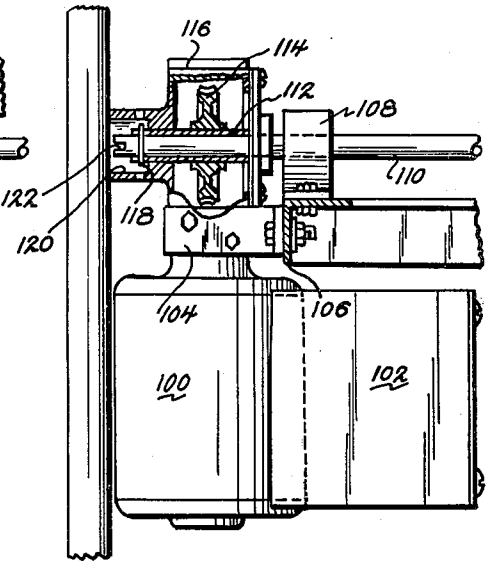


FIG-4



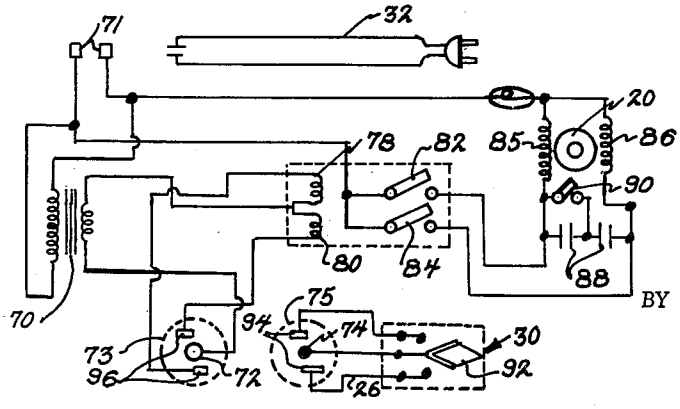


FIG-3

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MOTOR DRIVE ARRANGEMENT FOR HOSPITAL BEDS AND THE LIKE

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2 Claims. (Cl. 5—67)

This invention relates to the power operation of hospital beds for raising and lowering the beds or for tilting portions thereof, and is particularly concerned with a novel electric motor construction for this purpose and an arrangement for mounting the motor on the bed and for connecting the motor with the adjustable member which causes movement of the bed.

The motor operation of hospital beds to tilt portions of the springs frame or to raise and lower the entire bed is known, but heretofore in substantially every case the bed is of a special construction throughout with the motor or motors for operating the bed being incorporated therewith at the time of manufacture.

Some attempts have been made to provide motor operators that can be attached to existing hospital beds, and in this connection reference may be had to my previously filed application Serial No. 672,057, filed July 15, 1957. The present invention is an improvement over the construction shown in this co-pending application.

A particular object of the present invention is the provision of an electric motor especially adapted for being incorporated in existing hospital bed structures with a minimum of labor for modification of the hospital bed.

A further object of this invention is the provision of an arrangement for attaching an electric motor to a manually operated hospital bed so that the bed can readily be converted to power operation.

Still another object of this invention is the provision of a special motor construction and a manner of attaching it to a hospital bed which will permit of either power or manual operation of the hospital bed.

It is also an object of this invention to provide an electric motor and a mounting arrangement therefor that can readily be incorporated into the structure of a hospital bed by the use of simple tools and by simple operations and in a short time.

These and other objects and advantages will become more apparent upon reference to the accompanying drawings, in which:

FIGURE 1 is a perspective view of a hospital bed partly broken away showing a motor operator according to the present invention mounted thereon,

FIGURE 2 is a plan view showing more in detail the motor arrangement of FIGURE 1 and its support on the bed frame and its connection with the shaft by means of which the bed is operated to cause movement of the springs frame thereof,

FIGURE 3 is a diagrammatic representation of one form of control circuit for the electric motor for causing reversible operation thereof, and

FIGURE 4 is a side elevational view showing a modified manner of mounting the motor on the bed frame.

Referring to the drawings more in detail, the bed illustrated in FIGURE 1 comprises a bed frame **10** on which is mounted a springs frame **12**. In conventional hospital beds the springs frame is jointed at one or more points therealong so that the head end or foot end can be tilted upwardly and, in some cases, the center part of the bed can also be adjusted. In the usual manually operated bed there are provided cranks for rotating shafts that drive through gears or other mechanisms to accomplish the tilting of the various parts of the bed. These drives are of the self-locking type so that when

the bed is adjusted to any position, it will remain there until the adjusting shaft is again rotated.

For the sake of simplicity in the present application, there is illustrated only a single adjusting shaft pertaining to the head end of the springs frame of the bed, but it will be understood that motors could be provided for as many adjusting shafts as desired, and that it is within the purview of the present invention to have as many motors pertaining to the bed as there are adjustments, including a motor for raising and lowering the entire springs frame, if so desired.

In FIGURE 1 the rotatable adjusting shaft pertaining to the head end **14** of the bed is indicated at **16** and this shaft extends longitudinally of the bed to a position adjacent the foot board **18**. According to this invention an electric motor **20** is attached to the bed frame **10** as by a mounting strap or bracket **22** which will be more clearly seen in FIGURE 2.

Since the motor is relatively small, member **22** could comprise a simple strap, but it will be evident that this member could also be an angle bracket or a cast member if added strength and rigidity were required.

The electric motor **20** that is carried by bracket **22** may also have attached thereto as on the underneath side thereof a box **24** containing the relays and condensers and other components of the control circuit of the electric motor. A cable **26** leads from box **24** to the flexible support **28** for manual control switch **30** which is located so that it can be operated by the occupant of the bed. The flexible support **28** and switch **30** are disclosed more in detail in my co-pending application above referred to.

Preferably, the circuit leading to the switch is of low voltage thereby eliminating a hazard that would accompany carrying a line voltage to the switch and a second cable **32** is provided leading from the control box to a wall receptacle for supplying power to the control circuit and the electric motor.

Referring again to FIGURE 2, the motor shown therein is of the gearhead type wherein the motor drives a worm that runs on a worm wheel, these gears being located within a housing portion **34** integral with one end frame of the electric motor. The worm wheel is mounted on an output shaft **36** that is in coaxial alignment with adjusting shaft **16** of the hospital bed. Output shaft **36** on the end toward the bed is provided with a socket **38** adapted for receiving the end of shaft **16** and a drive pin **40** drivingly interconnects shafts **36** and **16**.

This connection of the shafts can be accomplished by cutting off shaft **16** where necessary and drilling a hole therein for receiving drive pin **40**. In certain cases, however, the shaft **16** may be short enough to permit the end to be received in socket **38**, in which case no cutting off of the shaft is necessary.

The opposite end of shaft **36** toward the foot board **18** of the bed is located within a recess **42** forming a part of housing **34** and is slotted as at **44** for receiving a hand crank. Slot **44** permits driving of shaft **36** manually in case there is a power failure or in case the bed is located where power can not be supplied to the electric motor.

Since it is desired to provide for manual operation of shaft **16** in the manner described, it will be evident that the reduction gearing pertaining to motor **20** is not of the self-locking type.

The side of housing **34** toward the bed frame **10** may also comprise a recess portion **46** surrounding the connection between shafts **16** and **36** whereby the rotating portions of the adjustment adjacent the foot end of the bed are all protected so that they do not become entangled in the bed clothing.

The control circuit in FIGURE 3 is exemplary of several types of reversing circuits that can be utilized with

the motor. In this figure there is a stepdown transformer 70 which has its primary connected across the terminals 71 of a receptacle in the wall of housing 24 that is adapted for receiving a plug on the end of cable 32 that leads to the receptacle from which power is derived for the motor.

Transformer 70 has a secondary that has one end connected with a terminal 72 of a plug 73 and with terminal 72 being adapted for engaging a terminal 74 of a receptacle 75 and which terminal 74 is connected with one of the wires of the control cable 26 leading to manually operable switch 30.

The secondary of the transformer 70 provides a low control voltage, for example 24 volts, so that there is no hazard to the occupant of the bed in operating switch 30.

The control circuit includes a relay 78 which has a blade 82 and a relay 80 which has a blade 84. When blade 82 is closed by energization of relay 78, field coil 85 of motor 20 is connected directly across the line by the connection of the motor coils to one terminal of plug 71 and the connection of the relay blades to the other terminal of the plug. When coil 85 is connected directly across the line, coil 86 is connected across the line through condensers 88. This provides for one direction of rotation of the motor. A centrifugal switch 90 is connected in circuit with the condensers and is adapted for opening at a predetermined motor speed.

When relay blade 84 is closed, the opposite condition obtain and the motor runs in the opposite direction.

The selective energization of the relays 78 and 80 is accomplished by manual manipulation of the movable element 92 of switch 30 which, as has been mentioned, is connected with terminal 74 of receptacle 75.

Receptacle 75 has another pair of terminals 94 adapted for connection with terminals 96 of plug 73 when the plug and receptacle are brought together. The terminals 96 are connected with the outer ends of the coils of relays 78 and 80, the opposite ends of which coils are interconnected with each other and with the end of the secondary of transformer 70 opposite its connection with terminal 72 previously referred to.

The modification of FIGURE 4 embodies a motor 100 which may be substantially identical with motor 20 of the first described modification and which motor 100 has associated therewith a control system which may be identical with the one just described and having the components thereof located within a housing 102 attached to the motor. In the FIGURE 4 modification the motor sets with its axis vertically and is connected by a bracket 104 with the end member 106 of the bed frame. Member 106 may also carry a bearing 108 through which adjusting shaft 110 of the bed extends.

In this modification shaft 110 extends completely through a hollow shaft 112 that forms the output shaft of the motor. Shaft 112 carries worm wheel 114 within

gear housing 116 and this worm wheel is driven by a worm carried on the motor shaft.

The bed adjusting shaft 110 is connected with hollow shaft 112 by a drive pin 118 that may be located within a recess 120 formed in the outer wall of the gear housing 116. The outer end of shaft 110 is slotted as at 122 so that it can be engaged by a crank for manual rotation of shaft 110 when this is necessary. As before, the reduction gearing of the electric motor is not self-locking so that when the motor is deenergized it is possible to rotate shaft 110 manually.

The electric motors are so selected that they will stall without breaking any of the driving parts when the portion of the bed being driven thereby reaches the limit of This eliminates the need for any limit switches and thus makes for a simple and economical installation.

It will be understood that this invention is susceptible to modification in order to adapt it to different usages and conditions; and, accordingly, it is desired to comprehend such modifications within this invention as may fall within the scope of the appended claims.

I claim:

1. A power unit for mounting on the rotatable adjusting shaft of a hospital bed to adjust the position of the bed and comprising a reversible geared head electric motor, said electric motor comprising an integral casing therewith for enclosing the speed reducing drive driven by said motor to form said geared head, a low speed output shaft extending through said casing transversely to the axis of said electric motor, said output shaft being solid and having a socket member fixedly mounted on one end thereof for telescopic engagement with the end of said rotatable adjusting member, means on said socket member for drivingly interconnecting said socket member to said adjusting member, the other end of said output shaft having a transverse slot therein for driving engagement with a hand crank so that said adjusting shaft may be manually operated when said electric motor is not operating, means for rigidly mounting said electric motor on the frame of the hospital bed, and a cylindrical portion extending outwardly of said casing over said output shaft and extending beyond said socket member so as to form a protective enclosure over the driving connection between said output shaft and said rotatable adjusting member.

2. A power unit as set forth in claim 1, wherein the means for drivingly interconnecting the socket member with the adjusting member consists of a drive pin which extends through said adjusting shaft member.

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