

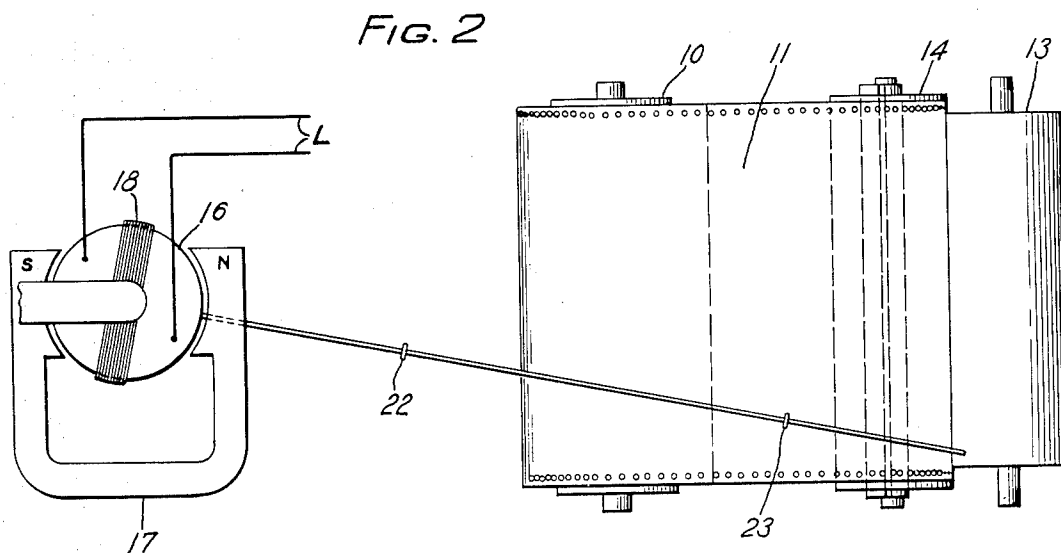
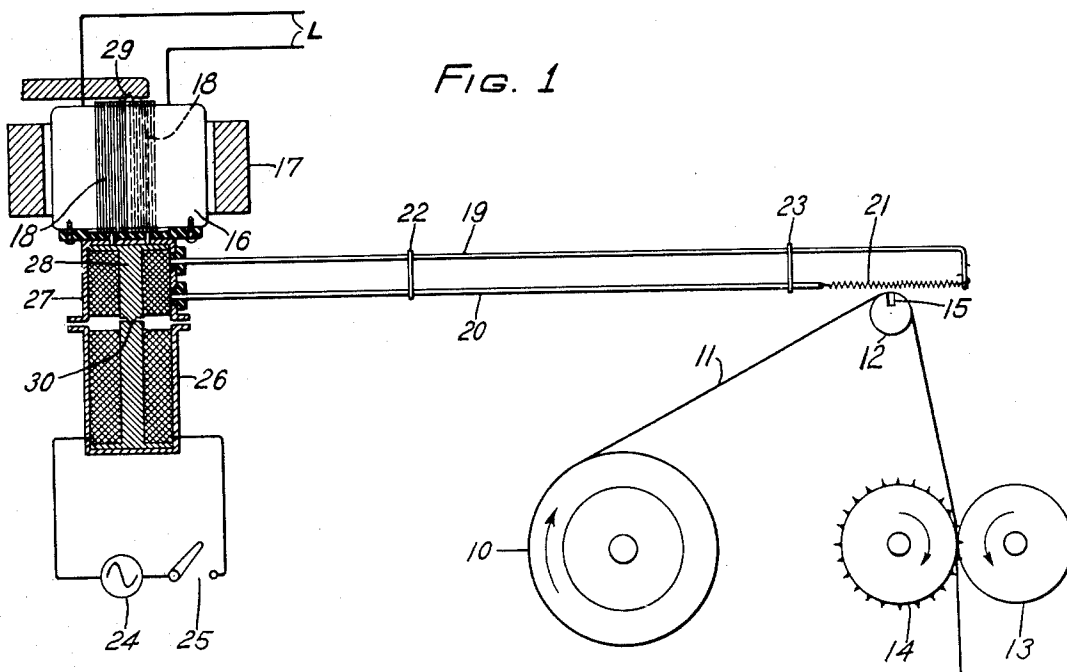
March 21, 1933.

W. J. MEANS

1,901,921

ELECTRICAL METER

Filed May 24, 1930



INVENTOR
W. J. MEANS
BY
H. G. Banfield
ATTORNEY

UNITED STATES PATENT OFFICE

WINTHROP J. MEANS, OF BROOKLYN, NEW YORK, ASSIGNOR TO BELL TELEPHONE LABORATORIES, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK

ELECTRICAL METER

Application filed May 24, 1930. Serial No. 455,272.

This invention relates to electrical meters and particularly to recording meters for permanently recording electrical variations.

In accordance with one method of producing a record a heat sensitive paper strip is moved forward at a uniform rate of speed over a suitable guide member which is directly under a heated stylus. The heat from the stylus affects the paper thereby producing a distinguishing mark upon the paper which records the relative movement of the stylus and the sheet. Such devices however are not entirely satisfactory since the guide member over which the paper passes even when made of material having low thermal conductivity such as wood, absorbs a large portion of the heat directed on the paper thus increasing the heat required to produce a legible record and decreasing the definition obtained.

In accordance with the present invention the amount of heat required is reduced to a minimum and a clearer record obtained by making the guide member over which the record sheet passes from material having high thermal conductivity properties and by providing an air space in that portion of the guide member over which the heated stylus passes.

When the record sheet is drawn over this type of guide member only that portion of the sheet immediately over the air space is affected by the heat from the stylus. The portion of the record sheet passing at any moment over the remaining part of the guide member remains unaffected due to the heat conducting properties of the guide member. This corresponds to the optimum condition of drawing the record sheet over a straight edge of air.

A clearer understanding of this invention may be had by reference to the accompanying drawing in which Fig. 1 is a schematic view of the apparatus embodying this invention and Fig. 2 is a plan view of such apparatus.

Referring to the drawing a record sheet or strip of heat sensitive flexible material 11 is shown passing from a supply reel 10 over a guide member 12 and between a

guide roller 13 and a toothed roller 14. This sheet is adapted to be moved forward in the direction of the arrow under the influence of roller 14, the teeth of which mesh with the perforations along the edge of sheet 11 so that an elemental section becomes progressively exposed over the slot 15 in guide member 12. One type of record sheet which may be employed comprises a fat or wax coated paper. The action of heat in this case is to melt the wax thus leaving a translucent line, the legibility of which can be intensified by the use of a suitably colored paper base. Papers of this sort may be prepared in a number of ways as, for example, by spraying with a fatty solution. The essential feature of such papers is that the wax or fat is in a finely divided state on the surface of the paper and is opaque until melted. Another type of record sheet which may be employed comprises the combination of a suitably colored wax paper placed face to face with a thin white absorbent paper. The action of heat in this case is to melt the colored wax coating on the paper which coating is absorbed by the white paper, thus giving a clear sharp edged record. It is to be understood, however, that other chemically treated papers or tapes may equally well be employed, the essential feature being that such papers or tapes become discolored when heat of a proper and predetermined temperature is applied.

A moving coil 18 wound on core 16 is placed between the pole-pieces N and S of a permanent magnet 17 which magnet maintains a strong magnetic field. The movable secondary 27 of a transformer is securely fastened to core 16 on which the coil 18 is wound, the core 16 and the secondary 27 being pivoted at points 29 and 30. Hence when the electrical variations which are to be recorded are impressed upon the leads L connected to the moving coil 18, the coil is deflected in proportion to these electrical variations and a pointer which is rigidly secured to the movable secondary 27 and which comprises two conductors 19 and 20 and a resistance wire 21, is deflected accord-

ingly. Conductors 19 and 20 may, for example, be ordinary conductors, such as copper wires and are held in spaced relation by means of insulating spacers 22 and 23. The resistance wire 21, however, is made of a metal which becomes heated to a comparatively high temperature by suitable current passing therethrough. This current is supplied by any suitable source, such as the generator 24, through the medium of a transformer which comprises a stationary primary 26 and the coil 27 which functions as a movable secondary. In operation the switch 25 is closed, thus permitting the passage of current from generator 24 through stationary primary 26 from where it is inductively conveyed to the movable secondary 27 and thence through the resistance wire 21. The stationary primary 26 is arranged to be symmetrical with respect to the axis of rotation of coil 18 and movable secondary 27 in which case, the stationary primary will remain unaffected by the angular position of the pointer and will exert no torque on the moving system. Resistance wire 21 is of sufficient length so that a portion thereof will always be adjacent to the exposed elemental section of sheet 11. Thus when the pointer moves through the arc of a circle corresponding to the distance between the edges of the sheet, a portion of the resistance wire 21 will be opposite to and almost in contact with a portion of the elemental section of sheet 11. The minimum distance between the heat sensitive sheet and the resistance wire 21 is determined principally by the temperature at which the sheet functions to give a suitable indication.

To prevent the guide rod 12 from absorbing heat which if permitted would cause a blurring of the record as well as an increase in the amount of heat required, this guide rod is made of a metal having high heat conducting properties, such as copper, and is provided with a longitudinal slot 15 on the portion adjacent the resistance wire. When the heat sensitive sheet is drawn over this type of guide member, only that portion over the slot and hence with air behind it produces a record. The portion passing over the metal base is unaffected due to the heat conducting properties of the bar. This corresponds to the optimum position of drawing the paper over a straight edge of air.

Thus, the apparatus disclosed herein provides a system in which a heat sensitive flexible material is moved, so that an elemental section thereof becomes exposed to a source of heat, said source of heat moving from one edge of the flexible material to the other in accordance with the electrical variations, the heat of the source causing a permanent impression on the flexible material. The record thus produced on the flexible mate-

rial is continuous rather than intermittent. The electrical variations may be recorded by such apparatus at a speed depending upon time required in having the heat sensitive sheet undergo a permanent change.

While this invention has been pointed out in a particular embodiment merely for the purpose of illustration, it is to be understood that the general principle of this invention may be applied to other and widely varied indicating and recording instruments without departing from the spirit of the invention.

What is claimed is:

1. The method of recording electrical variations which consists in transmitting a strip of heat sensitive material over a guide member having a longitudinal slot so that a narrow section of said material becomes progressively exposed over the slot and applying heat steadily to the exposed narrow section to cause a permanent impression upon said material.

2. The method of recording electrical variations which consists in transmitting a strip of heat sensitive material over a guide member so that a narrow section of the paper becomes progressively exposed over a slot in the guide member, applying heat to the exposed narrow section and changing the point of application of the heat with respect to the edges of said material in accordance with electrical variations whereby a permanent record of these electrical variations will be established on said paper.

3. A recording meter comprising a strip of heat sensitive material, a supporting member having a longitudinal slot over which said strip traverses, means for passing said strip over said slot at a uniform rate of speed and means for applying heat to that portion of the strip immediately over said slot.

4. A recording meter comprising a strip of heat sensitive material, a supporting member of high heat conducting material having a longitudinal slot therein over which said strip traverses, a source of heat adjacent said strip and means for moving said source of heat between the edges of said strip whereby a permanent record may be made of the variations in the characteristics of an electrical source.

5. A recording meter comprising a strip of heat sensitive material, a heater element including a stationary coil and a movable coil inductively coupled together and means for progressively exposing an elemental section of said material to said heater element.

6. A recording meter comprising a strip of heat sensitive material, a guide member of high thermal conductivity having a longitudinal slot therein, means for progressively exposing an elemental section of said material over said slot, a heater element

adjacent said exposed section, means including a stationary primary and a movable secondary inductively coupled together for heating said element, and means including
5 said secondary for moving said heater element over said exposed section in accordance with electrical variations.

In witness whereof, I hereunto subscribe my name this 23rd day of May, 1930.

10

WINTHROP J. MEANS.

15

20

25

30

35

40

45

50

55

60

65