June 6, 1939. L. H. SCHWARTZ 2,161,688

TRANSILLUMINATING DEVICE

Filed Oct. 25, 1935 2 Sheets-Sheet 1

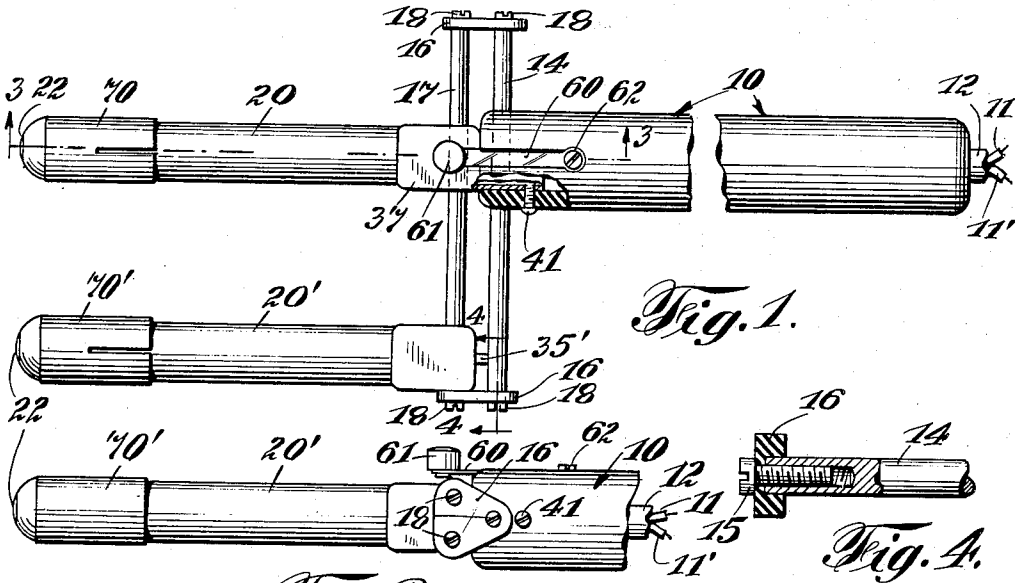


Fig. 1.

Fig. 2.

Fig. 4.

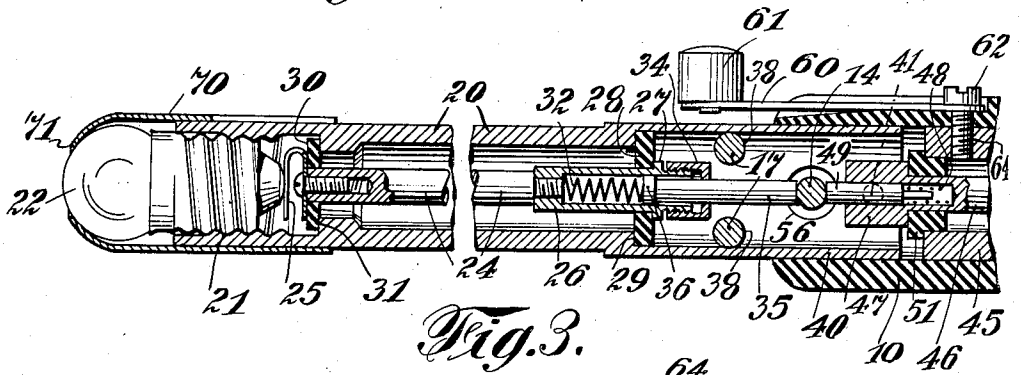


Fig. 3.

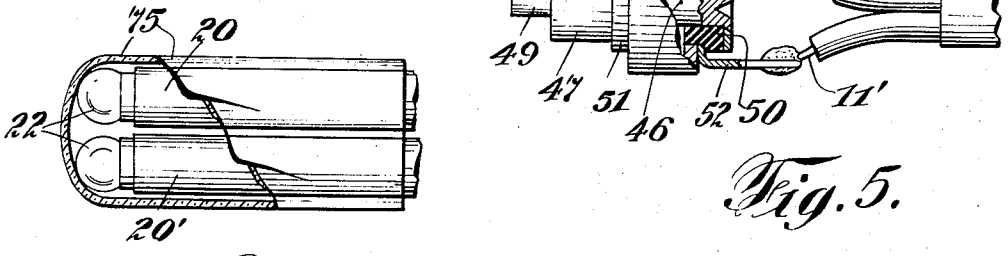


Fig. 5.

Fig. 6.

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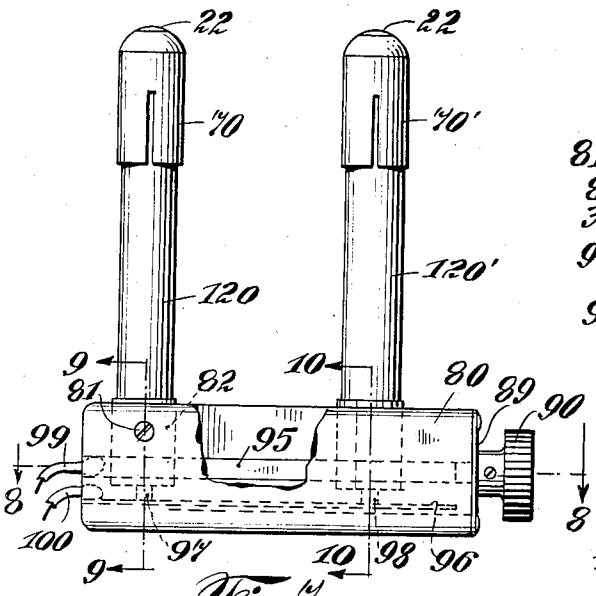


Fig. 7.

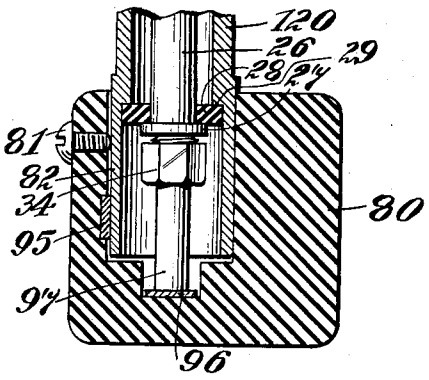


Fig. 9.

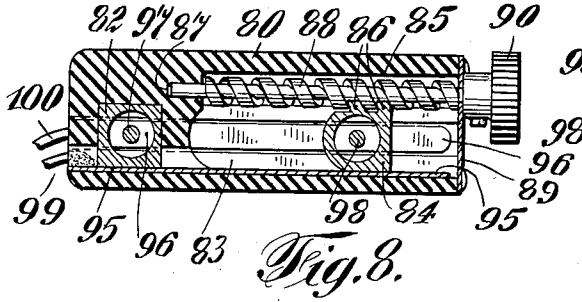


Fig. 8.

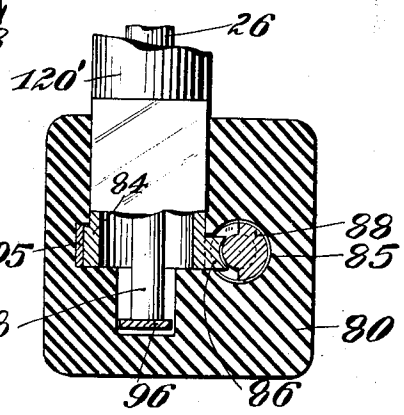


Fig. 10.

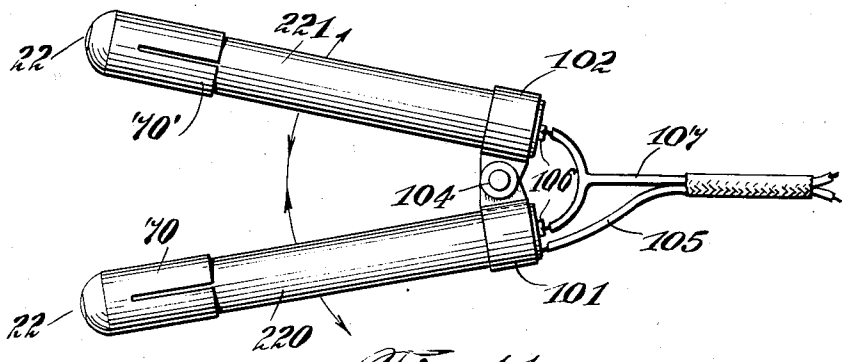


Fig. 11.

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UNITED STATES PATENT OFFICE

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TRANSILLUMINATING DEVICE

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Application October 25, 1935, Serial No. 46,704

9 Claims. (Cl. 128—23)

This invention relates to improvements in diagnostic instruments and more particularly to improvements in transilluminating devices.

Transilluminators have been made and used heretofore as single units in which the source of light rays is mounted at the end of a rod or some similar member. In some types of examinations it is desirable to compare the results of one inspection against those of another. The practice has been to inspect a certain portion of the patient's anatomy, retaining a visual image of the inspected portion and compare it with a subsequent inspection. Such practice, of course, is not positive and is not satisfactory for other reasons.

An object of the present invention is to provide a transilluminating instrument of such character that more than one portion of a patient's anatomy can be examined simultaneously.

Another object of the invention is to provide a transilluminating instrument made up of two or more tubular members having sources of light rays mounted in the ends thereof, such members being so connected that the light carrying ends can be moved relative to each other to be brought into approaching or separated relation.

An additional object of the invention is to provide a transilluminating instrument in which the light carrying members are mounted for rectilinear motion relative to each other.

A further object of the invention is to provide a transilluminating instrument in which the light carrying members are mounted pivotally near their bases so that their light carrying tips can be moved relative to each other.

In carrying out the foregoing and other objects of the invention, a transilluminating instrument in the preferred form, comprises a handle through which the electrical conductors pass, and a pair of light carrying members secured to the handle in such fashion that these members can be moved in a rectilinear motion relative to each other. The motion of these members can be secured in various ways, such as by manually sliding one member relative to the other along guide bars, or by sliding one member relative to the other through the agency of a worm-and-gear arrangement.

In a simpler form of the invention the two light carrying members, which are of tubular form, can be pivotally secured together near their bases so that these members can be moved along radii relative to each other to cause their light carrying tips to assume the desired positions. The light carrying members, which are tubular in form and which have light bulbs connected to one end thereof, ordinarily have caps over the light bulbs with small openings therein for projecting light rays in a desired direction. These caps can be removed however and when the tube tips are brought together the light bulbs can be covered by a suitable transparent shield for oral examinations, etc.

Other features, objects and advantages of the invention will become apparent from the following detailed description of the accompanying drawings illustrating the same, wherein

Fig. 1 is a plan view partially in section and partially fragmentary of the preferred form of the invention.

Fig. 2 is a view at a different angle of the same device.

Fig. 3 is an enlarged section taken substantially on the line 3—3 of Fig. 1.

Fig. 4 is an enlarged section taken substantially on the line 4—4 of Fig. 1.

Fig. 5 is a view of a portion of the connector arrangement shown in Fig. 3.

Fig. 6 is a fragmentary view showing the manner in which the light bulbs carried by the arms can be enclosed in a transparent shield.

Fig. 7 is a fragmentary plan view of a modification of the device.

Fig. 8 is a section taken substantially on the line 8—8 of Fig. 9.

Fig. 9 is an enlarged section taken substantially on the line 9—9 of Fig. 7.

Fig. 10 is a section taken substantially on the line 10—10 of Fig. 7.

Fig. 11 is a view of a still further modification of the invention.

Referring now to the drawings and particularly to Figs. 1 to 6, inclusive, 10 indicates the handle of a trans-illuminating device embodying the invention, such handle being made preferably of some good insulating material, and being hollow for the passage of electrical conductors 11 and 11' in a cable 12. The upper part of the handle is also hollowed out to a considerable extent to receive contact members of the assembly. Positioned diametrically opposite the upper part of the handle are openings for the passage of a round bar 14. The bar 14 forms one of three slide bars which serve as conductors and also as guideways in the operation of the device. These bars have their end portions hollowed out and internally threaded for the reception of screws 18. The bars are held in properly spaced relation by means of triangularly shaped blocks of insulating material 16, which are apertured and par-

tially counterbored to receive the ends of the bars. Thus, in addition to the bar 14, the device includes two bars 17, the positions of which are indicated by the attaching screws 18 of Fig. 2.

One of the transilluminating tubes is fixed substantially immovable relative to the handle 10. This bar comprises a hollow metallic cylinder 20, the upper end of which is internally threaded as at 21 for the reception of a light bulb 22. Located within the tube 20 is a conductor rod 24 having a spring contact member 25 secured to the upper end thereof. This rod 24 has a spring receiving sleeve 26 screwed to one end thereof, the sleeve 26 being provided with a shoulder 27 bearing against one side of an insulating disk 28, the other side of which rests against an internal shoulder 29 of the tube. A similar insulating disk 30 rests between the internal shoulder 31 of the tube and the contact 25. By this arrangement the conductor rod 24 is positively positioned in the tube. The sleeve 26, which is hollow, serves as a receptacle for a spring 32, and the lower end thereof is externally threaded to enter a cup 34. The bottom of the cup 34 is centrally apertured for the passage of a contact rod 35 which has a flange 36 on the inner end thereof to prevent the rod from dropping out of the cup. The spring 32, of course, normally presses this rod 35 toward the handle 10. This lower end of the tube 20 has a squared portion 37 in which are provided a pair of oppositely disposed openings 38 for the passage of the rods 17. These rods fit in the openings 38 close enough to make good electrical contact with the tube 20. Below the squared portion 37 the tube 20 is provided with an enlarged cylindrical skirt portion 40 which fits snugly within the upper end of the handle 10. A set screw 41 passes through an opening in the handle into a matched opening in this skirt portion to lock the tube 20 relative to the handle.

The contact mechanism within the handle 10 comprises in part a metallic ring 45 centrally disposed, which has a conductor rod 46, one end of which is enlarged at 47. The enlarged end of this rod 47 is hollowed out for the reception of a spring 48 and a pin 49. The proper alignment of the member 46 relative to the ring 45 is accomplished by means of two flanged collars of insulating material 50 and 51. A terminal member 52 having a central orifice therein fits around the insulating collar 50 between shoulders thereof, and one end of the ring 45. The shoulder of the other insulating collar 51 rests against the opposite end of the ring 45 and against the enlargement 47 of the member 46. These parts are locked in this position by spreading out the end of the member 46 after it passes through the central opening of a terminal 55. A suitable tool may be used to rivet this end of the member and lock the parts together. The two terminals 52 and 55 are connected to the conductors 11 and 11'.

The skirt portion 40 of the tube 20 is provided with opposite openings 56 of greater diameter than the rod 24, such opening 56 being in line with the openings in the handle so that the rod 14 can pass through the handle and through the skirt portion. Inasmuch as it is desired for this rod 14 to serve as one terminal for the transilluminating devices, the arrangement of the parts is such that the spring pressed rod 35 and the spring pressed rod 49 bear against opposite sides of the rod 14 as it passes through the handle and the skirt 40 (Fig. 3). Thus the rod 14 is energized by the conductor 11, and the circuit from the rod 14 continues to the spring terminal 25. If desired, however, the rods 35 and 49 can be unitary with an enlargement apertured to receive the rod 14.

Since the rod 14 is included in one side of the electrical circuit utilized it becomes necessary to provide means for completing the circuit through the light bulb. This means is made up of a spring switch 60 having a button 61 on the end thereof. The spring is secured to the ring 45 by means of a screw 62 passing therethrough and through the handle 10 into threaded engagement with an aperture 64 in the ring 45. The button 61 is utilized to press the offset end of the spring 60 against the outer surface of the tube 20. Thus an electrical circuit is set up in the following manner. From the conductor 11' to terminal 52, ring 45, spring 60, the metal of the tube 20, to one terminal of the light bulb 22, thence to the spring contact 25, rod 24, spring pressed rod 35, rod 14, contact rod 49, member 46, terminal 55 to the conductor 11. At the same time that this circuit is made up, the rods 17 as well as the rod 14 are energized.

The other transilluminating member comprises a tube 20' constructed in a similar manner to the tube 20 with the exception that the skirt portion 40 is omitted. The internal arrangement of this tube is substantially as that described for the member 20 with the exception, of course, that the spring pressed contact rod 49 and its associated mechanism is not necessary. By reference to Fig. 1 it will be seen that a spring pressed contact rod 35' extends downwardly from the member 20' to engage the slide rod 14. Since the rods 14 and 17 are connected in the circuit, they serve as conductors to complete the circuit through a bulb in the member 20'.

The operation and use of the device just described is substantially as follows: By the slide arrangement of rods 14 and 17, it is possible to move the member 20' rectilinearly relative to the member 20 with the rods stationary, or to move both the member 20' and the rods 14 and 17 relative to the member 20. Ordinarily for external examinations spring caps 70 and 70' are inserted over the light bulbs in the ends of the members 20 and 20', these caps each having an opening 71 in the top thereof for the passage of rays from the bulbs. If it is desired to make an examination of for example, the sinus ducts of a patient, the two members 20 and 21 can be adjusted so that the caps 70 and 70' are properly positioned on each side of the nasal passage. Since these parts can be adjusted relative to each other, it follows that the instrument can accommodate the facial structure of any patient. The foregoing use, of course, is merely illustrative of one of the many uses to which the device can be put. In addition, should it be desired to use the instrument in the making of oral examinations, the two caps 70 and 70' can be removed, the parts 20 and 20' brought together as closely as possible, and the exposed bulbs 22 enclosed by a transparent shield 75. This shield can be made of glass or of any other suitable substance, the only requirement being that it be of transparent material and that it be capable of sterilization.

In the modification shown in Figs. 7 to 10, inclusive, 80 represents a casing of some suitable insulating material. This casing is hollowed out for the reception of the base of a stationary member 120 (dotted lines, Fig. 7), which is held

in place by a set screw 81 passing through the housing 80 and engaging the base 82 of the member 120. The casing 80 is provided for a part of its length with a cavity 83 in which the base 84 of the movable member 120' is seated. Adjacent the cavity 83 is a cylindrical cavity 85. These two cavities are joined by the removal of the wall therebetween, the opening so formed serving to receive an offset 86 of the base 84. This cavity 85 has a coaxial portion 87 of reduced diameter at its inner end.

The offsets 86 is cut into the shape of gears or teeth to engage a worm 88 positioned in the cavity 85. One end of the worm 88 fits in the reduced portion 87 of the cavity. The other end of the worm passes through a plate 89 secured to the end of the casing into engagement with a thumb wheel 90 utilized for rotating the worm. Due to this arrangement of parts rotation of the worm imparts longitudinal movement to the base 84, and accordingly to the member 120'.

In order that the desired electrical circuits can be completed, two bus bars of springy material are fastened in the casing. One bus bar 95 is seated in a recess extending longitudinally of the casing and positioned adjacent the upstanding side walls of the two base members 82 and 84. This bus bar 95 is fixed to the base 82 so that it makes good electrical contact with the metal of the member 120. Since the bus bar is of spring material it bears againsts the base 84 to make good electrical contact therewith, regardless of the longitudinal position of the member 120' relative to the casing. The other bus bar 96 is positioned in a recess in the bottom of the casing, making close contact with a terminal member 97 extending below the base 82 and having a continuation thereof extending upwardly through the member 120 to the usual central contact for the light bulb. Suitable insulating means can be utilized for insulating the terminal 97 and its extension from the member 120. A similar member 98 extends below the base 84, and since the bus bar 96 normally is forced upwardly by its spring character, good contact with the terminal 98 is always assured. These two bus bars 95 and 96 have conductors 99 and 100 connected to them respectively. These conductors 99 and 100 may pass downwardly through a suitable handle which can be affixed to the casing 80 in any desired position..

This device can be utilized in the same canner as that previously described, the only difference in operation being that movement of one member relative to the other is accomplished through the worm and gear mechanism.

In Fig. 11 a simplified form of the instrument is illustrated, such instrument consisting of the transilluminating members 220 and 221. These members have metallic bands 101 and 102 secured around them respectively, the bands being fastened together between the members in any suitable pivotal connection shown generally at 104. Since the members 220 and 221 are of metal and the bands 101 and 102 are also of metal, a single conductor 105 may be secured to either one of the members 220 or 221 or either one of the bands, thereby energizing the members themselves. These members have central contacts 106 which are insulated from the tubes of the members and which lead to the usual central spring contact for the light bulb. Another conductor 107 may be connected to the two terminals 106.

The device just described is capable of being utilized for the same purpose as those previously described, the only difference being that the two members more relative to each other in arc fashion instead of rectilinear fashion.

From the foregoing it will be seen that the present invention in any form illustrated provides novel and useful transilluminating devices which are adaptable to a number of uses, and which are superior to the single transilluminating devices heretofore used, or to two transilluminating devices used concurrently. It will be apparent that modifications other than those shown can be made, without departing from the scope of the invention, and, accordingly, this invention is not to be limited to the illustrated embodiments but is to be limited only by the following claims.

I claim:

1. A transilluminating device for manual use comprising a plurality of elongated electrically energized illuminating tubes having sources of light rays at their tips, said tubes being so connected for relative movement that the distance between the tips thereof can be varied and the tips can be moved into close proximity, and a transparent shield adapted to fit over and inclose the ends of the tubes when the tips thereof are in close proximity.

2. A transilluminating device for manual use comprising a plurality of electrically energized illuminating tubes having sources of light rays at their tips, said tubes having their bases so pivotally secured thereto that the distance between the tips thereof can be varied and that the tips thereof can be moved into close proximity, and a transparent shield adapted to fit over and inclosè the ends of the tubes when the tips thereof are in close proximity..

3. A transilluminating device for manual use comprising a plurality of electrically energized illuminating tubes having sources of light rays at their tips, a plurality of spaced guide rods passing through the bases of said tubes whereby said tubes can slide relative to each other to vary the distance between their tips.

4. A transilluminating device comprising a plurality of electrically energized illuminating tubes having sources of light rays at their tips, a plurality of spaced guide rods passing through the bases of said tubes whereby said tubes can slide relative to each other to vary the distance between their tips, said rods serving as electrical connectors.

5. A transilluminating device for manual use comprising a handle, an electrically energized illuminating tube secured to one end of the handle, a plurality of spaced guide rods passing through the base of said tube, and a second electrically energized illuminating tube secured to said rods, said rods serving as guide members for relative sliding movement between the tubes to vary the distance between the tips of the tubes.

6. A transilluminating device comprising a handle, an electrically energized illuminating tube secured to one end of said handle, a plurality of spaced guide rods passing through the base of said tube, and a second electrically energized illuminating tube slidable on said rods for movement to vary the distance between the tips of the tubes, said rods serving as electrical connectors between the tubes.

7. A transilluminating device comprising an electrically energized illuminating tube having its tip socketed for the reception of an electric light bulb, the material of said tube serving as a conductor for one terminal of a bulb socketed

therein, an insulated conductor within said tube leading to the other terminal for said bulb, current carrying conductors electrically connected to said tube, a plurality of spaced guide rods passing through the base of said tube, and a second tube similar to the first tube and having said guide rods passing through the base thereof whereby one tube may slide on said guide rods relative to the other tube, said rods serving as electrical conductors between the tubes.

8. A transilluminating device comprising an electrically energized illuminating tube having its tip socketed for the reception of an electric light bulb, the material of said tube serving as a conductor for one terminal of a bulb socketed therein, an insulated conductor within said tube leading to the other terminal for said bulb, current carrying conductors electrically connected to said tube, a plurality of spaced guide rods passing through the base of said tube, and a second tube similar to the first tube and having said guide rods passing through the base thereof whereby one tube may slide on said guide rods relative to the other tube, said rods serving as electrical conductors between the tubes, and a handle having one end secured to the base of one of said tubes.

9. A transilluminating device for manual use comprising a casing of insulating material, a pair of electrically energized illuminating tubes having their bases secured in said casing, a worm and gear arrangement in said casing operating to cause relative sliding movement between said tubes in the casing and electrical connections between said tubes, and a transparent shield adapted to fit over and enclose the outer ends of the tubes when the tips of said tubes are in close proximity.

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