Aug. 16, 1938. G. THORNTON-NORRIS 2,127,316

ELECTROMECHANICAL DISPLAY APPARATUS

Filed April 21, 1937 2 Sheets-Sheet 1

FIG. 1.

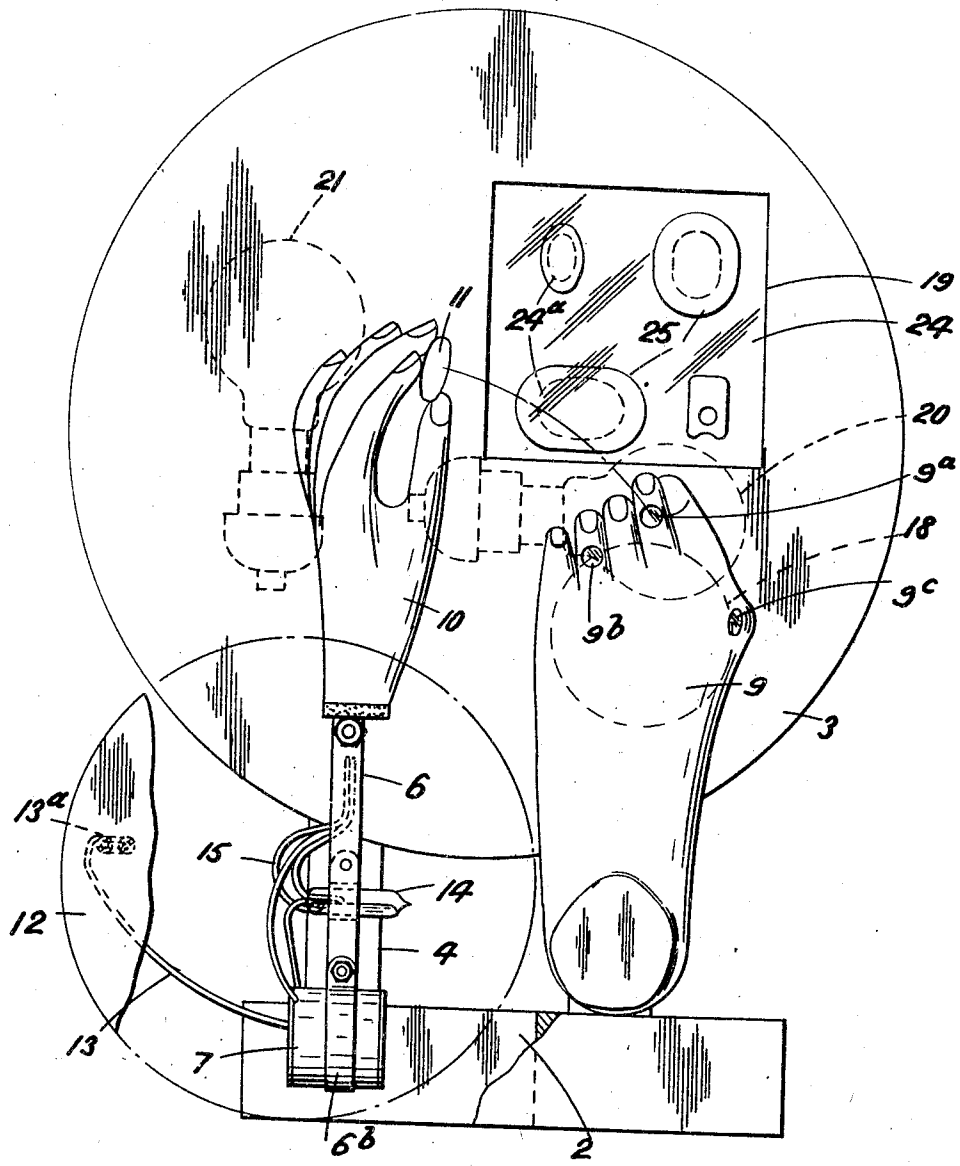
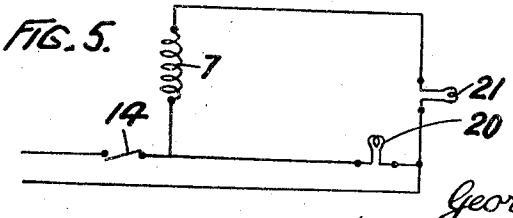


FIG. 5.



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FIG. 2.

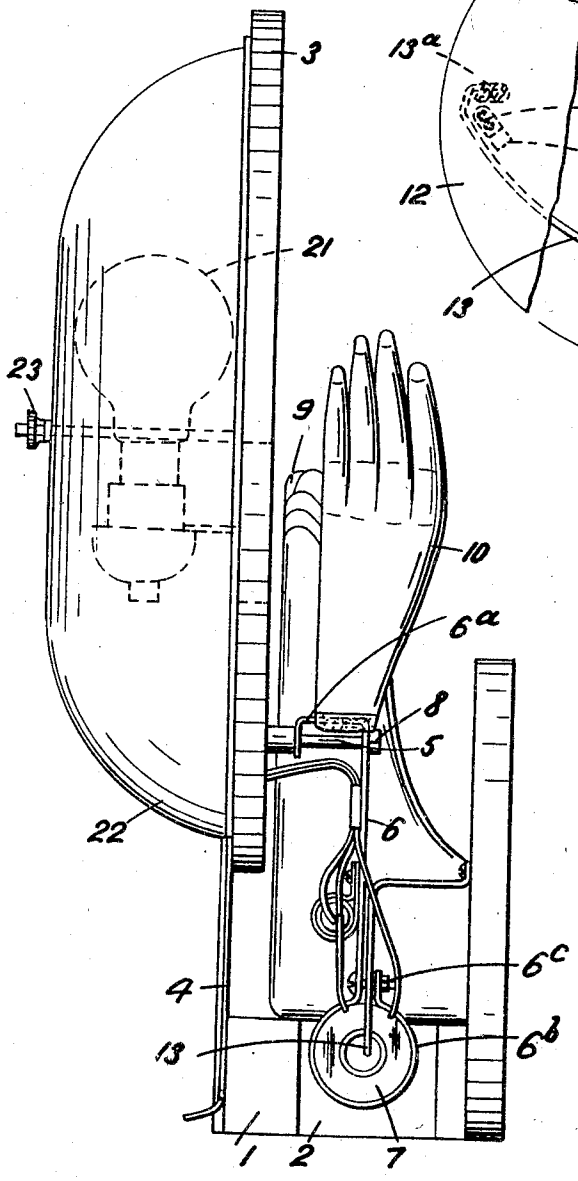


FIG. 3.

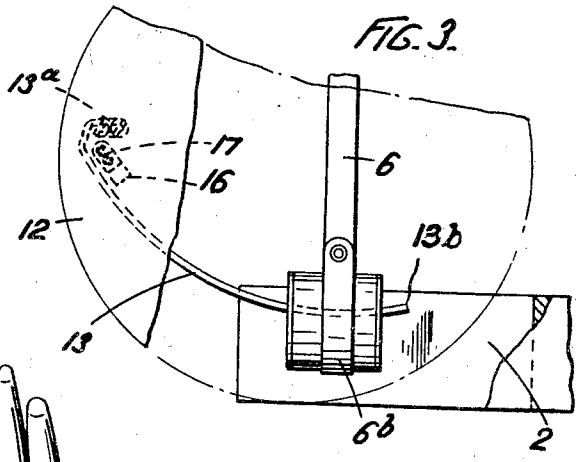
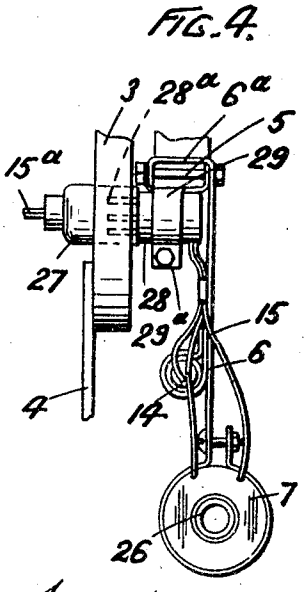


FIG. 4.



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Patented Aug. 16, 1938 2,127,316

UNITED STATES PATENT OFFICE

2,127,316

ELECTROMECHANICAL DISPLAY APPARATUS

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Application April 21, 1937, Serial No. 138,276
In Great Britain June 30, 1936

13 Claims. (Cl. 40—51)

This invention relates to display apparatus of the kind which relies for its display-value upon a moving display member or members actuated by an electromagnetically driven oscillating device or pendulum. Apparatus of the kind referred to has been combined with illuminating means, generally in the form of an electric lamp or lamps, carried or controlled by the pendulum to give the effect of a moving light or a moving beam of light.

It is an object of the present invention to provide an improved construction for display devices of the kind in question whereby their operation is rendered more reliable than heretofore and also more adaptable (by means of a variety of adjustments) to varying requirements.

Another object is to provide improved intermittently working illuminating means for such apparatus.

Another object is to provide interchangeable pendulum units associated with similar or dissimilar moving display members and to facilitate the mechanical attachment and electrical connection of such units to stationary parts of the apparatus.

A subsidiary object is to provide means for modifying the swing of the pendulum and for limiting the amplitude of its swing.

A still further object is to improve the arrangement of illuminating means for the display apparatus so as to render it more adaptable to varying requirements or differing conditions of electrical supply and to increase its sphere of usefulness.

Apparatus according to the invention comprises a framework having pivoted thereto a pendulum carrying a solenoid and which also actuates a switch for controlling the intermittent energization of such solenoid, the latter coacting, for the purpose of oscillating the pendulum, with a stationary armature or core mounted on the said framework. The switch may conveniently be of the mercury type or a purely mechanical (non-fluid) contacting device may be employed in some instances.

In practical embodiments of the invention the pendulum may either be journalled on a spindle or provided with a spindle journalled in the framework aforesaid, the journalling being preferably of the two point variety, so as to restrict oscillation of the pendulum to one plane without introducing undue friction. For instance the pivot end of the pendulum shaft may be of inverted J-shaped formation the limbs of the J being pierced by aligned holes to receive a stationary pivot spindle. Similarly, if a live spindle be provided it may be journalled in a U-shaped or J-shaped bearing bracket on the frame.

Flexible conductors may conveniently be employed to convey electric current to the solenoid and switch carried by the pendulum; in some cases, however, the use of sliding contacts is contemplated.

The pendulum with its solenoid, switch and mechanical and electrical connections may take the form of a self contained unit, in which case it can be made readily removable from the framework and interchangeable with other such units. This expedient is valuable not merely for convenience in effecting replacements in the case of electrical or mechanical failure but also for the reason that it permits pendulums, with different oscillation periods or pendulums of different effective field strengths or it may be pendulums associated with different display members to be used on one and the same framework, which latter may incorporate or carry one or more stationary display elements. Simple attachments of the plug and socket type may, for instance be used for effecting readily separable electrical and mechanical connections between the pendulum and the framework or, if desired, a removable mechanical pivot for the pendulum may be constructed as a multiple contact plug for an electric jack on the framework, sliding electrical contacts being thereby established, so that flexible electrical connections between stationary and moving parts can be dispensed with.

The invention will now be more particularly described with reference to the accompanying drawings, in which Fig. 1 is a front elevation and Fig. 2 a side elevation of one embodiment. Fig. 3 is a view corresponding to a part of Fig. 1 but showing certain modifications, Fig. 4 is a fragmentary side elevational view illustrating a form of readily detachable mounting for the pendulum and Fig. 5 is an electrical diagram.

The embodiment of the invention shown, by way of example, in Figs. 1 and 2 is a display apparatus adapted to advertise articles for pedicure and like purposes.

To a base 1, rendered bifurcate by slotting it as at 2, a vertical panel 3 is attached by a bracket 4. From the panel 3 projects a fixed pivot 5 for the pendulum 6. The upper or fulcrum end of the pendulum 6 is of an inverted J-shape as at 6^a the two parallel limbs of the J being pierced to receive the pivot 5: The lower end of the said pendulum is formed into a clip 6^b, adapted to be clamped around a solenoid 7 with the aid of a

screw and nut 6c. This method of holding the solenoid allows of its being adjusted relatively to the pendulum rod. It will be understood that the pendulum 6 can swing freely on its pivot 5, the described construction of its fulcrum end constraining it to swing in one plane, preferably parallel to the plane of the panel 3. A nut or equivalent means 8 retains the pendulum on its pivot and the bob weight of the said pendulum is constituted by the solenoid 7. Reference 9 designates a hollow model of a deformed and calloused human foot, this model being fixed to the base 1. A model 10 of a human hand is fixed to the pendulum above the pivotal axis so that oscillation of the pendulum swings the hand to and from the foot, in simulation of the act of applying a corn plaster, represented by disc 11, to a corn delineated in some suitable way at 9a on the foot. Preferably corns or callouses such as 9a, 9b and 9c are indicated in the model foot by inserts of transparent or translucent material while the rest of the foot is opaque and means of illumination, hereinafter to be described are then used in such a way as to emphasize the presence of the blemishes in question.

A frontal sub-panel 12, preferably large enough to conceal mechanical parts which it is not desired to display is fixed to the base 1 and serves as a means for supporting fixedly an iron armature 13 for the solenoid 7. This armature is fixed at 13a, adjustably if need be, to the said sub-panel and Fig. 1 shows how it is curved, to conform to the path of oscillation of the solenoid, the axis of which may be regarded as tangential to the arc formed by the said armature. The free end of this armature 13 may just reach or may just enter the solenoid when the pendulum is at rest. When the solenoid is energized, by an electric current passing through its windings, the resulting magnetic field causes it to travel along the said armature, i. e. to swing to the left, from the position depicted in Fig. 1, the hand 10 being correspondingly swung to the right. When the hand reaches the foot this movement must cease: for this purpose the supply of current to the solenoid 7 is interrupted at an appropriate stage of the leftward swing of the pendulum by means of a mercury switch 14, interposed in the current supply leads 15. When the solenoid has been deenergized the pendulum is free to swing to the right (through and beyond the position of rest depicted in Fig. 1) and it swings the hand correspondingly to the left. As the pendulum passes through the position of rest (or approximately at this time) the mercury switch 14 again closes the circuit through the solenoid, so that the conditions for its enforced movement to the left (Fig. 1) again prevail, excepting that the momentum of its rightward swing has first to be overcome before its direction of motion can be reversed. It will be apparent from Figs. 1 and 2 that the mercury switch is held to the pendulum rod by a clip and screw, which permit of its angular adjustment.

An electromagnetic or a mechanical stop or stops may be provided for restricting the amplitude of swing of the pendulum. For instance, if the stationary armature 13 be extended to a point (as 13b in Fig. 3) in the path of travel of the solenoid appreciably beyond that at which the mercury switch 14 closes, the circuit, so that the solenoid is re-energized before it reaches the free end of the said armature the strong magnetic "pull-back" effect obtained immediately it passes the said free end will assist the action of gravity in arresting and reversing the direction of swing of the pendulum. With an armature as shown in Fig. 1 the maximum amount of magnetic "pull back" will occur at or about the position of rest of the pendulum. In either case, in order that the device may be self starting, the switch 14 must be in closed circuit condition whenever the pendulum is in or is passing through its position of rest: from this it follows that the solenoid will be energized at all times when it is swinging clear of the free end of the said armature, so that there will be a magnetic field tending to draw it back on to said armature.

Where a mechanical stop is required, instead of or in addition to an electromagnetic stop a buffer of rubber or of some other yielding or resilient material can be disposed in the path of movement of the pendulum. Fig. 3 includes such a stop consisting of a buffer 16 attached by a bracket 17 to the rear of the sub-panel 12. Contact of the solenoid 7 with the buffer 16 arrests leftward swing of the pendulum. Preferably the stop is adjustably mounted.

18 and 19 are apertures in the panel 3 while 20 and 21 are electric lamps mounted behind the said panel and enclosed by a cover 22 (Fig. 2) which preferably has a light reflecting interior surface. Screw means for detachably fixing the said cover are indicated at 23. Light emerging through the aperture 18 which is preferably furnished with a colored window or screen, serves to make luminous the blemishes 9a, 9b, 9c on the model foot. A window 24, closing the aperture 19 is mainly darkened or opaque but has translucent or transparent portions 24a covered by translucent representations of articles such, for instance as corn and bunion plasters 25. The window 24 may also carry advertising or other matter which is invisible excepting when illuminated from behind.

Fig. 5 is a diagram of an improved circuit arrangement for the solenoid and illuminating means in apparatus according to this invention. The flasher lamp 20 is connected directly across the source of current supply and shunted by the solenoid 7 and lamp 21 (preferably of the "traction" type) connected in series. The pendulum actuated switch 14 makes and breaks circuit for all three of the elements 7, 20 and 21, simultaneously. It will be observed that the flasher lamp operates on the full voltage of the supply whereas the other, or "traction" lamp and the solenoid divide this full voltage between them.

If it be not desired to make the switching on and off of the flasher lamp simultaneous with the energization and deenergization of the solenoid the switch 14 may be provided with an additional contact or contacts (over and above those required for establishing a circuit through the solenoid and traction lamp) and the flasher lamp or a plurality of flasher lamps can be connected to such additional contact or contacts so as to be operated without dependence upon the time of energization of the solenoid. It is possible in this way to obtain luminous effects which vary during each swing of the pendulum.

The swinging of the solenoid (as part of the pendulum) assists in cooling it and utilizing the relatively heavy solenoid as the pendulum bob-weight economizes weight by concentrating the same where it is most advantageously employed.

The solenoid 7 may be furnished with a fixed, a movable or a removable hollow metal (usually iron) liner as at 26 in Fig. 4, which reduces or modifies the magnetic pull exerted on the station-

ary armature. The provision of interchangeable liners, differing as to dimensions or other characteristics affords convenient means for adjusting the character of the pendulum oscillation.

The armature **13** may consist of a single piece of soft iron or other magnetizable material; again, it may consist of or include a permanent magnet or it may be built up of magnetic and non-magnetic materials.

The plug and socket arrangement shown in Fig. 4 enables the pendulum **6** with its solenoid **7**, switch **14** and electrical connections **15** to be readily detached from the panel **3**. The member **27** is an electric plug socket fixed in the panel **3** and connected by wires **15**[a] with the lamps **20** and **21** and with the source of current supply. **28** is a plug with contact pins **28**[a] fitting into the said socket, the wires **15** from the solenoid **7** and switch **14** being connected to the said pins. The pivot pin **5** for the pendulum **6** is carried by a member **29** including a clamp **29**[a] embracing the plug **28**. The pendulum features otherwise conform to what is shown in Figs. 1 and 2. It will be apparent that the whole pendulum assembly with the electric leads carried thereby can be removed from the panel **3** by simply withdrawing the plug **28** from the socket **27**. Other pendulum assemblies, if provided with similar plug connections can be fitted in its place.

Various means of adjustment are provided in the apparatus of this invention. The switch, particularly, when it is of the mercury type, may be adjusted as to its angular position as already explained. The loading of the pendulum either above or below its pivot can be varied and the pendulum can be adjusted out of plumb, as by shifting the solenoid **7** in the clamp **6**[b] which holds it frictionally. Solenoids giving different strengths of field and with or without greater or less amounts of iron in their structure may be used. Stationary armatures of various sizes may be used.

Finally, the display apparatus can easily be adapted for different voltages and current consumptions by changing the traction lamp for one of different voltage and/or different wattage.

What I claim is:—

1. In an electromechanical display apparatus of the kind herein referred to, a framework, a stationary armature mounted on said framework, a pendulum pivoted to said framework and including a solenoid positioned for cooperation with said stationary armature and means for intermittently energizing said solenoid, the latter having a metal liner adapted to modify the magnetic pull exerted on the stationary armature.

2. The device of claim 1, characterized by the metal liner being removably fitted in the solenoid so as to be interchangeable with other liners.

3. The device of claim 1, characterized by the metal liner being fitted adjustably in the solenoid.

4. In an electromechanical display apparatus of the kind herein referred to, a framework, a stationary armature mounted on said framework, a pendulum pivoted to said framework and including a solenoid positioned for cooperation with said stationary armature, means for intermittently energizing said solenoid and electromagnetic braking means for said pendulum.

5. The device of claim 4, characterized by the stationary armature extending through the solenoid, sufficiently beyond the point of rest of the pendulum to exert a braking and reversing effect on the latter during a period of energization of the solenoid.

6. In an electromechanical display apparatus of the kind herein referred to, a framework, a stationary armature mounted on said framework, a pendulum pivoted to said framework and including a solenoid positioned for cooperation with said stationary armature, display illuminating means, a source of electric supply and means for intermittently connecting said solenoid and said display illuminating means to said source of electric supply, said display illuminating means comprising a flasher lamp connected across the full supply voltage and shunted by the solenoid and another lamp connected in series.

7. The device of claim 6 characterized by a pendulum actuated switch serving as the means for intermittently connecting the solenoid and the display illuminating means to the source of electric supply.

8. The device of claim 6, characterized by the lighting of the flasher lamp and the energization of the solenoid being time-spaced by the means which connects these members intermittently to the source of electric supply.

9. In an electromechanical display apparatus of the kind herein referred to, a framework, a stationary armature mounted on said framework, a pendulum pivoted to said framework and including a solenoid positioned for cooperation with said stationary armature, electric display illuminating means and pendulum actuated switch means controlling intermittent energization of the solenoid and intermittent switching of the display illuminating means at differing points in the normal pendulum swing.

10. In an electromechanical display apparatus of the kind herein referred to, a framework, a pendulum carrying a solenoid, a source of energization for said solenoid, a stationary armature mounted on said framework for co-operation with said solenoid, and means also carried by said pendulum for intermitting the energization of said solenoid, said pendulum being detachably mounted on said framework by means of a readily separable plug and socket connection including a pivot for said pendulum.

11. The device of claim 10, characterized by the plug and socket connection being organized to establish separable electrical connections between the solenoid and the source of energization therefor.

12. The device of claim 10, characterized by the separable plug and socket elements of the plug and socket connection being both normally stationary and by the pendulum being pivoted to one of said elements.

13. The device of claim 10, characterized by the pendulum being fixed to one of the separable plug and socket elements of the plug and socket connection and by said one element engaging pivotally with its co-acting element so as to pivot the pendulum.

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