May 11, 1965 R. S. PRICE 3,182,399

TRACING CONVERTER

Filed Oct. 14, 1960

FIG.1.

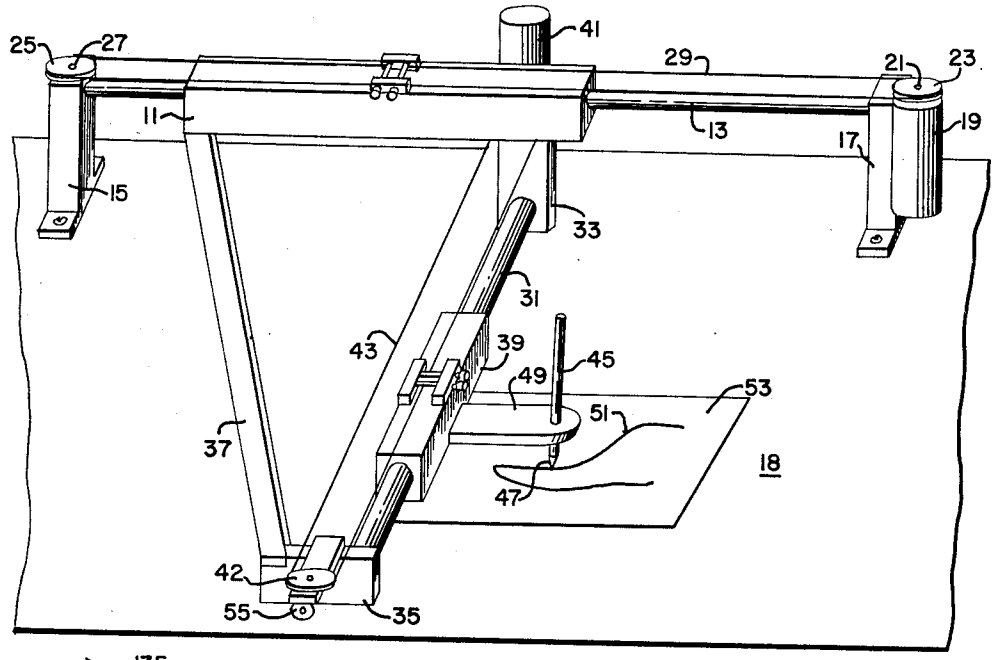
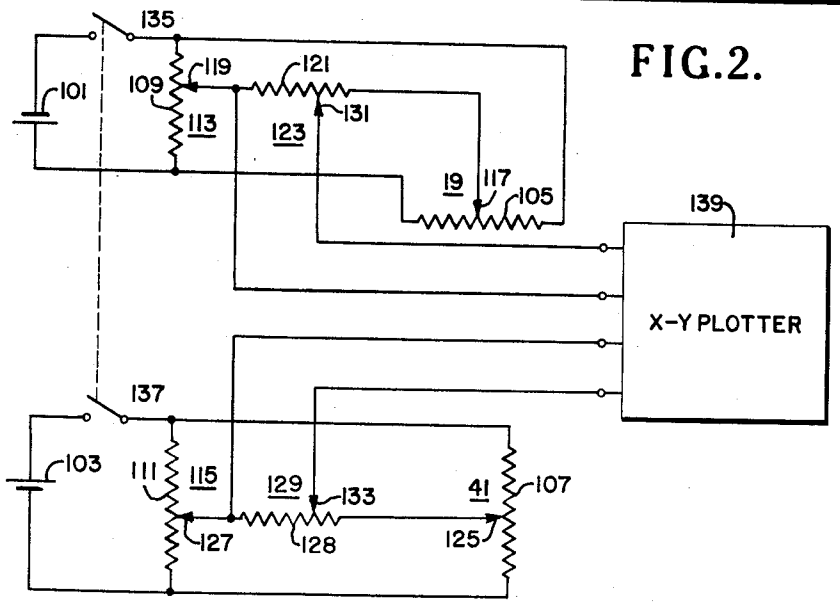


FIG.2.



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TRACING CONVERTER

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The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

This invention relates to tracing apparatus and more particularly to an electrical tracing converter device in which desired proportions of x and y axis coordinates of graphical data may be independently selected for reproduction on an x–y plotter.

In reproduction of graphical information it is sometimes desired to reproduce such information in a manner to emphasize or deemphasize either the x-axis or y-axis dimension of information. Conventional pantographs and photographic enlargers, for example, must enlarge or reduce data for each axis by the same proportion whereas the unique apparatus of the present invention provides for individual selection of the degree of magnification or reduction of each of the x and y axes independently.

The independent selection of scale values is provided by the employment of individual sensitivity potentiometers in conjunction with each of the x and y axes displacement potentiometers respectively.

It is an object of this invention to provide tracing apparatus for reproducing graphical data in which the scale factor of the x and y axes may be independently selected.

It is a further object of this invention to provide a tracing converter with a sensitivity potentiometer in the x-axis and in the y-axis thereof.

A further object of this invention is to provide tracing apparatus for x–y coordinate graphical data in which the magnification or reduction of the original data may be independently selected for each of the x and y axes.

A still further object of this invention is to provide a new and improved tracing converter for reproducing graphical data on an x–y plotter in which magnification or reduction of the data of the x and y axes may be selected independently.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawing in which like reference numerals designate like parts throughout the figures thereof and wherein

FIG. 1 of the drawing is a view in perspective and partly broken away illustrating a preferred embodiment of the tracing unit of the invention, and

FIG. 2 of the drawing illustrates a schematic circuit suitable for use with the tracer converter of the present invention as connected to an x–y plotter.

Referring now to FIG. 1 of the drawing, a preferred embodiment of the physical arrangement of the apparatus is illustrated in which the horizontal x-axis positioning is provided by block **11** which is slidably mounted on cylindrical rod **13**. Cylindrical rod **13** is supported at the ends thereof by supporting members **15** and **17** respectively which may be fastened by means of screws or bolts to a surface **18** such as a table top. A potentiometer **19** for x-axis displacement is mounted on supporting member **17**. Potentiometer **19** has a shaft **21** upon which is connected grooved pulley **23**. A second grooved pulley **25** is rotatably mounted on shaft **27** which is fixed to supporting

member **15**. A fine wire or string **29** is connected or tied to block **11** at the ends thereof and wound around pulleys **23** and **25** such that when block **11** is moved along the x-axis, pulleys **23** and **25** will rotate and potentiometer shaft **21** will be moved, varying the potentiometer setting. A y-axis rod **31** is supported by blocks **33** and **35**. A stabilizing bar **37** connects between blocks **11** and **35**. Block **33** is fixedly attached to block **35**. A block **39** is slidably mounted on rod **31** for y-axis displacement. A y-axis potentiometer **41** is mounted on block **11** with a pulley extending from the lower side, not shown in the drawing. The pulley of potentiometer **41** is connected to pulley **42** rotatively mounted on block **35**, through a fine wire or string **43** which is tied or otherwise secured at its ends to block **39** such that the pulleys of potentiometer **41** is rotated when block **39** is moved along rod **31** on the y-axis. Tracing element **45** having point **47** is supported by arm **49** which is secured to block **39**. In operation, a curve such as curve **51** on chart **53** secured to surface **18** may be followed by tracing point **47** by manually moving tracing element **45** along curve **51**. When the tracing element is moved along curve **51**, for example, slidable blocks **11** and **39** are caused to be moved and the shafts of potentiometers **19** and **41** rotated. A roller **55** may be provided on block **35** to reduce friction between block **35** and surface **18**.

Referring now to FIG. 2 of the drawing in which a schematic diagram of the electrical circuitry including the potentiometers of the invention is illustrated, voltage sources **101** and **103** are connected to supply voltages respectively to the resistance elements **105** and **107** of potentiometers **19** and **41** respectively. Voltage sources **101** and **103** also connect across resistance elements **109** and **111** of potentiometers **113** and **115** respectively. Movable taps **117** and **119** of potentiometers **19** and **113** connect to resistance element **121** of potentiometer **123**. In like manner, movable taps **125** and **127** of potentiometers **41** and **115** connect across the resistance element **128** of potentiometer **129**. Potentiometers **123** and **129** have movable taps **131** and **133** respectively.

Switches **135** and **137** are provided to connect or disconnect batteries **101** and **103** from the circuits. These switches may be mechanically coupled or ganged as indicated. The outputs of the tracing converter potentiometers are fed to a conventional x–y plotter **139** for reproduction. The x-axis information is fed to the plotter from movable taps **119** and **131**, and the y-axis information is fed to the plotter from movable taps **127** and **133**.

Referring to both FIGS. 1 and 2 of the drawings potentiometers **113** and **115** are provided for zero adjustments of the x-axis and y-axis output voltages respectively of the tracing converter.

In operation, potentiometer taps **117** and **125** are adjusted to a desired initial position as a result of movement of the tracing element. Potentiometer taps **119** and **127** are now adjusted to produce a zero output voltage at the input to x–y plotter **139**. Taps **131** and **133** are independently moved to produce the desired scales of voltages at the input of the x–y plotter.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. Tracing apparatus for reproduction of graphical data comprising a tracing implement for following graphical data on x and y coordinate axes, first guide means, said tracing implement slideably connected to said guide means to provide displacement of said implement

along a *y* axis, second guide means slideably mounted on said first guide means to provide displacement of said tracing implement along an *x* axis, a first enclosed rotary potentiometer mounted at one end of said first guide means having a pair of terminals and a moveable tap, said moveable tap having a rotatable shaft connected thereto with a first pulley fastened thereon, means connecting the terminals of said potentiometer to first source of D.-C. voltage, a second pulley mounted on the other end of said first guide means, a first endless line rotatably engaging said first and second pulleys, means fastening said first endless line to said tracing implement such that said tap will move in linearly proportional relationship with the movement of said tracing implement along said first guide means whereby the voltage at said tap will be proportional to the instant position of said tracing implement with respect to said first guide means, a second enclosed rotary potentiometer having a pair of terminals and a moveable tap, said moveable tap having a rotatable shaft connected thereto with a third pulley fastened thereon, said terminals connected to a second source of D.-C. voltage, a fourth pulley mounted at the other end of said second guide means, a second endless line rotatably engaging said third and fourth pulleys, means fastening said second endless line to said first guide means such that said tap of said second potentiometer will move in linearly proportional relationship with the movement of said first guide means along said second guide means whereby the voltage at the tap of said second potentiometer will be proportional to the instant position of said first guide means, a first sensitivity potentiometer connected between the tap of said first potentiometer and the *y* axis input of an *x–y* plotter such that a desired portion of the voltage at the tap of said first potentiometer may be independently selected and applied to said *y* axis input of said *x–y* plotter, a second sensitivity potentiometer connected between the tap of said second potentiometer and the *x* axis input of said *x–y* plotter such that a desired portion of the voltage at the tap of said second potentiometer may be independently selected and applied to said *x* axis input of said *x–y* plotter.

2. Tracing apparatus for reproducing *x–y* coordinate axes graphical data comprising a first cylindrical rod disposed along an *x* axis coordinate, a first slideable block slideably mounted on said first cylindrical rod, a second cylindrical rod mounted on said first block and disposed along a *y* axis coordinate, a second slideable

block slideably mounted on said second cylindrical rod, tracing means attached to said second block for movement therewith, a first enclosed rotary potentiometer having a pair of terminals connected to a first source of D.-C. voltage, said first potentiometer having a rotatable shaft with a first pulley fastened thereon, said first potentiometer being mounted at one end of said first cylindrical rod, a second pulley mounted at the other end of said first cylindrical rod, a first endless line rotatably engaging said first and second pulleys and fastened to said first slideable block to move with the movement of said first slideable block, a second enclosed rotary potentiometer having a pair of terminals and a rotatable shaft with a third pulley fastened thereon, said terminals of said second potentiometer being connected to a second source of D.-C. voltage, said second potentiometer being mounted at one end of said second cylindrical rod, a fourth pulley mounted at the other end of said second cylindrical rod, a second endless line rotatably engaging said third and fourth pulleys and fastened to said second slideable block to move with the movement of said second slideable block, a first sensitivity potentiometer connecting said tap of said first potentiometer to a first output terminal means such that a desired portion of an output voltage of said first potentiometer representing a desired scale factor may be independently selected and applied to said first terminal means, a second sensitivity potentiometer connecting said tap of said second potentiometer to a second output terminal means such that a desired portion of an output voltage of said second potentiometer representing a desired scale factor may be independently selected and applied to said second terminal means.

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