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(54) Relaxation and massage apparatus.

(57) The invention provides a bed having a series of panels which can be adjusted between a co-planar flat position and one in which the panels are inclined to one another, with motor means for raising and lowering the panels, further motor means for vibrating the panels to provide a massage effect, and infra red control apparatus for said motors.

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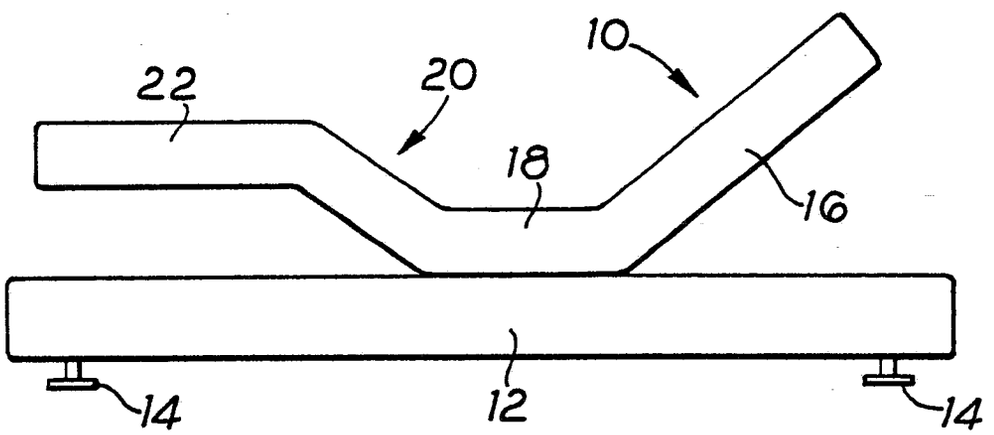
Fig. 1



RELAXATION AND MASSAGE APPARATUS

It is known from Patent GB 1404038 to make a hospital bed with a mattress support comprising four successive panels hinged together for adjustment between a coplanar and flat bed position, and other positions in which for example a first end panel of the series is upwardly inclined to form a backrest, a second of the panels remains fixed, and third and fourth panels are differently inclined to form a leg rest. Motors are provided for effecting the raising and lowering between the different positions. A remote control system is provided including an optical link and this has the important advantage of minimising the risk of electric shock and leakage currents because the remote control operates at low voltage. However, the apparatus of this patent is of limited use and the object of the invention is to provide a more versatile apparatus.

According to the invention relaxation and massage apparatus comprises a frame, a plurality of support panels located on said frame, at least two of said panels being pivoted on axes extending transversely of the length of the frame, first and second motor means for individually raising and lowering said two panels so that the same incline in different directions and possibly to different angles relative to said frame, whereby the panels may be adjusted between a substantially co-planar bed-like position and a chair-like position with a leg rest, third and fourth motor means individually associated with two of said panels and each having out of balance masses so that the said motors may be driven to provide vibrations, and remote control means for operating all of said motors.

Preferably the apparatus is provided with four panels hinged together and the first and fourth are provided with elevation motors (said first and second motors) whereas a further one of said panels is fixed in position on said frame and the remaining one is hinged between the fixed one and one of the motor raisable and lowerable panels.

Preferably the vibratory motors are provided on the same panels as are provided with the raisable and lowerable motor connections.

Preferably the means for raising and lowering the panels comprise struts having one end fixed to the panel to be raised and lowered, and a corresponding recirculating ball unit associated with a screwthreadlike portion on the strut and driven by the appropriate motor to cause the raising and lowering.

Preferably the vibratory motors are mounted directly on the underside of the panels.

Preferably the remote control mechanism comprises an infra-red transmitter which may be for example hand held and an infra-red receiver mounted on the apparatus, and arranged so that a series of successive commands may be transmitted from the transmitter to the receiver for example to select backrest, up, and then stop; alternatively each command function may initiate operation for a preset time period, so that if the backrest is to be raised from the coplanar or flat condition to the maximum angle it may be necessary to select the up control a number of times to give a number of increments of lift. In the case of the vibrator motors, the ON command may be for a preset period of for example 5 or 10 minutes.

One embodiment of the invention is now more particularly described by way of example and with reference with to the accompanying drawings wherein

Figure 1 is an elevation of the bed showing a typical position for use;

Figure 2 is an elevation, somewhat diagrammatic, and with parts omitted for clarity, showing the frame of the same;

Figure 3 is an underside plan view of the frame, again with certain parts omitted for clarity; and

Figure 4 is a block diagram of the control system.

Referring first to Figure 1 the bed shown has a mattress 10 which may comprise a single flexible generally rectangular unit able to conform to different profiles such as that illustrated in Figure 1, or to assume a flat bed-like position, according to the location of the supporting frame to which the mattress is secured, or upon which it rests. The mattress is located above a base 12 which may be supported on feet 14. In the illustrated position, the four successive portions of the mattress may be called the backrest 16, the seat 18, thigh support 20 and leg rest 22.

Turning now to Figures 2 and 3, the frame comprises a pair of side plates 30 (which are generally located within the base 12) and these are connected together and cross-braced by cross-beams, 32,34. This is the fixed and stationery part of the frame and one of the beams 32 is used to support panel 36 which carries the seat portion 18 of the mattress. The side plates 30 may be made of sheet metal with parallel in-turned edges, and the upper of those edges 33 can be fixed to the panel 36 by screws, and the lower edges 35 can be fixed within the base in similar fashion.

The backrest portion 16 is carried by a similar panel 38 mounted on a pair of struts 40 which may likewise be made of sheet metal with in-turned edges fixed by screws to the panel. The struts 40 are braced by a cross-beam 42 and are pivoted to

the side plates 30 on axis 44, which is conveniently located as close as possible to the panels and between the adjacent edges of the panels 36,38.

Similarly, leg rest 22 is supported on panel 50 fixed to the struts 52 braced by cross-beam 54, but in this case there is a parallelogram linkage comprising upper and lower links 56 at one side and 58 at the other side, pivoted on axes 60 to the side plates 30 and to the struts 52 respectively. Panel 70 is for the thigh support and lies between the panels 36 and 50.

The parts are configured to the required profile by a pair of drive systems which are generally located in the positions of the chain dot lines 64,66 Figure 2 extending between the main cross-beam 34 of the stationery part and the cross-beams 42,54 respectively of the two movable panels.

Turning now to Figure 3, the drive systems each comprise motor 72, coupled to gear box 74 so as to give a suitably drive speed, and in turn coupled to a recirculating ball screw jack 76 having one end coupled to the beam 34 and the other to the beam 42 or 54 respectively. Each end of each jack is on a pivot allowing the systems to swing through the narrow angle necessary as the jacks lengthen or shorten in the desired adjusting movement.

The panels carrying the backrest and leg rest portions of the mattress frame each have an associated vibratory motor 80 which as shown is located in a cavity within the mattress (Figure 2) and is mounted on the respective panel 50,38. Each has an out of balance mass, that is an eccentric weight, so that when the motor turns, vibrations are imparted to the panel and due to the upholstery, a massaging effect is applied to the user of the bed/chair.

The motors, both those of the jack systems 72 and of the vibratory massage system 80 will usually be mains voltage, for example 110-120 or 220-240 volt. The control system is to be low voltage, for example using a dry cell located in a hand held infra red transmitter so as to be self-contained and completely isolated from the mains electric supplies. As is well known, such a transmitter need not be in direct line of sight with a corresponding receiver, for the transmitter infra red code signal may be reflected from room surfaces to reach the receiver which can therefore be located in any convenient position for example within the base 12.

Referring now to Fig 4, the control system is designed around an infra-red link, and comprises four main blocks :

A) Transmitter
B) Receiver Head
C) Control Logic
D) Power Interface

A) Transmitter

The functional design of the transmitter provides two sets of operating controls.

1) A set of five controls which determine the mode that control is to be exercised and represent back-rest lift, leg-rest lift, back massage, leg massage, and timer.

2) A set of three controls which are the active controls and represent up, down and stop.

These eight controls are coded by pulse position modulation onto an infra-red beam.

B) Receiver Head

The receiver head provides detection and preamplification of the infra-red signal and passes this signal onto the control logic. Integral with the receiver head are displays which indicate to the user the current selected mode of operation, the current active command (if any), and also when in the timer mode shows the time set by the user as a linear bargraph. These displays are driven from signals generated by the control logic.

C) Control Logic

This section is conveniently split into six blocks as in the diagram. These may be labelled:

i) Decoder
ii) Burst Generator/Counter
iii) Function Counter
iv) Magnitude Comparators
v) Timer
vi) Display Decoder/Driver
vii) Lift Decoder

i) The decoder accepts the preamplified pulse position modulated signal from the receiver head and demodulates into the original eight control signals. For convenience in other parts of the control logic section, Boolean functions are carried out on the active eight signals, and timing correction to ensure synchronicity with incoming mains frequency. The various logic levels produced by the decoder are distributed for use throughout the remainder of the control logic.

ii) The burst generator derives a square wave from incoming mains at mains frequency. This square wave is used to gate a free running oscillator running at approximately 512 times mains frequency. A variable time delay is introduced between the trigger point of the square wave and the gating on of the free running oscillator. The delay effects pre-set control over the maximum speed of the motors.

The output from the free running oscillator is

passed to an eight bit binary counter, whose terminal count output is used to inhibit the free running oscillator. As this terminal count appears after 256 counts, in one half mains cycle the binary count progresses from zero to 255. By adjusting the free running frequency of the oscillator, the counter reaches its maximum count at an earlier or later point during the half cycle of mains. At mains zero crossing the counter is reset until the next trigger pulse. The outputs from the counter appear as an eight wide binary bus.

iii) The two function counters are associated with and are under the control of the mode controls back massage and leg massage. As an example, the back massage function counter is enabled whilst the back massage mode is selected by the receiver and decoded control signal. Each function counter comprises an eight bit binary up/down counter, counting a clock frequency derived from incoming mains, in a direction controlled by the up or down active received control signals. In this way, when a function counter is enabled by its corresponding mode control, its count can be varied by an up or a down command through the infra-red link.

The stop command applies a reset to both function counters. The outputs of both function counters each appear as an eight wide binary bus.

iv) The eight wide bus output of each function counter is applied to one set of inputs of an eight bit magnitude comparator. The burst generator/counter provides an eight wide bus which is applied to the second set of inputs of each magnitude comparator.

The output of each magnitude comparator provides a pulse at the point when the two sets of inputs correspond. This pulse occurs at a point in the mains cycle set by the binary count on the corresponding function counter, and is used to control the firing point of a thyristor which in turn controls the current passing through a permanent magnet motor. In this way the motor rotates at one of 255 speeds, or stop. To the motor shaft is fixed an eccentric mass, so that mechanical vibration is caused when the motor rotates.

v) Incoming mains frequency is divided to produce one pulse each ten minutes, this is applied to the clock input of a four bit presettable down counter acting as a timer. This counter is preset to binary five when either the timer mode is entered or when one motor is started. The active 'down' control can decrement this count by acting as an auxiliary clock input.

In this way the user can control the count appearing at the counter output. This count will then decrement by one every ten minutes until it reaches zero, when a pulse is generated which is applied as a reset to the function counters, thus stopping any motors running. The active stop command also resets the timer counter.

vi) The display decoder/driver accepts both the mode controls and the active controls and also during the timer mode the binary count appearing on the timer counter. These are decoded and used to drive the displays.

vii) The lift decoder applied Boolean functions to the mode controls 'back lift' and 'leg lift', and the active controls 'up' and 'down', to produce four control lines used to switch the two lift motors bidirectionally. Interlock circuits are provided to prevent accidental operation of both 'up' and 'down' on one motor simultaneously.

D)

The power interface provides power supply for the control electronics power switching for the lift motors and speed control thyristor switching for the massage motors. All motors are driven through opto-isolators, offering complete operator safety.

Claims

1. Relaxation and massage apparatus comprising a frame, a plurality of support panels located on said frame, at least two of said panels being pivoted on axes extending transversely of the length of the frame, first and second motor means for individually raising and lowering said two panels so that the same incline in different directions and possibly to different angles relative to said frame, whereby the panels may be adjusted between a substantially co-planar bed-like position and a chair-like position with a leg rest, third and fourth motor means individually associated with two of said panels and each having out of balance masses so that the said motors may be driven to provide vibrations, and remote control means for operating all of said motors.

2. Apparatus as claimed in Claim 1 comprising four panels hinged together, with the first and fourth provided with said first and second motor means.

3. Apparatus as claimed in Claim 1 wherein said vibratory motors are provided on the first and fourth panels.

4. Apparatus as claimed in Claim 1 wherein the means for raising and lowering the panels comprise struts having one end fixed to the panel to be raised and lowered and a corresponding recirculating ball unit associated with the screw-thread like portion on a corresponding strut but driven by the appropriate motor to cause the raising and lowering.

5. Apparatus as claimed in any preceding claim wherein the remote control mechanism comprises an infra-red transmitter and receiver.

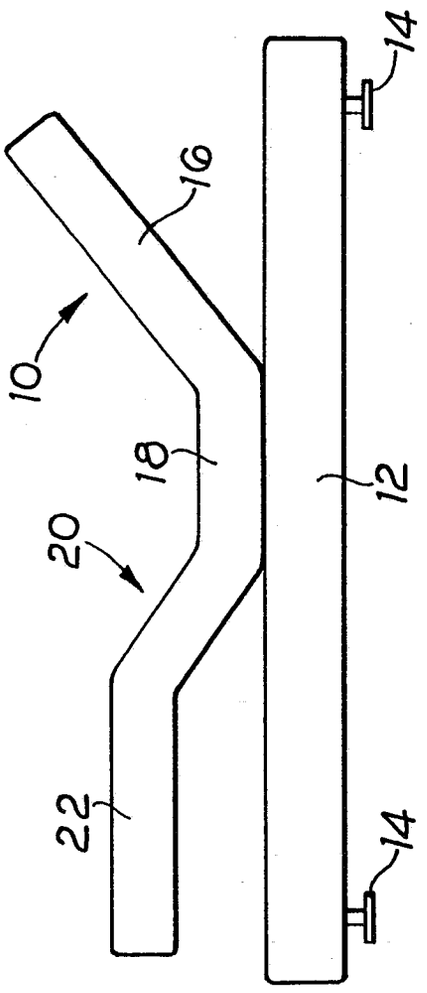


Fig. 1

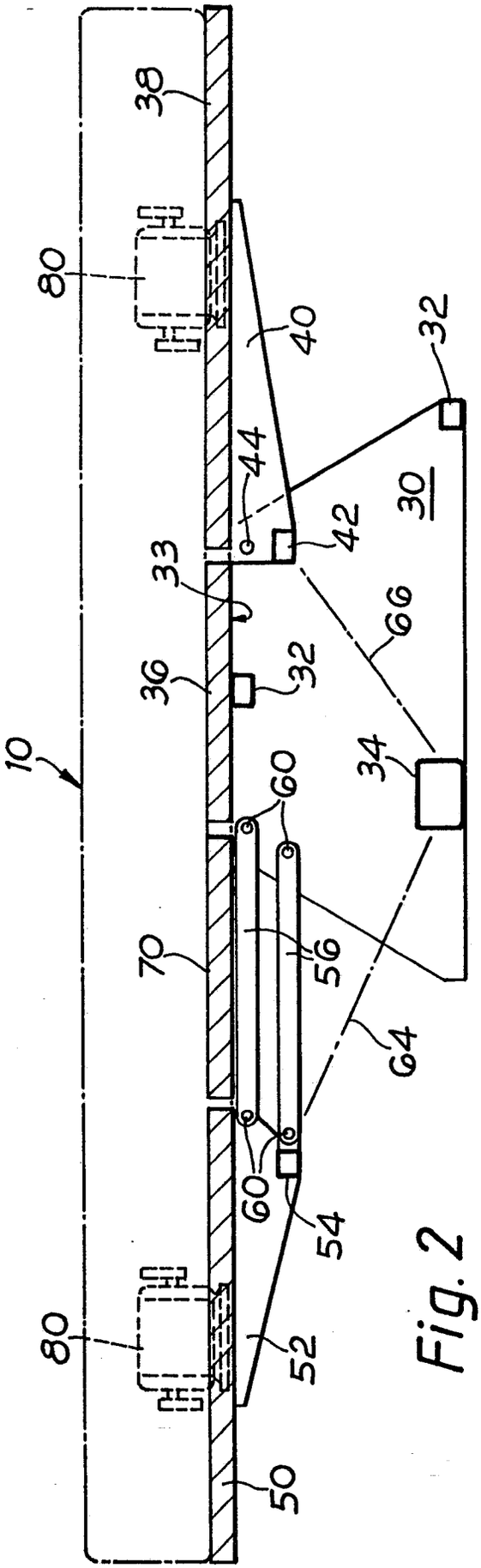


Fig. 2

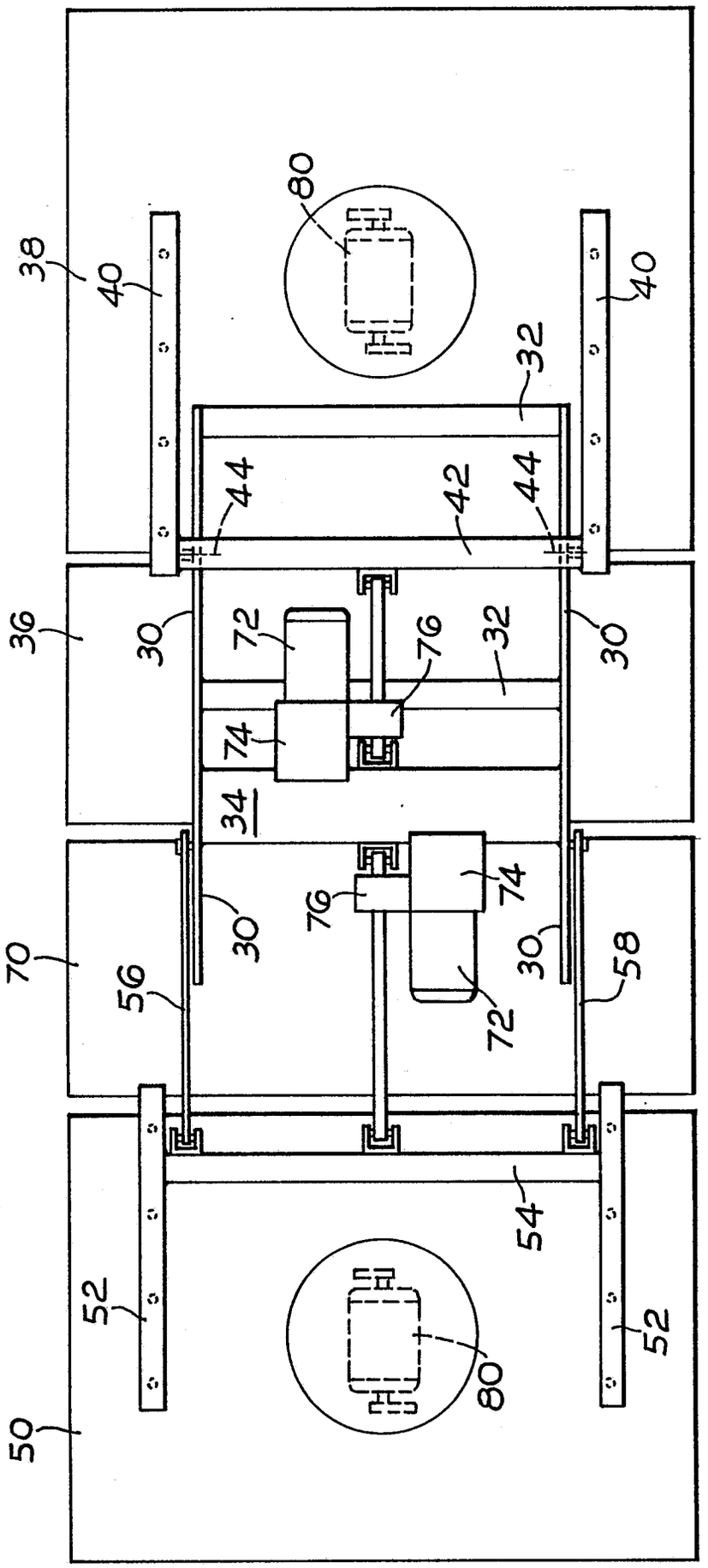


Fig. 3

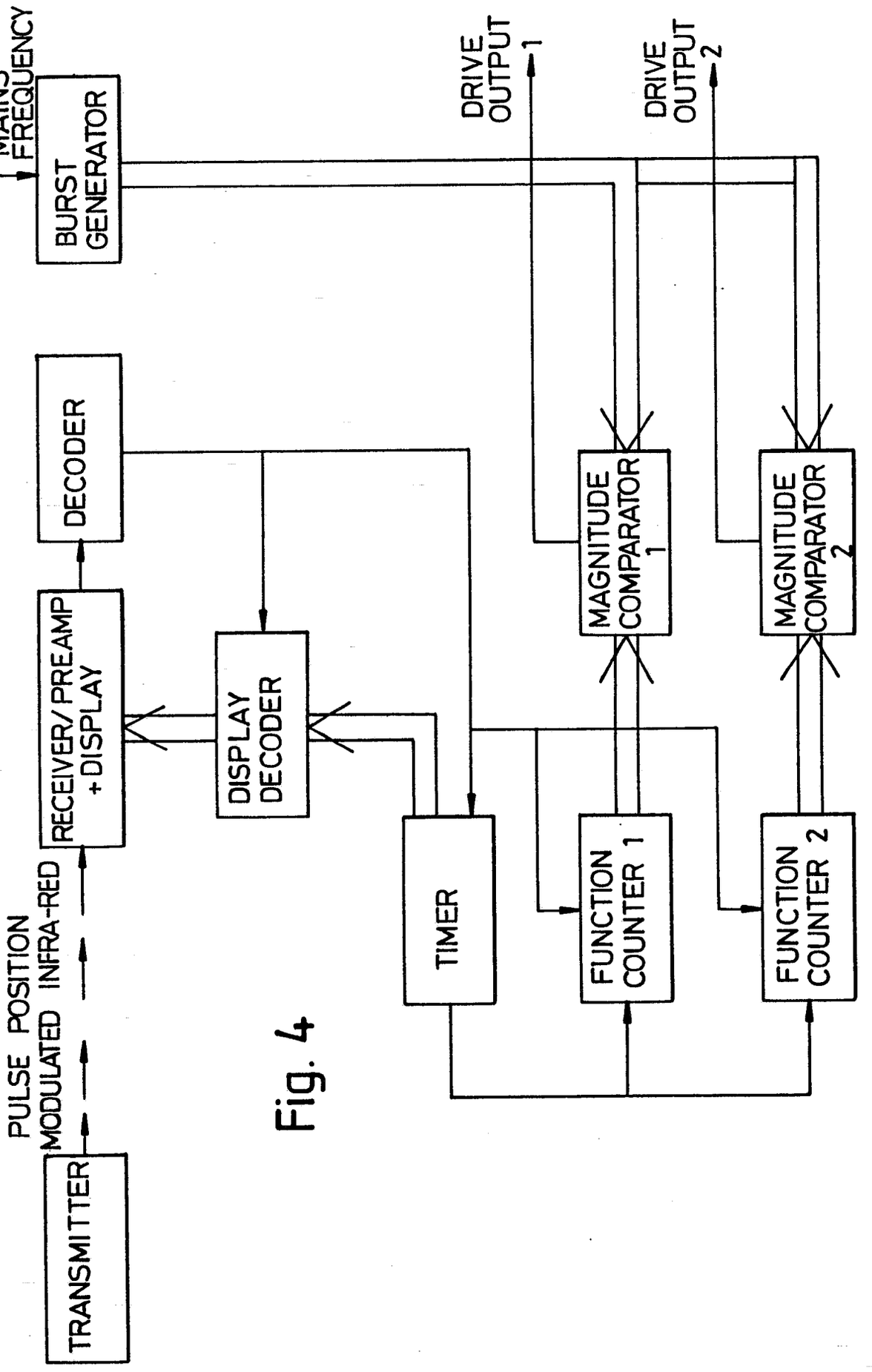


Fig. 4