

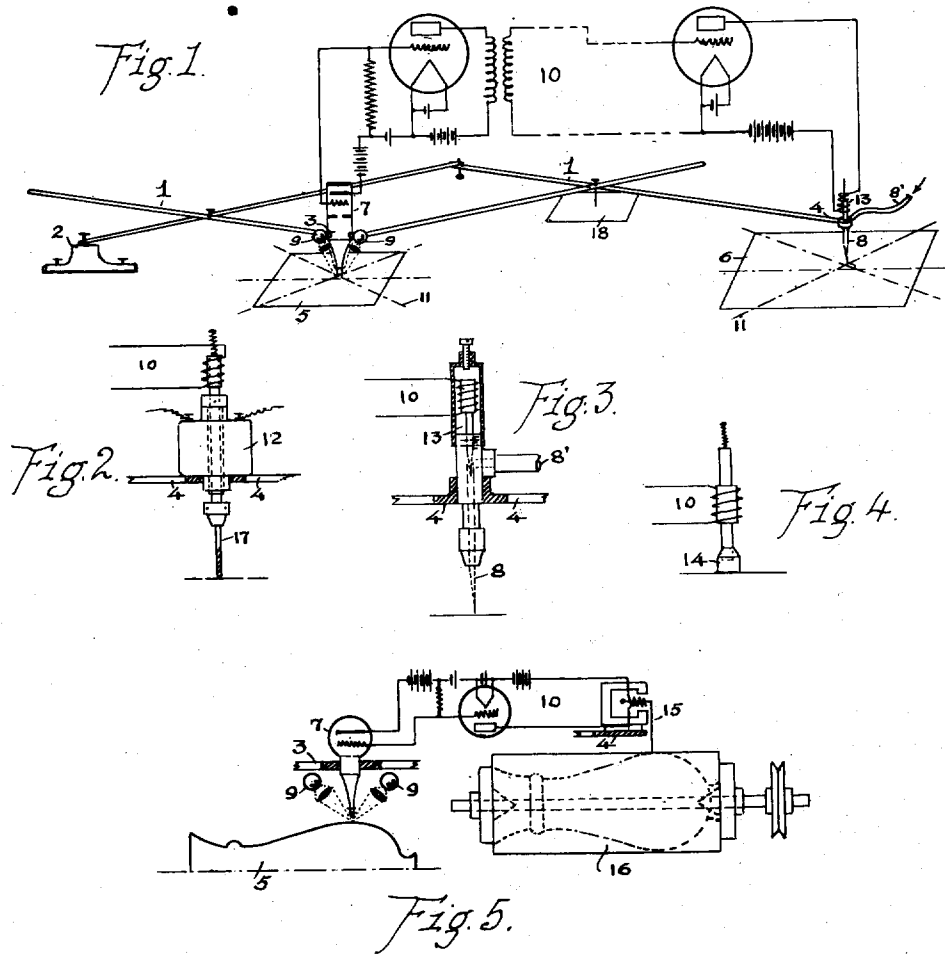
Aug. 22, 1933.

W. HOWEY

1,923,208

PANTOGRAPHIC SCANNING

Filed May 7, 1930



Walter Howey

Inventor

By

N. S. Amstutz

Attorney

UNITED STATES PATENT OFFICE

1,923,208

PANTOGRAPHIC SCANNING

Walter Howey, New York, N. Y.

Application May 7, 1930. Serial No. 450,349

6 Claims. (Cl. 33—25)

My invention relates to improvements in pantographic scanning, and it more especially consists of the features pointed out in the claims.

The purpose of my invention is to provide a scanning device which is operable in any direction on a given plane; which prevents errors such as over-running; that allows the most intricate subjects to be scanned; that permits a variable speed of scanning under the manipulation by the operator in contrast to a fixed speed when exact linear scanning on adjacent paths of travel is used; that may also combine the remote control of another pantograph by means of right angled components similar to the well known telautograph; that permits of any desired type of recording means or control of other mechanisms; that may use a supplemental recording means to simultaneously make a record of the thing which is being formed or duplicated; that utilizes a light sensitive cell associated with amplifying means having a power output adapted to control any desired form of power machinery by relay or pneumatic action or other means; that will control the direction of power machinery to do lathe work, pottery making, stamping or cutting or drilling, or shaping metals by blow torch action; that may accomplish these and other related purposes from original drawings of the artist or engineer, thus eliminating the use of patterns or templates; that in its broadest aspect, comprises the control of reproducing or producing tools by means of a photo electric cell adapted to scan an engineer's or artist's drawing made in black and white lines; and that may also control any form of movable stop, trigger or valve to operate a paint gun, air brush, etc., etc. The present invention is an improvement on the optical scanning system disclosed in Patent No. 1,719,621 of July 2, 1929.

With these and other ends in view, I illustrate in the accompanying drawing such instances of adaptation as will disclose the broad underlying features of my invention without limiting myself to the specific details shown thereon and described herein.

Figure 1 is a diagrammatic perspective instantiating one of many different kinds of adaptations.

Fig. 2 is a diagrammatic view of a motor driven drill control.

Fig. 3 is an enlarged diagrammatic view of a magnetic torch control.

Fig. 4 is a diagrammatic view of a hammer control.

Fig. 5 is a diagrammatic view of an optical

scanning system associated with a reproducer working in clay.

In practicing my invention I may use whatever alternatives or equivalents of structure that the exigencies of varying conditions may demand without departing from the broad spirit of the invention.

Any desired type of pantograph 1 or other mechanical movement may be used. In the pantograph instanced, one arm is fastened pivotally to a support 2. At one corner 3 of the parallelogram formed by four of the cooperating bars of the pantograph a source of light 9 is located. This comprises an optical system which concentrates the light upon a small area of an adjacently placed subject 5. The illumination is picked up by a photoelectric light sensitive cell 7 and suitably amplified by the circuit 10 so as to control a reproducing or recording device which is positioned at the extreme end 4 of the last pantograph arm.

It is immaterial whether the scanning of a delineative subject by the light sensitive cell 7 acts upon a control mechanism for producing a physical replica such as a drill 17, operated by a motor 12, an electrically controlled acetylene torch 13, a profiling cutter, a routing cutter, a punch or hammer 14, etc., regardless of the specific uses to which these various implements may be put.

As is well known the interconnected arms of a pantograph may be adjusted in respect of each other to enlarge or reduce as desired. Whatever is being copied in facsimile, or otherwise; the reproduction 6 may be an enlargement or a reduction.

Applicant is aware that pantographs having an acetylene torch at one of its extremities, and a tracing wheel secured to another part of the pivotally connected bars, have been used to duplicate parts by manually causing the tracing wheel to follow the outline of a master pattern or template, the accuracy of the result being entirely dependent upon the care exercised by the operator. With my system the personal equation of the operator is eliminated because the optical scanner 7 takes the place of a mechanical tracer used heretofore. The scanning may be done at any angle across the pattern or subject, other than that indicated by 11. When a dark portion of the design or pattern is scanned by the optical system, the recording or reproducing mechanism will be operated.

In the operation of a drill it is obvious that when the scanner is opposite a center mark on the

drawing, the drill will be pressed into its work by the power output of the amplifying system 10 against the reverse pull of a spring. When it is desired to withdraw the drill or other tool from its work without moving the articulated arm, it is only necessary to slip a white card beneath the scanner. The direction of movement of whatever tool is being operated, in respect of a black line of the drawing or a white space of the drawing, may be controlled by means of any well known conventional relay connected in the output of the circuit 10.

It will be noted that if a routing cutter is used instead of the drill 17, it will follow whatever contour or shape may be given to a black line on the drawing. In moving the scanner along the line, if it starts the least bit to the right or left of the line the router will be withdrawn from the work, thus preventing over-running. The control referred to is also applicable to any of the other tools or appliances heretofore mentioned, whether any of such tools be electrically or pneumatically operated under the direction of the photo electric cell.

In Figs. 1 and 3, the conventional blow torch pointed flame is indicated at 8. The illustration in Fig. 5 shows an adaptation of the system to pottery working, wherein the shaping of the clay cylinder 16 is done by the tool 15 under the direction drawing 5 acting through the photo electric cell 7.

With my system an increase of speed is secured, by reason of the fact that in crossing large open spaces the scanner and reproducer can both be moved rapidly, and only slowly or entirely stopped at the crossing of a line. This cannot be done wherever a fixed lineal speed of scanning is used in recurring adjacently positioned paths of straight line travel. Should it be desired to preserve a copy of an outline of the work being done, a record sheet 18 may be acted upon at any cooperating point of the pantograph. In Fig. 3 the tube 8' may be used to supply acetylene gas or air to operate whatever device may be attached.

What I claim is:

1. In a universal scanning device, an articulated system of interconnected arms in adjustable pivotal relation to each other, a support on one of the arms for a light sensitive tracing media adapted to follow a path defined by contrast of light reflections of a given surface, a device positioned on another arm of the system including means to reproduce said path upon another surface, and means to render the reproducing means inoperative upon departure of the tracing media from said path in a direction parallel to the plane of said path.

2. A universal scanning device, comprising a pantograph having a plurality of pivotally inter-

connected arms, a light sensitive tracing device adapted to follow a path defined by contrast of light reflection of a given surface positioned on one arm, a responsive device including means to reproduce said path upon another surface, and means to render the reproducing means inoperative upon departure of the tracing device from said path in a direction parallel to the plane of said path.

3. A universal scanning device, comprising a pantograph for reproducing an illuminated subject, a light sensitive scanner positioned adjacent the subject adapted to follow a path defined by contrast of light reflection from the subject, a responsive device including means to reproduce said path on a receiving surface, and means for rendering the reproducing means inoperative upon a departure of the scanning device from said path in a direction parallel to the plane of said path.

4. An optical scanning system comprising a plurality of pivotally interconnected arms, means for adjusting the relation of said arms to each other, means for permanently pivoting one of said arms, a light sensitive scanning device positioned on the arms at one point, said device being adapted to follow a path defined by contrast of light reflection from a subject on a given surface, a responsive device including means to reproduce said path upon another surface, and means to render the reproducing means inoperative when the scanning device departs from said path in a direction parallel to the plane of said path.

5. An optical scanning system comprising means for scanning a suitable subject said means being adapted to follow a path defined by contrast of light reflected from the subject, a photo-electric device responsive to the scanning means, means responsive to the photo-electric device for reproducing the scanned subject, and means for rendering the reproducing device inoperative when the scanning means departs from the path of the subject which is being scanned in a direction parallel to the plane of said path.

6. An industrial scanning system comprising a photo-electric scanning cell adapted to follow a path defined by contrast of light reflection from a given subject, an amplifying system, a responsive device controlled by the scanner through the amplifying system for reproducing the scanned subject, means for simultaneously moving the scanner and the responsive device parallel to one plane and the responsive device parallel to another plane, and means for rendering the reproducing means inoperative upon a departure from the path being scanned by the scanning cell in a direction parallel to the plane of said path.

WALTER HOWEY.