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3,287,552

REMOTE CONTROLLED LIGHTING SYSTEM

Filed Nov. 15, 1963

2 Sheets-Sheet 1

FIG. 1.

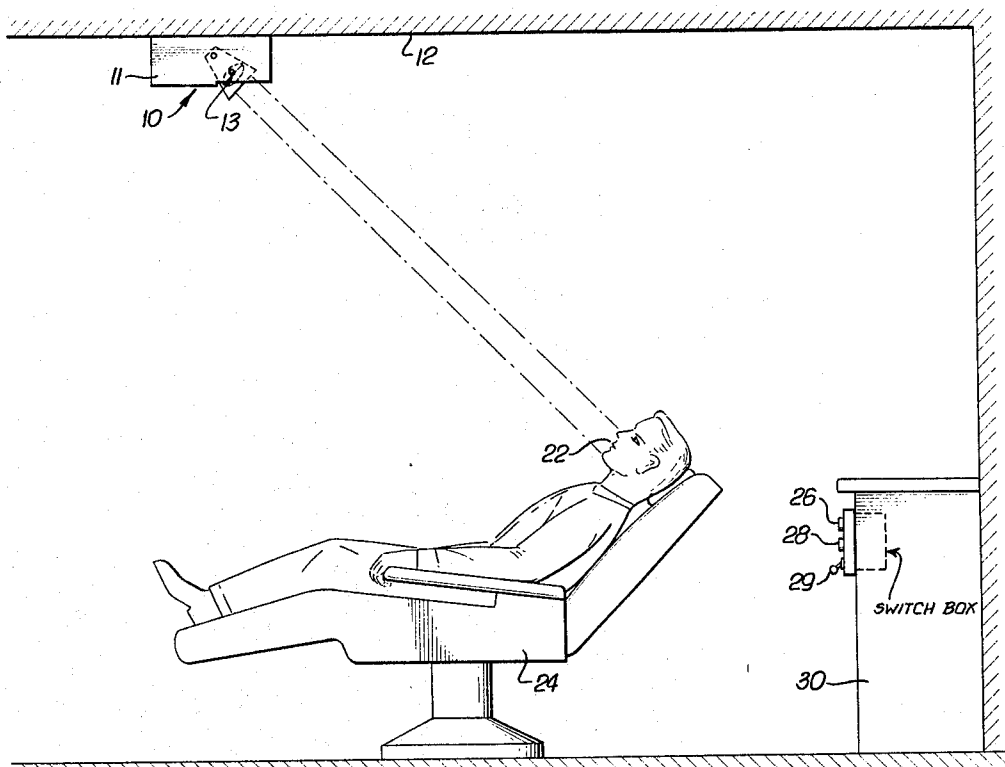


FIG. 2.

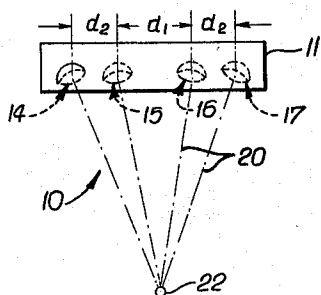
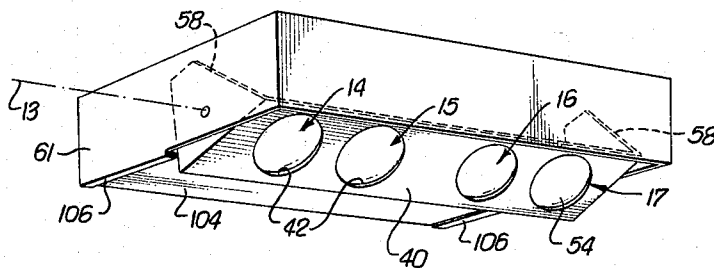


FIG. 3.

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FIG. 4.

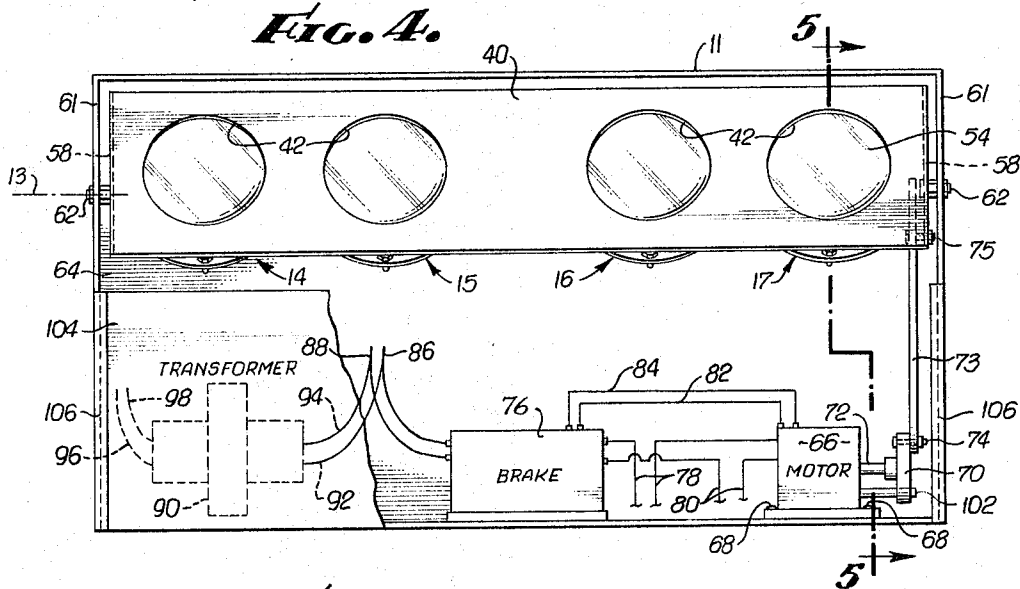


FIG. 5.

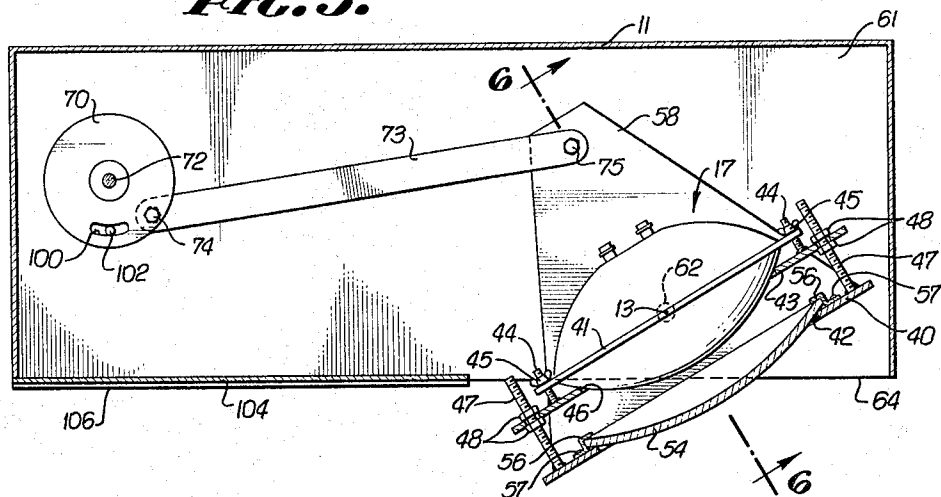
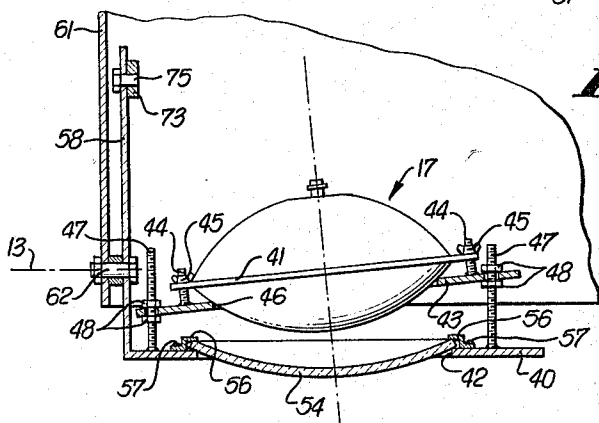


FIG. 6.



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3,287,552

REMOTE CONTROLLED LIGHTING SYSTEM
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The present invention relates to a remote controlled lighting system and more particularly to a lighting system for dental work which satisfies the needs demanded by modern layout of dental operatory.

In the layout and design of the dental operatory, the present day approach is to provide maximum comfort for the patient, both physically and psychologically. Concurrent with this the doctor's task should be as simplified as possible. In order to meet these goals many changes have taken place in the operatory layout.

For the patient's comfort contoured dental chairs have been designed. The contoured dental chair places the patient in a reclined position and by its appearance adds considerably to the patient's well-being. In contrast, the standard upright high-backed dental chair had a series of chrome plated levers, rods and assorted gadgetry which by its appearance connotated dental discomfort. Also, by placing the patient in a reclining contoured chair, it is easier for the dentist to sit down while operating on the patient.

Another change has been the advent of high-speed air-driven drilling equipment which has eliminated the multi-armed suspended electric-driven drills. In the place of belt driven drills, a simple air hose is connected to the handpiece or drill. The drill and hose are inconspicuous and may be placed out of the patient's sight. This advance eliminates the equipment which is most commonly associated with pain.

Still further, the tall dental unit which supported a multi-armed dental operating light, the belt driven drill, an extended work table, which also contained a cuspidor, air, water, and related attachments, is now being replaced by a pleasing low console unit with nothing suspended from it. The console's appearance is a pleasant adjunct in the new operatory layout.

In striving toward maximum comfort to the patient and convenience to the doctor, the prior art has stumbled in its search for a dental lighting system which will adequately meet these goals. When the aforementioned dental unit was replaced by the console, the problem existed of what to do with the multi-armed dental operating light. In order to meet this problem, the prior art suspended the light from a wall or the ceiling or even mounted it on a floor pedestal. In many instances two dental lights were used, one being on one side of the patient and controlled by the doctor and the other being on the other side of the patient and controlled by an assistant. Today the multi-armed dental operating light is standard equipment in most dental offices.

The multi-armed dental light is not compatible with modern layout of dental operatory. The many arms and mechanisms of this light, which are so apparent to one sitting in the dental chair, present a psychological barrier to putting the patient at ease. This problem is aggravated when the arms move over the patient while the doctor or his assistant is directing the light within the patient's mouth.

Further, the multi-armed dental light does not provide the convenience to the doctor which is demanded by modern layout of dental operatory. In positioning the light the doctor must be concerned about keeping the

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light a sufficient distance from the patient's mouth so that the heat radiated therefrom is not uncomfortable, with getting the light sufficiently close to the mouth so that there is proper illumination and directing the light so that while he is working in the mouth undesirable shadows will not be cast. With these requirements in mind and the many possible planes of movement of the multi-armed light the doctor unconsciously goes through a trail and error process to properly position the light. These problems are further aggravated when an assistant is required to position the light to the doctor's satisfaction. It is important that the doctor not be burdened or aggravated by the setting of the dental light since his mind must be free for concentration on the dental work to be performed.

Other lighting systems found in the prior art, such as the remotely controlled surgical operating lights, do not meet the demands of the modern layout of dental operatory. Further, the fixed ceiling mounted lighting systems are not practical since a dental light must be positioned for each individual patient and the task to be performed.

The present invention has overcome the problems presently existing by providing a remotely controlled compact lighting system which is adapted to be mounted on the ceiling and precisely positioned by finger tip actuation to direct the light within the patient's mouth.

The invention has provided a novel arrangement which is so compact and unnoticeable in its operation that it will not present any psychological barrier to putting the patient at ease in the dental chair. This arrangement has eliminated the gadgetry that normally surrounds the patient when using presently existing dental systems.

The present invention overcomes the problem of properly positioning lights for illumination of a patient's mouth by rotatably mounting the lights about a fixed axis with the axes of the beams directed to converge at a predetermined point with respect to the dental chair. With such an arrangement the dentist need only be concerned with positioning the lights about a single axis.

In the preferred embodiment, the lights are motor driven and controls are provided which are readily accessible to the dentist for actuating the motor. In order to precisely position the lights a brake is provided which will instantaneously brake the movement of the motor as soon as it is de-energized so as to prevent overshooting of the lights from their intended position.

Shadows from the doctor's body or his instruments have been eliminated by arranging two pairs of lights in a lateral fashion along an axis with the pairs of lights spaced from one another so as to project a pair of light beams from both sides of the patient's mouth. Accordingly, should the doctor's body block the beams from one pair of lights the other pair will ensure proper illumination. Further, this arrangement allows the doctor to utilize his instruments and his hand within the central portion of the mouth without a material lessening of the illumination.

Further, a lens means is provided for the lighting system which will color correct the light beams and eliminate glare. The lens in combination with low voltage light sources ensures that there are no heating problems. The lens means may be fixedly mounted on the assembly so that the ordinary seal-beam type of light can be employed.

Because of the novel arrangement provided by the invention, the lighting system can be easily mounted on the ceiling, flush with the ceiling or even on a wall. The system is provided with a means for selectively adjusting

the lights to converge to a common point after the system is mounted.

If desired the lighting system can be easily mounted on a track-train arrangement on the ceiling for movement toward or away from the patient. Alternatively, the system could be easily mounted with means for telescoping the lights vertically with respect to the ceiling. In either instance remote controls may be used for selected positioning.

An object of the present invention is to provide a dental lighting system which satisfies the demands of modern layout of dental operatory.

Another object is to provide a dental lighting system which presents a minimum of psychological disturbance to a patient sitting in a dental chair.

Still another object is to provide a movable dental lighting system which can be operated conveniently by the doctor while he is working within the mouth of a patient.

Still another object is to provide a dental lighting system which is movable by a motor and which upon control will not overshoot the desired area to be illuminated.

Still another object is to provide a movable dental lighting system which is precisely and easily controlled and which is capable of adjustment for illumination at varying distances from the system.

Still a further object is to provide a dental lighting system which has an arrangement of lights which will minimize shadows within the mouth of the patient when a dentist is working therein.

Still another object is to provide a dental lighting system which is color corrected, has minimum glare and radiates a minimum amount of heat.

Other objects and many of the attendant advantages of this invention will be readily apparent as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

FIG. 1 is a side view of the lighting system and a patient sitting in a dental chair;

FIG. 2 is an isometric view of a portion of the preferred lighting system with the lens means removed so as to see the light units.

FIG. 3 is a diagrammatic view showing the convergence of the beam axes.

FIG. 4 is a bottom view of the preferred lighting system with a portion thereof cut away and with the electrical circuitry involved shown schematically.

FIG. 5 is a sectional view taken along line V—V of FIG. 4.

FIG. 6 is a section view taken along line VI—VI of FIG. 5.

Referring now to the drawings, wherein like reference numerals designate like or corresponding parts throughout the several views, there is shown in FIG. 1 a preferred dental lighting system 10 having a housing 11 which is fixed to a ceiling 12 within the office of a dentist by any suitable means such as screws (not shown).

A plurality of light units 14, 15, 16 and 17, each of which is capable of projecting a light beam, is pivoted within the housing 11 about an axis of rotation 13. The light units are positioned so that the axes 20 of the light beams therefrom converge to an operating point 22 within the mouth of a patient sitting in a dental chair 24.

Remote control switches 26 and 28 and an on-off switch 29 are provided in an easily accessible place to the dentist such as on a cabinet 30. The switch 26 is capable of actuating the system for rotation of the light units about the axis 13 in one direction and the switch 28 is capable of actuating the light units in an opposite direction about the axis 13.

In the preferred embodiment of the invention the switches 26 and 28 are of the push button type so as to move the light units when pushed in and stop the light units when released. Further, the switches should be responsive to a "feather touch" from the operator's finger.

The general arrangement just described allows the positioning of the light units so as to properly illuminate the patient's mouth by merely pushing one or the other of the push buttons of the switches 26 or 28.

As shown in FIG. 2, the light units 14, 15, 16 and 17 are laterally mounted on an elongated rack 40 so as to be capable of projecting the beams of light therefrom through openings 42 within the rack.

Reference is made to FIGS. 5 and 6 for the details of mounting the light unit 17, this type of mounting being the same for the other light units. The light unit 17 is connected to a respective plate 43 by bolts 44 fixed to the plate 43 and wing nuts 45, the plate 43 having an opening 46 smaller than the periphery of the light unit 17.

The bolts 44 extend through holes in a rim portion 41 of the light unit 17 so that when the wing nuts 45 are tightened, the light unit 17 is pressed firmly against the plate 43. The plate 43 in turn is adjustably mounted on the rack 40 by bolts 47 and pairs of nuts 48, the bolts 47 being connected to the rack 40 and slidably extending through the holes in the plate 43.

Each nut within a pair of nuts 48 is on an opposite side of the plate 43 so that the light unit 17 can be selectively angled with respect to the rack 40 to bring the axis of the light beam to an intersection with the axes of the light beams from the other light units as shown in FIG. 3.

A lens 54 is mounted within the opening 42 in front of the light unit 17 so as to be capable of filtering infrared light from the light unit. This lens will color correct the light and absorb most of the heat radiated therefrom. The lens 54 may be held in place on the rack 40 by any suitable means such as clips 56 fixed to the rack by screws 57. The mounting of a lens for the other light units is the same as that described for the light unit 17.

In the preferred embodiment the light units are arranged in pairs, the light units 14 and 15 forming one pair being spaced a distance d_1 from light units 16 and 17 forming the other pair. In the preferred embodiment distance d_2 between the light units in each pair is equal and approximately one-half of the distance d_1 . The pairs of lights are symmetrically arranged on the rack 40 so that the half-way mark of distance d_1 establishes the center of the dental system 10. Accordingly, the system is adapted for installation on the ceiling 12 with the center of the system lying within a vertical transverse plane lengthwise through the chair 24. This will allow the doctor to work without casting objectionable shadows in the patient's mouth.

The rack 40 is provided with transverse arms 58 which are pivoted within the housing 11 to opposite sides 61 thereof by any suitable means such as pins 62, the housing 11 having an opening 64 for allowing the light to be projected therethrough. The location of the pivot points may be such that a line drawn between the pins 62 substantially coincides with an axis extending through the sources of light of the light units 14, 15, 16 and 17.

A reversible motor 66 is fixedly mounted within the housing 11 by any suitable means such as metal screws 68. A circular plate 70 is centrally and fixedly mounted on an output shaft 72 of the motor. An arm 73 is rotatably mounted at one end to the plate 70 by a bolt with limited threads and nut 74 and rotatably mounted at an opposite end to one of the arms 58 by a bolt with limited threads and a nut 75. Accordingly, when the motor 66 is energized the plate 70 will actuate the arm 73 to move the arm 58 and pivot the light units about the axis 13.

The motor 66 is connected to a brake 76 via lines 78, 80, 82 and 84, the line 78 going through the switch 26, the line 80 going through the switch 28 and line 82 acting as a return for current through either switch.

The brake in turn is connected to a power source (not shown) via lines 86 and 88, one of these lines going through the switch 29 for turning the system on and off.

The brake has a capacitor which responds to the release of push button actuation of either of the switches 26 or 28 to feed a counter current via lines 82 and 84 to the

motor 66 so as to instantaneously stop the motor 66 when the doctor releases the switch.

A transformer 90 is connected to the source of power via lines 92 and 94 and has output leads for feeding a low voltage (such as 12 volts), via lines 96 and 98 to the light units.

In order to ensure that the light units are not pivoted too far in one direction, the plate 70 is provided with an arcuate slot 100 of a size to slidably receive therethrough a pin 102, the pin 102 being fixedly secured to the motor 66.

In order to facilitate accessibility to the motor 66 and other components within the housing 11, the housing has a cover plate 104 which is slidable on lips 106, the lips 106 being turned in portions of the housing 11. When the components within the housing 11 are to be inspected or serviced, the cover plate 104 is merely slid back so as to make an opening.

It has been found suitable to employ a "Tung-Sol Seal Beam No. 4416" for each of the bulbs within the device, utilizing a low voltage such as 12 volts. Further, it has been found satisfactory to employ a five-inch convex Corning Lens made of Corning Glass for each of the lenses. Such a lens absorbs 99 percent of the infrared light projected by the light unit and will absorb a considerable amount of the heat therefrom, correcting the light to 4,000° Kelvin which is the desired level for dental operating lights.

Normally, the only chair movement that the dentist is concerned about is various reclining positions of the back portion. Accordingly, it is desirable, upon the installation of the present lighting system, to fix the housing 11 to the ceiling 12 with the axis 13 substantially normal to a vertical longitudinal plane through the chair 24. The lighting system is adapted for minimizing shadows while the doctor is working on the patient by installing the light with its center (center of the distance d_1) lying within the vertical plane passing through the longitudinal axis of the chair 24.

After installation of housing 11 on the ceiling 12, the nuts 48 are selectively adjusted along the screws 47 until the light units project the light beams with their central axes 20 converging to the operating point 22, as shown in FIG. 3.

In the operation of the lighting system a patient is sitting in the chair 24 with his head resting on the head rest portion thereof. Because of the various heights of patients, the head will be located in various positions along the upper portion of the chair, thus making it necessary to adjust the lighting system for illumination of the patient's mouth. After turning the light units on by the use of switch 29, the doctor easily makes the adjustment by pushing one or the other of the switches 26 or 28, the particular switch pushed determining the direction of movement of the light units. Upon reaching the desired location the doctor need merely release the switch, this release causing the light units to be instantaneously braked by the brake 76 and immediately stopped. Accordingly, the doctor is greatly relieved in setting his lights for proper illumination of the patient's mouth prior to commencing the dental work.

In some instances it may be desirable to locate the on-off switch 29 and the push button switches 26 and 28 on the dental chair 24. Whether the controls are located on the chair 24, the cabinet 30 or some other easily accessible location to the doctor is merely a matter of preference to the individual doctor.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

I claim:

1. A remote controlled lighting system for projecting

light into the mouth of a patient reclining in a dentist chair comprising:

- a housing;
- an elongated rack having two pairs of openings;
- a pair of arms connected to said rack and pivoted within said housing for rotatably mounting said rack about an axis of rotation;
- two pairs of light units wherein each unit is capable of projecting a beam of light;
- means connected to the rack positioning each light unit adjacent a respective opening with each beam of light projectable therethrough and said means also for angularly adjusting the central axis of each beam so that the beam axes can be converged to a selected common point within the patient's mouth;
- the distance between the openings within each pair being substantially equal and approximately one-half the distance between said pairs;
- a reversible motor carried within said housing and spaced from one of said arms;
- linkage means connected at one end to an output shaft of said motor at a location eccentric the longitudinal axis of the shaft and at an opposite end to said one arm at a point which is spaced from said axis of rotation so that upon operation of said motor the light units are rotated about the axis of rotation and the selected common point is swung in an arc which is in a plane substantially normal to said axis of rotation;
- means connected to said motor for limiting its movement in both directions so that a moment arm always exists between the force of the motor and said linkage means;
- a pair of push button type switches connected to said motor for energizing the motor in opposite directions and for de-energizing the motor when the button is released;
- said switches being mounted on a support in the proximity of said chair;
- means connecting said motor and responsive to said switches for instantly braking momentum of said motor upon de-energization thereof so that said common point can be instantly stopped at a desired location to properly illuminate a patient's mouth;
- lens means carried by said housing which is capable of absorbing light which falls within a predetermined range of wave lengths; and
- said lens means being positioned within the paths of light beams projectionable from said light units.

2. A remote controlled lighting system for projecting light into the mouth of a patient reclining in a dentist chair comprising:

- a housing;
- an elongated rack having pairs of openings;
- a pair of arms connected to said rack and pivoted within said housing for rotatably mounting said rack about an axis of rotation;
- pairs of light units wherein each unit is capable of projecting a beam of light;
- means connected to the rack positioning each light unit adjacent a respective opening with each beam of light projectable therethrough and said means also for angularly adjusting the central axis of each beam so that the beam axes can be converged to a selected common point within the patient's mouth;
- the distance between the openings within each pair of light units being substantially equal and approximately one-half the distance between pairs;
- reversible motor means within said housing for energizing said pair of arms for rotating said light means about the axis of rotation to swing the selected common point in an arc which is in a plane substantially normal to said axis of rotation; and
- remote control means for selectively energizing said motor.

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