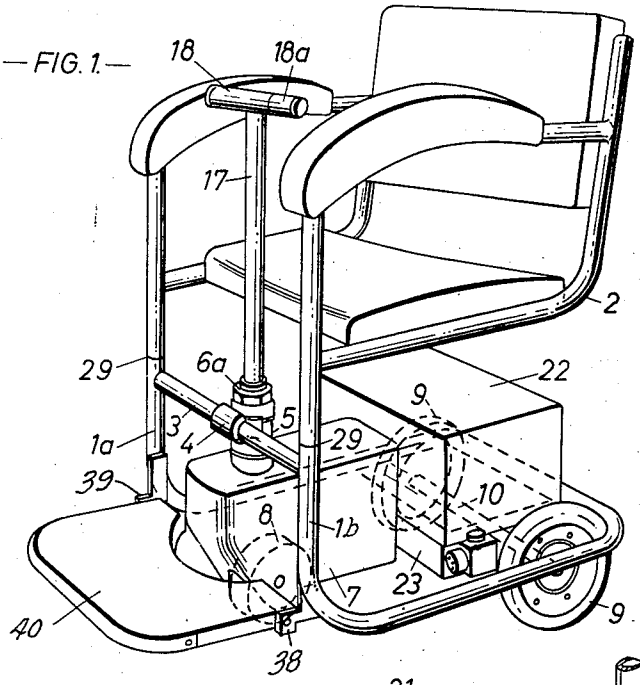
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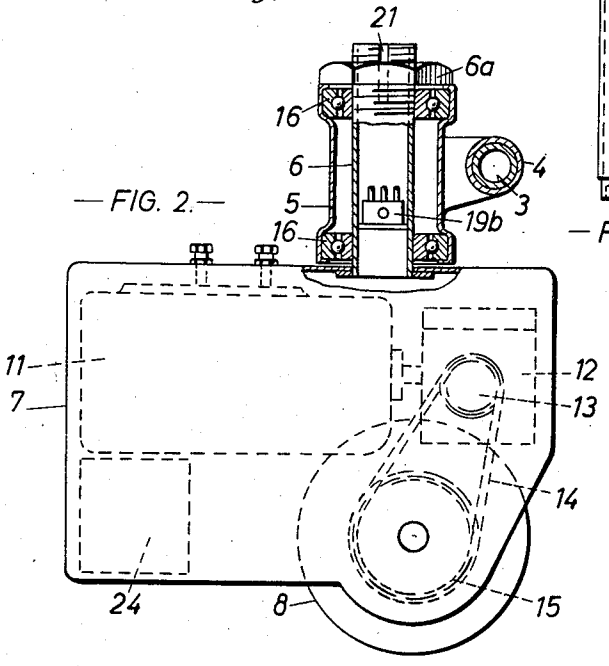
ELECTRICALLY DRIVEN INVALID CHAIR

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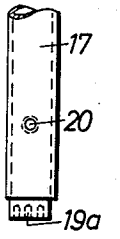
— FIG. 1. —



— FIG. 2. —



— FIG. 3. —



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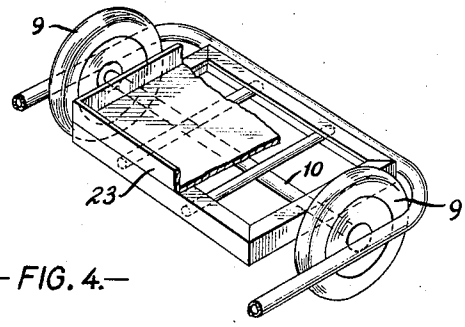
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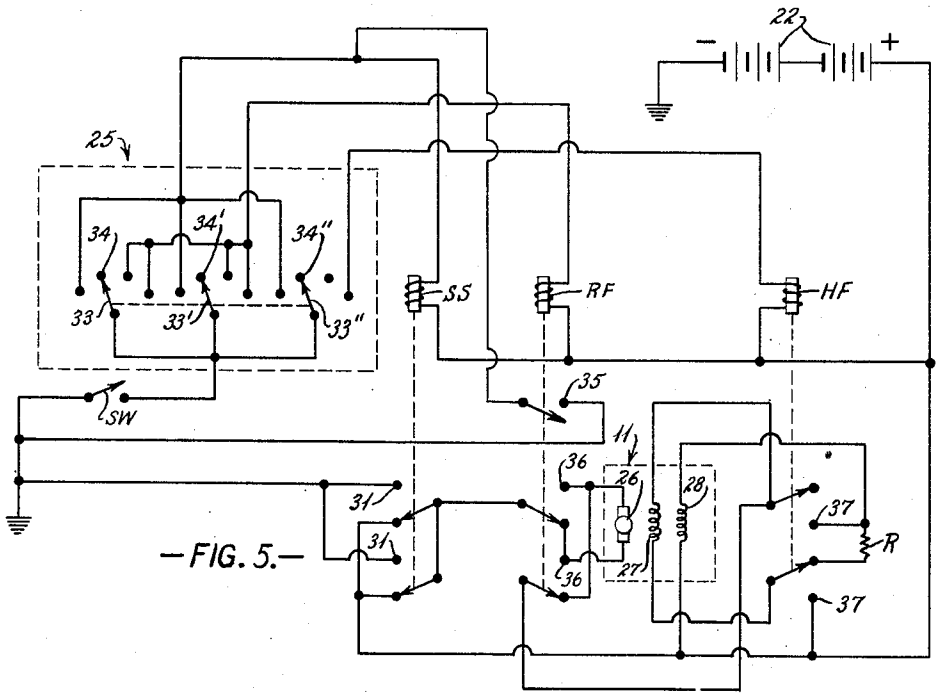
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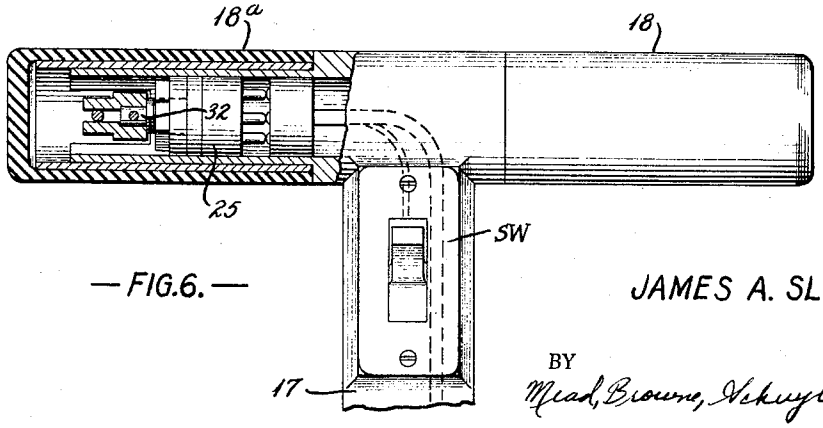
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— FIG. 4.—



— FIG. 5.—



— FIG. 6.—

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ELECTRICALLY DRIVEN INVALID CHAIR

James A. Slater, Eastleigh, England

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Claims priority, application Great Britain January 17, 1956

4 Claims. (Cl. 180—26)

This invention concerns invalid chairs and relates particularly to wheeled invalid chairs intended primarily for indoor use.

Several types of mechanically propelled invalid carriages for use out-of-doors are, of course, already known in the art, and as their prime movers, utilize either internal combustion engines or electric motors. Carriages propelled by internal combustion engines are obviously fundamentally unsuited for indoor use, while those electrically driven carriages which have been available hitherto, by reason of their steering constructions and drive arrangements, and their physical size together with that of the storage batteries required to operate the drive arrangements, have been of such unwieldy dimensions and limited manoeuvrability as to be impracticable for use indoors in domestic premises.

It is, therefore, an object of the invention to provide a highly manoeuvrable, mechanically propelled invalid chair suitable for indoor use and having dimensions of an order permitting it readily to negotiate paths between and around domestic furniture and the like.

According to the present invention, a mechanically propelled invalid chair includes a seat-carrying upright framework of which the height is commensurate with its width and length, a pair of non-driven spaced wheels supported or journalled in the base of said framework at or near to the rearward lateral edge thereof, a single driven wheel supported centrally of the lateral forward region of said framework, said wheel being adapted by way of steering means conveniently accessible to a person disposed on said seat, to be rotated at least through substantially a semicircle, and a front wheel driving motor mounted immediately adjacent said wheel in such a manner as to partake in the steering movements thereof.

The chair is preferably constructed of tubular material, for example tubular steel, and may conveniently comprise a cantilever chair of the type commonly employed as so-called nesting chairs. Such a chair presents a convenient base for mounting the aforementioned wheels, and between this base and the seat-carrying portion provides ample space for mounting an electric motor, steering means and storage batteries. The springing action of the cantilever type of chair is also a desirable feature.

The steering means preferably comprises a substantially upright steering column terminating at a height to be grasped by a person seated in the chair and detachably connectable with a box pivotally secured to a transverse member extending between the lateral forward extremities of the framework and housing said motor, said box at the same time presenting journal bearings or the like supports for the front wheel.

The invention will be described further, by way of example, with reference to the accompanying drawings, in which:

Fig. 1 is a perspective elevation of one invalid chair constructed in accordance with the invention,

Fig. 2 is a diagrammatic sectional elevation of the front wheel drive and steering arrangements,

Fig. 3 is a detail of a steering column used to steer and control the arrangement of Fig. 2,

Fig. 4 is a detail in perspective showing the rear wheels suspension and battery-carrying arrangement,

Fig. 5 is a schematic circuit diagram of the drive and control arrangements for the chair, and

Fig. 6 is a front view from the chair side of the steering handle, partially broken away, to show the electrical switch means contained therein.

In the embodiment of the invention shown in the drawings, between the forward, upright laterally spaced frame portions 1*a*, 1*b* of a cantilever chair 2 of tubular steel construction, there extends a transverse steel tube 3 centrally intermediate the ends of which is secured a stout metal casting 4 presenting an upright collar 5. Freely rotatable within this collar 5 there engages a smaller diameter tubular stub 6 projecting from or secured to the upper face of a box housing 7, at a lower region of which is journalled a single front wheel 8. The upper portion of this stub is threaded and engaged by a nut 6*a* to hold the box 7 secured to the collar 5. Two laterally spaced rear wheel 9 are located on an axle 10 at a rearward region of the base portion of the chair framework to complete a stable three-wheeled support for the chair 2.

Within the housing 7 is mounted a fractional horsepower electric motor 11, the means for energising and controlling which will later be more fully explained, and the output shaft of this motor terminates in reduction gear box 12 presenting a chain sprocket 13. The rotational drive provided at the gear box 12 by the motor output shaft is then taken via a chain 14 coupled to a chain wheel 15 secured to or formed integrally with the front driving wheel 8 of the chair 2 itself. Ball races 16 may, if desired, be interposed between the metal collar 5 and the stub 6 projecting from the upper face of the housing 7, and it will be appreciated that by coupling to the stub, a suitable means for effecting rotation thereof relative to said collar, the motor housing and hence the front driving wheel can, if desired, be rotated through a full 360°. Preferably, however, mutually co-operating stop means (not shown) are incorporated on the stub 6 and the metal collar 5 to prevent a rotation greater than about 190° with the chair moving in a forward direction, the remaining 170° of a complete turning circle being obtained by placing the chair in reverse. In this connection it will be noted that the box 7 is suspended in the collar 5 at a forward region of said box, so that the longer rearward portion is housed and freely rotatable between the side members of the chair framework.

The steering means in this embodiment of the invention comprise an upright column 17 (Figs. 1 and 3) which at its top end is provided with a transverse, rubber- or plastic-faced manual grip 18. As will be described later, a portion 18*a* of this manual grip may be made rotatable relative to the remainder, whereby rotary movement of said portion 18*a* may operate an electric switch 25 housed within the grip and adapted to control the supply of electrical energy to the driving motor. For this reason, and also to enable the upright column 17 to be detachably connected with the motor and front wheel housing, the lower end of the steering column and the interior of the stub 6 at the top of the housing may be provided with mutually co-operating electrical plug and socket means 19*a*, 19*b*. The stub and the lower end of the steering column are likewise provided with mutually co-operating stout pin 20 and a keyway 21 adapted for interengagement to transmit steering movements from the column to the stub.

One or more storage batteries diagrammatically indicated at 22 for supplying electrical energy to the driving motor 11, are carried on a tray 23 extending transversely across the base of the chair framework, for example be-

tween the two rear wheels 9, only a single lead into the motor and front wheel housing 7 being necessary, since the return path to the battery may conveniently be completed through the metal framework of the chair 2. In order to provide a relatively slow and also for a faster forward speed, it has been found convenient to use a change-field motor having two windings, and switch means for placing these windings either in series or parallel. The switch means also provides for reversing the connection of the armature with respect to the fields to permit reverse movement of the chair. For this purpose the motor and front wheel housing 7 also includes a relay box 24 (Fig. 2) wherein are mounted two double-pole change-over relays RF and HF (Fig. 5) and a third relay SS provided with two make contacts 31. The manual grip 18 at the upper end of the steering column, at an inner region thereof, fixedly houses a three-pole, four position manually operated rotary switch 25, the control spindle 32 of which is secured to the manually rotatable outer portion 18*a* of the manual grip 18. In this rotary switch 25 (see Fig. 5) the wiper 33, 33′ and 33″ of each section is connected, via an isolating switch SW, to the chair frame, which in turn is connected to the negative pole of the battery 22, and one position 34, 34′ and 34″ in each section of the switch 25 is left disconnected to provide for a "stop" position. Preferably this stop position is provided at the second position of each section of the switch 25, considering rotation of the control spindle and hence of the wiper in a clockwise direction. The remaining clockwise positions of two sections of switch 25 are commoned together and connected to one end of the operating coil of the relay RF, which also has a make contact 35 adapted on operation of said relay, to extend earth to the operating coil of relay SS, the other end of the operating coil of relay SS being connected to battery positive. The make contacts 31 of relay SS are paralleled and inserted in the positive battery lead through the motor armature 26 so that relay SS thus operates as a "start" relay. The motor armature 26 is so connected to the contacts 36 of the relay RF, that, as shown, this relay can operate to reverse the current through the armature 26, whereby the direction of rotation of the motor 11 is reversed. It will be observed the earth is also extended to the operating coil of relay SS when the switch 25 is in its fully anti-clockwise position, but that in this case relay RF does not operate. Thus, in the fully anti-clockwise position of switch 25, the motor 11 drives the chair 2 in reverse, but when switch 25 is in either of its two clockwise positions, relay RF operates to reverse the current through the armature and hence the drive is forward.

The second relay HF and its change-over contacts 37 are used to connect the motor field windings either in series or parallel, whereby the two different forward speeds are obtained. For this purpose one of the motor field coils 27 is connected across the two movable contacts of this relay, the other field coil 28 being connected across two of the fixed contacts thereof, one of the latter being connected to the chair frame. A cross-connection including a resistor R is then made between two diagonally opposite fixed contacts of the change-over contacts on this relay HF (but not so as to include that fixed contact which is connected to the chair frame) whereby on operation of relay HF the series connection of the field coils 27 and 28 necessary for a smooth start and slow speed is changed into a parallel connection enabling the motor 11 to develop its full power and to drive at a higher speed.

In the third section of the manually operated rotary switch in the steering column grip, therefore, the fourth position is connected to this last-mentioned relay HF and the first position, thus requiring the wipers to pass through the stop position first, is connected to the reverse relay RF as mentioned above. In order to prevent abrupt rotation of the manually operated switch 25 from a forward speed straight through the stop position and into reverse, the steering column grip 18 includes pin and gate means (not shown) requiring axial displacement of the rotary portion 18*a* of the grip on changing from forward to reverse movement of the chair.

The double pole change over relay RF, which changes armature polarity for forward and reverse, normally (in the non-energized position) has the motor connected so as to propel the chair backwards; also it will be noted that the starting relay SS (in the non-energized position) has its upper fixed contact connected to battery negative. In this state, if the chair is pushed or otherwise propelled forward other than by the motor, there will be an electrical generating action within the motor, the power from which is dissipated through the resistor R. This self-generating action within the motor (which behaves and acts like a dynamo in these circumstances) causes a considerable retarding force within the motor and acts as a brake to the chair. This action takes place regardless of whether the battery is connected or not, and the effect is that the chair will be kept at a safe slow walking speed down steep ramps, regardless of the weight of the person. The state of charge of the batteries in no way affects the action just described.

It will be appreciated that the features proposed by the invention provide a high degree of manoeuvrability and either forward or rearward motion in a chair of compact construction and of dimensions sufficient only to seat a user comfortably in an upright position. Since the steering and driving components of the chair, once the detachable steering column is removed, are contained wholly in the lower portion of said chair, it will be appreciated that it is possible to make the upper portion thereof detachable from the lower portion, as indicated at 29, whereby the two portions may readily be housed, for example, in the luggage compartment of an automobile if desired. Alternatively, the upper portion may be placed on the vehicle seat, where it may be sat in and hence, in effect, occupy no room at all. Hingedly attached to the chair frame by brackets 38 and 39 is a foot board 40 for the comfort and convenience of the occupant.

I claim:

1. An electrically driven invalid chair comprising a chair frame including a pair of vertical, parallel spaced members at the front of said frame, a seat and means for horizontally supporting said seat with respect to said members, a pair of spaced, rear wheels rotatably secured to the back of and within said chair frame and supporting said back of said frame thereon, a horizontal bar extending between and secured to said vertical members below the level of said seat, a fixed collar centrally disposed on said bar, an electrical motor and housing therefor located below said horizontal bar and said seat and having a major portion of said housing disposed within said chair frame, a front wheel mounted on the undersurface of said housing and means driven by said motor within said housing for imparting a driving force to said front wheel, a fixed stub on the upper surface of said housing, said stub having an electrical connector therein, said stub rotatably engaged within said collar, an upright steering column having its lower end rotatably and removably secured within said collar and a handle on the other end of said column, said steering column located adjacent the front edge of said seat, said lower end of said steering column having an electrical connector in removable engagement with said corresponding connector on said stub, and an electrical switch on said handle for controlling the operation of said electrical motor in said housing and imparting movement to said chair.

2. The electrically driven invalid chair defined in claim 1 wherein the electrical connectors on said steering column and said stub are male and female plugs.

3. The electrically driven invalid chair defined in claim

1 wherein said means for horizontally supporting said seat with respect to said vertical, parallel spaced members includes a pair of spaced tubular members which removably engage said vertical members and support said seat in cantilever fashion.

4. An electrically driven invalid chair comprising a chair frame including a pair of vertical, parallel spaced members at the front of said frame, a seat and means for horizontally supporting said seat with respect to said members, a pair of spaced rear wheels rotatably secured to the back of and within said chair frame, said rear wheels supporting the back of said chair frame, a horizontal bar extending between and secured to said vertical members, a fixed collar centrally located on said bar below the level of said seat, an electrical motor and housing therefor located below said horizontal bar and said seat and having a major portion of said housing disposed within said chair frame, said housing rotatably mounted on said collar, a front wheel mounted on the undersurface of said housing and first means driven by said motor within said housing for imparting a driving force to said front wheel, second means on the upper surface of said housing including an electrical connector,

a rotatable upright steering column inserted within said collar and a handle on the upper end of said column, said steering column located adjacent the front edge of said seat, the lower end of said steering column having an electrical connector in removable electrical contact with said electrical connector on said second means, and an electrical switch on said handle for controlling the operation of said electrical motor in said housing and imparting movement to said chair.

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