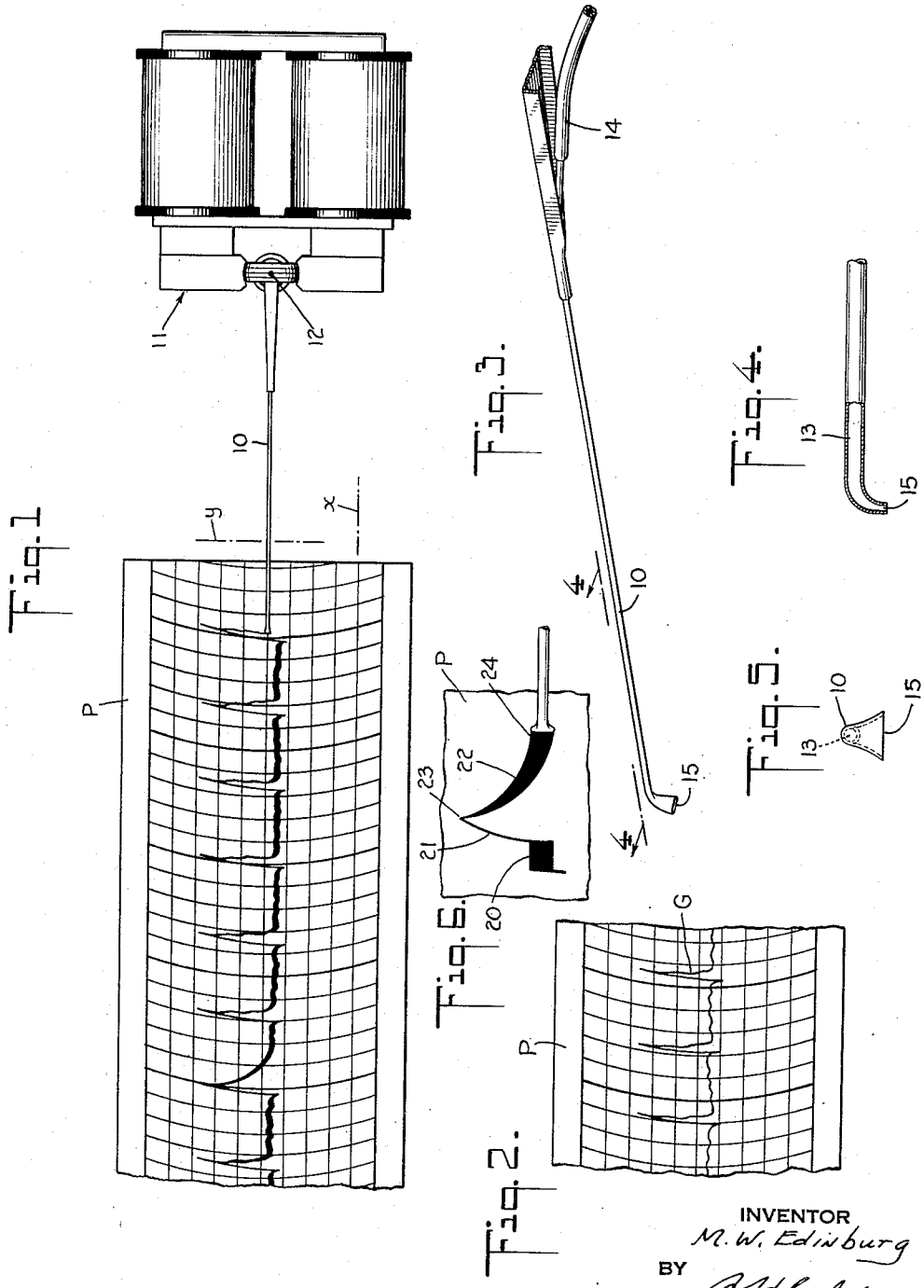
July 21, 1953 M. W. EDINBURG 2,646,336

DIRECT WRITING ELECTROCARDIOGRAPH

Filed April 21, 1948



INVENTOR
M. W. Edinburg
BY
R. H. Golden
ATTORNEY

Patented July 21, 1953

2,646,336

UNITED STATES PATENT OFFICE

2,646,336

DIRECT WRITING ELECTROCARDIOGRAPH

Murray W. Edinburg, Worcester, Mass.

Application April 21, 1948, Serial No. 22,321

2 Claims. (Cl. 346—140)

1

This invention relates to an electrocardiograph of the type using a directly writing stylus actuated in response to variations in heart currents. More particularly, my invention relates to that type of electrocardiograph disclosed in my copending application, Ser. No. 692,717, filed August 23, 1946, now Patent No. 2,571,223, dated October 16, 1951, in which a directly writing stylus is electromagnetically actuated in response to variations in amplified heart currents. My invention is particularly related to that type of directly writing stylus utilizing an ink writing pen, but it may conceivably be embodied in an electrocardiograph in which the directly writing stylus is of the "hot" stylus type.

Physicians are accustomed to utilizing electrocardiographs of the light beam type in which an Einthoven string galvanometer effects the movement of a light beam relatively to a light sensitive paper for recording heart currents impressed on the galvanometer. In machines of the particular type, or in the vacuum tube mirror galvanometer type electrocardiographs, the graph that results is formed by a line of varying width or thickness. Thus, the slower the movement of the light beam in the y axis transversely of the movement of the paper, the wider is the recorded line, maximum width being obtained when the light beam is stationary. Physicians have become accustomed to this type of graph and have been trained to understand and read the particular type of graph.

Directly recording electrocardiographs are extremely desirable for many reasons that are well understood by those skilled in the art and some of which are fully recited in my earlier application. However, such directly recording electrocardiographs contribute a graph in which the line is of uniform width throughout. Physicians find it very difficult to adapt themselves to this type of graph, and for that reason there has been some resistance to the introduction of the directly recording electrocardiographs despite their many advantages.

It is the object of my invention to contribute a directly writing electrocardiograph in which the graph is substantially the same as that which results from the use of a light beam type of electrocardiograph. The results of my invention are out of all proportion to the very simple means I have conceived; thus, I merely form the writing end of the stylus of my electrocardiograph so that it is narrow and elongated with the axis of the elongation aligned substantially parallel to the y axis of the graph paper when the stylus is in a

2

neutral position. Thereby, the width of the line made by the stylus will vary with the speed of movement of the stylus in the y axis relatively to the speed of movement of the paper.

In disclosing my invention here, I have shown it applied to an ink writing stylus or pen, but it may very well be applied in principle to a hot writing stylus, as will be apparent presently.

I have thus outlined my invention in order that the detailed description thereof that follows may be better understood, and in order that my contribution to the art may be better appreciated. Those skilled in the art will appreciate that the conception on which my disclosure is based may readily be utilized as a basis for the designing of other structures for carrying out the several purposes of my invention, and that the patent to be granted me shall not be limited to the particular structure shown in this application.

Referring now to the drawings, Fig. 1 shows the stylus or pen of my invention in its relation to a piece of graph paper. Fig. 2 shows the type of graph that is formed by the usual directly writing stylus or pen of the prior art. Fig. 3 is a perspective view of part of the pen of Fig. 1. Fig. 4 is a section through the end of the pen of Fig. 3. Fig. 5 is an end view of the pen. Fig. 6 is an enlarged view of part of the graph showing the variation in the width of the graph that results through the utilization of my invention.

Referring now more particularly to the drawings, I show in Fig. 2 a piece of graph paper P in which the graph G is a thin line of the type that results from the utilization of present directly writing styluses either of the hot stylus or ink writing type. Referring now more particularly to Figs. 1, 3, 4, and 5, I show there a pen 10 adapted for movement by the electromagnet 11 in response to variations in a heart current, this movement being about the pixot axis 12. Pen 10 is formed with a passage 13 to which ink is fed by a flexible rubber tube 14, the ink moving preferably by capillary attraction. In this way, the ink is supplied to a writing opening 15 that is narrow and elongated, with the axis of elongation thereof in substantial alignment with the y axis of the graph paper P.

It is obvious that when the graph paper P moves linearly in its x axis, and there is no movement of the pen 10 in the y axis, then the width of the line formed by the pen 10 will be maximum as shown at 20 in Fig. 6. When the pen 10 moves at maximum speed in the y axis, this movement being of course on an arc in the particular structure shown, then the width of the line will be

at a minimum as seen at 21 in Fig. 6. When the pen moves at a varying speed, then the width of the line will vary as shown at 22 in Fig. 6. Thus, it is evident from the line 22 that the pen has moved at a gradually decreasing speed from the peak 23 to the point 24. While my invention is extremely simple so far as structure is concerned, those skilled in the art will understand the considerable contribution made thereby to this art.

I now claim:

1. In an electrocardiograph of the type having a graph paper, means for moving said graph paper in a linear x axis direction, an electromagnetically actuated pen, means for moving said pen in a generally y axis direction at right angles to said x axis in response to variations in heart currents, said pen having a passage therethrough for the feeding of ink from an ink supply, said passage terminating in a narrow elongated writing opening in writing relation to the graph paper and with the axis of the narrow elongated opening aligned substantially parallel to the y axis of the graph paper when the pen is in a neutral position, whereby the width of the line made by said pen will vary with the speed of movement of said pen in the y axis relatively to the speed of movement of the paper.

2. In an electrocardiograph of the type having a graph paper, means for moving said graph paper in a linear x axis direction, an electromagnetically actuated pen, means for moving said pen relatively to the paper with the writing end of the pen moving substantially in a y axis direction at right angles to said x axis in response to variations in heart currents, said pen having a passage therethrough for the feeding of ink from an ink supply, said passage terminating in a narrow elongated writing opening in writing relation to the graph paper and with the axis of the narrow elongated opening aligned substantially parallel to the y axis of the graph paper when the pen is in a neutral position, whereby the width of the line made by said pen will vary with the speed of movement of said pen in the y axis relatively to the speed of movement of the paper.

MURRAY W. EDINBURG.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
738,839	Patton	Sept. 15, 1903
757,024	Clement	Apr. 12, 1904
899,043	Harris	Sept. 12, 1908
1,964,512	Halpern	June 26, 1934
2,216,259	Wetterstrand	Oct. 1, 1940
2,412,639	Traugott	Dec. 17, 1946
2,439,640	Traugott	Apr. 13, 1948
2,454,966	Faus	Nov. 30, 1948