

Feb. 25, 1964

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3,122,137

DEVICE FOR FACILITATING IONTOPHORESIS TREATMENT OF EYES

Filed Oct. 30, 1961

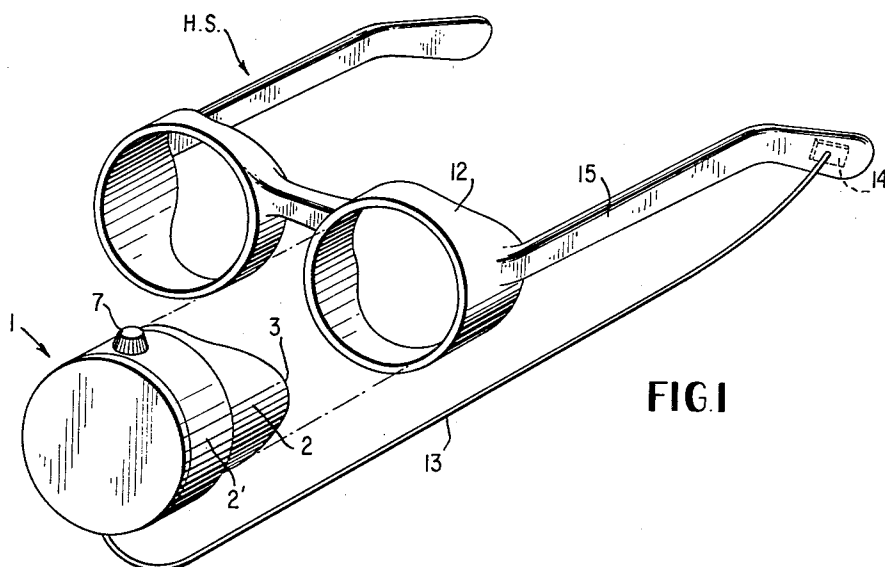


FIG. 1

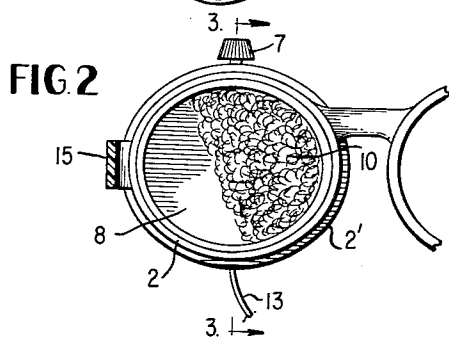


FIG. 2

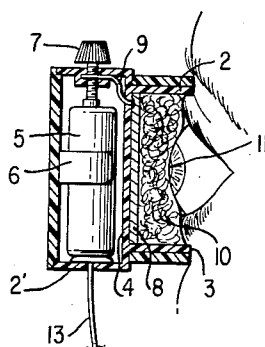


FIG. 3

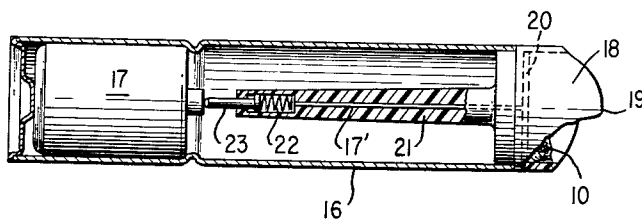


FIG. 4

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DEVICE FOR FACILITATING IONTOPHORESIS TREATMENT OF EYES

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Filed Oct. 30, 1961, Ser. No. 148,617

3 Claims. (Cl. 128—172.1)

This invention relates generally to apparatus for readily and safely utilizing iontophoresis in treating the human eye, and more particularly to apparatus enabling iontophoresis to be readily utilized by a patient to introduce medication into the eye without danger of injury to the eye.

As is now quite well known, iontophoresis is the introduction of electrolytic drugs into living tissues under the driving power of a galvanic current. Ophthalmologists have long recognized the value of iontophoresis in the treatment of the eye. By the turn of the century various iontophoretic devices had been developed. With the advent of the miracle drugs, such as penicillin, the iontophoretic process came to be recognized as a highly effective way to administer these drugs.

Experience has shown that the concentration of penicillin, for example, introduced to the eye iontophoretically is ten times greater than that obtained by a bath application of equal duration. Not only does the iontophoretic process permit a more rapid medicine application, but it also permits a more localized and more highly concentrated application of drugs. Ophthalmologists also use iontophoresis in conjunction with the administration of drugs intramuscularly and intravenously to stimulate the eye, thereby causing a concentration of injected drugs in the eye and surrounding area.

Some frequently used solutions for iontophoretic medication are:

Zinc sulfate (+) 1:500.
Calcium chloride 1.5:500 (+).
Quinine hydrochloride (+) 1:1000.
Epinephrine hydrochloride (+) 1:1000, may be added to the foregoing solutions by using 1 to 2 drops.
Histamine (Roche) (+) 1:10,000 to 1:20,000.
Acetylcholine chloride (+) 1:400—1:2000.
Choline chloride (+) 1:100.
Eserine salicylate (+) 0.015:500.
Methacholine chloride (+) 0.25:100.
Sodium para-aminosalicylate (—) 1—2:100.
Sodium or calcium penicillin (—) 500—2000 Oxford units per cc.
Sodium sulfathiazole (—) 5%.
Gantrisin Roche (—) 4%.
Aureomycin borate (+) 1 mg. per cc.
Sodium sulfacetimide (—) 1—10%.
Streptomycin or neomycin (+) 50—100 mg. per cc. (applied over the lids).

(+) means introduction from the positive pole.
(—) means introduction from the negative pole.

Currently in use in the art of iontophoresis are pencil-like electrodes which are held manually by a doctor to a patient's eye, or devices which are attached to the eye itself, or are supported by the eye itself, and must be so attached or supported with extreme care by a doctor or experienced therapist.

An object of the invention is to provide an iontophoretic apparatus that can be used by the patient in accordance with a doctor's directions but without a doctor's aid.

Another object of the invention is to provide an iontophoretic apparatus which is safe and does not place undue strain or pressure on the patient's eye.

Another object is to provide a self-administering iontophoretic apparatus which is inexpensively and simply constructed.

Another object of the invention, as embodied in one

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form herein described, is to provide an eye-treating device using the iontophoretic principle and which is so constructed that the patient's hands are left free while the treatment is being self-administered.

5 Another object is to provide a unitary portable eye iontophoretic device which requires no conductors leading from an external energy source to the device.

Another object of the invention is to provide means by which iontophoretic treatment of the eye and medicine application thereto can be accomplished with just the right amount of applicator pressure on the eye itself.

Another object is to provide an eye iontophoretic device adapted to be principally supported by the area of the eye orbit around the eye and not the eye itself.

15 Other objects will become apparent from a reading of the following description, the appended claims, and the accompanying drawings, in which:

FIGURE 1 is an exploded perspective view showing a supporting device together with a holder frame for holding the supporting device in operative position relative to the eye;

FIGURE 2 is a fragmentary rear elevational view of the construction shown in FIGURE 1, part of a medicated pad being omitted;

FIGURE 3 is a transverse sectional view taken on the line 3—3 of FIGURE 2, showing the supporting device supported by the eye orbit and a concave eye contact area of the medicated pad touching the eye; and

FIGURE 4 is a cross sectional view of an alternative form of the invention.

The embodiment of the invention shown in FIGURES 1, 2 and 3 is adapted for use in connection with a holding structure, generally designated HS, formed quite like the frame of a pair of spectacles or eyeglasses. As shown in these figures, the device includes a supporting means 1 formed of any suitable nonconductive material such as plastic and which is annularly shaped with two separated adjacent generally cylindrical tubular portions 2 and 2' of different diameters. The smaller diameter portion 2 is shaped to provide an inner eye orbit receivable rim 3 adapted to fit the eye orbit of the patient. The outer part of the smaller diameter portion 2 is fast with a flat circular separator wall 4 between the two portions 2 and 2'. The larger diameter portion 2' contains an electrical power source, e.g. a galvanic battery 5, held in place by a clip 6 and provided with any suitable switch means 7. The smaller diameter portion 2 of the supporting means 1 is backed with a metal electrode 8 which abuts the flat circular separator wall 4. A conductor 9 connects the electrode 8 with the battery 5 through the switch 7. A pad of medication-absorbent material 10 is positioned within the smaller diameter portion 2 so that it makes contact with the electrode 8. The absorbent material 10 is formed on its rear face into a concave eye contact area 11.

As shown in FIGURE 1, the smaller diameter portion 2 is adjustably receivable by a holder frame 12 formed as part of the holder structure HS. A conductor 13 is provided between the battery 5 and a contact plate 14 located on the inner surface of the holder structure temple piece 15.

The construction of a single supporting device and its mounting on the holder structure HS have been described above. Two similar supporting devices may be mounted respectively in the two holder frame means 12, depending upon whether one eye or both eyes is or are to be treated.

The construction shown in FIGURES 1, 2 and 3 is used by placing the holder structure HS on the head and hooking the temple pieces 15 into position over the ears. The contact plate 14 is then in electrically contacting relation with the head behind the eye area. The support-

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ing means 1 is then inserted into the holder frame means 12 and the pad 10 is applied to the eye to be treated. The rim 3 of the supporting means abuts the eye orbit, thereby positioning the concave eye contact area 11 over and in light contact with the eye, and supporting the medication-administering device without applying undue strain on the eye itself.

When the device is properly positioned and the current is turned on, the iontophoretic process begins. Current from the battery 5 passes through the medicated absorbent material 10, carrying some of the medicine in an ionized state into the eyeball and the surrounding area by the iontophoretic process. The medicine is deposited in the eyeball and surrounding area, and the electrical current passes harmlessly through the head tissue.

In the alternative form of the invention as shown in FIGURE 4, a manually graspable, electrically conducting case 16 contains a battery 17 and is affixed to and carries a pad supporting means 18. The supporting means 18 is formed so that the inner rim 19 is shaped to fit the eye orbit of the patient. The supporting means 18 is internally backed with an electrode 20 and contains a medicine-absorbent material which is formed at the rear into a concave eye contact area similar to that shown at 11 in FIGURE 3. The electrode 20 is connected to the battery 17 through a conductor 17' extending within an insulating stem 21, a spring 22 in a recess in the inner end of the stem 21, and a plunger 23 urged by the spring 22 into contact with the central battery terminal.

In using the construction shown in FIGURE 4, the case 16 is grasped by the patient and the rim 19 held against the orbital area with the medicated pad in contact with the eyeball, the patient's eye orbit being subjected to the principal locating pressure, and the pad bearing on the eyeball with no more pressure than that required for producing effective electrical contact. Current will flow through the circuit provided by the battery 17, the conductor 17', the electrode 20, the medicated pad, the eyeball, and the patient's body.

The constructions shown and described embody the invention in preferred forms, but it is intended that the disclosure be illustrative rather than definitive, the invention being defined by the claims.

I claim:

1. An eye medication administering device comprising a holder structure substantially in the form of an eyeglass frame, formed of a non-conductive material and having a holder frame and temple pieces; a contact plate positioned on one of the holder structure temple pieces so as to make contact with the rear portion of a patient's head when the device is in use; a cylindrical supporting means adjustably mounted within the holder frame and composed of non-conductive material shaped to provide a rim which is engageable with and supportable by the eye orbit; a medication absorbent material disposed within the supporting means; an electrode carried by said supporting means and being situated so that the absorbent material is between and in contact with said electrode and the eye; and an electrical power source electrically connected to said electrode and said contact plate.

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2. An eye medication administering device comprising a holder frame structure substantially in the form of an eyeglass frame, formed of a non-conductive material and having a holder frame and temple pieces; a contact plate positioned on one of the holder structure temple pieces so as to make contact with the rear portion of a patient's head when the device is in use; a cylindrical supporting means mounted within said holder frame means for adjustment normal to the eye and composed of non-conductive material shaped to provide a rim which is engageable with and supportable by the eye orbit; a medication absorbent material disposed within said supporting means and formed with an eye contact area positioned within said supporting means whereby the contact area makes contact with the eye when said supporting means rim is held against the eye orbit by said holder structure and the absorbent material bears substantially none of the weight of the device; an electrode carried by the supporting means and being situated so that the absorbent material is between and in contact with said electrode and the eye; and an electrical power source electrically connected to said electrode and said contact plate.

3. An eye medication administering device comprising a holder frame structure substantially in the form of an eyeglass frame, formed of a non-conductive material and having a holder frame and temple pieces; a contact plate positioned on one of the holder structure temple pieces so as to make contact with the rear portion of a patient's head when the device is in use; supporting means mounted within said holder frame for adjustment normal to the eye and being composed of non-conductive material shaped to provide a rim which is engageable with and supportable by the eye orbit; a medication absorbent material disposed within said supporting means and formed with an eye contact area positioned within the supporting means whereby the contact area makes contact with the eye when said supporting means rim is held against the eye orbit by said holder structure, and the absorbent material bears substantially none of the weight of the device; an electrode carried by the supporting means and being situated so that the absorbent material is between and in contact with said electrode and the eye; and an electrical power source electrically connected to said electrode and said contact plate.

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