Nov. 26, 1935. W. A. BOCKIUS 2,021,931

PANTOGRAPHIC DEVICE

Filed April 2, 1934 2 Sheets-Sheet 1

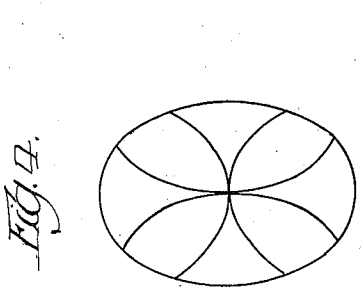

Fig. 4.

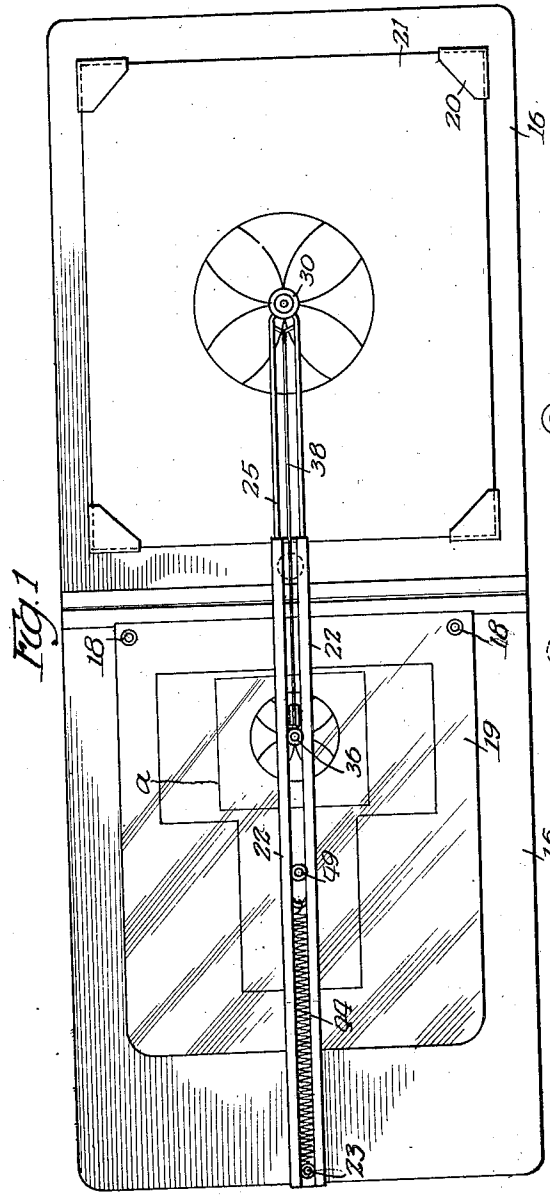

Fig. 1

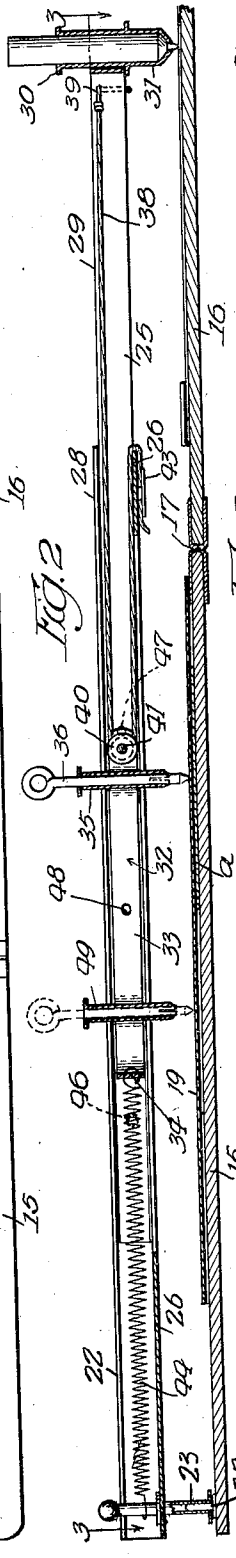

Fig. 2

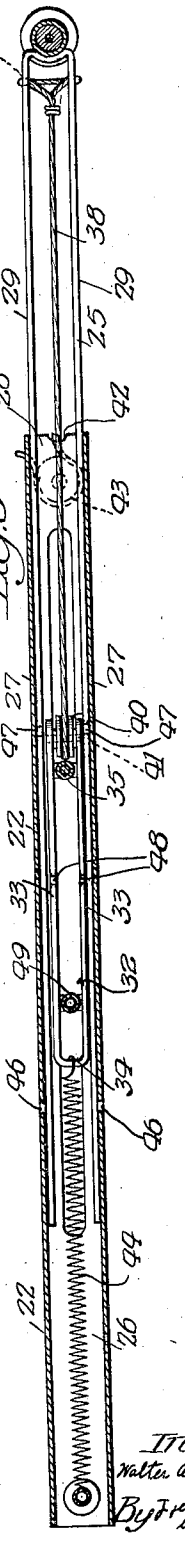

Fig. 3

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PANTOGRAPHIC DEVICE

Filed April 2, 1934 2 Sheets-Sheet 2

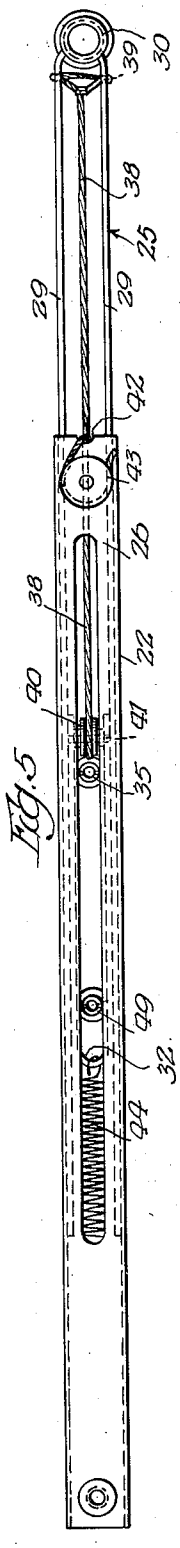

Fig. 5

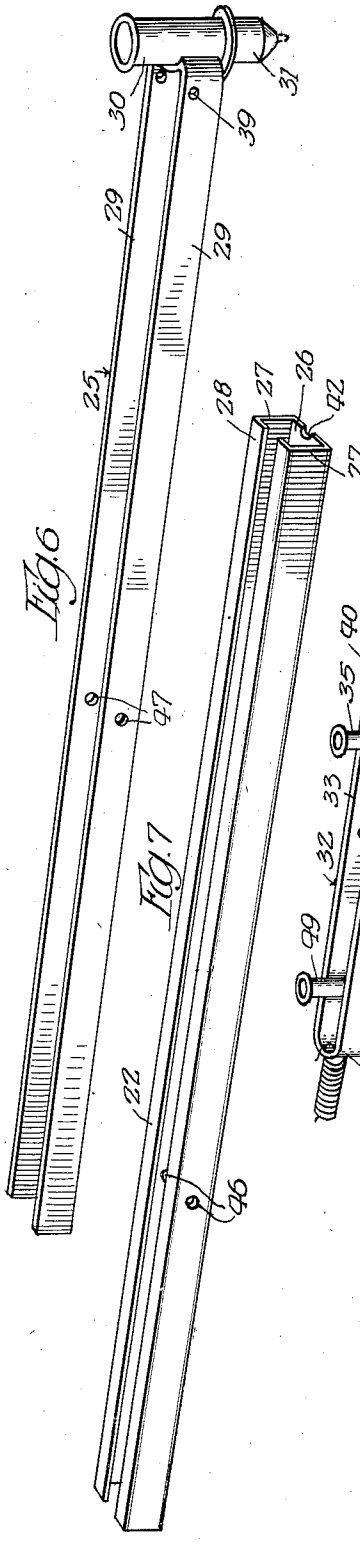

Fig. 6

Fig. 7

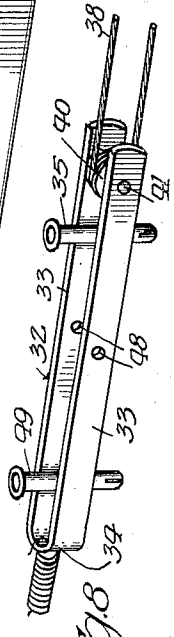

Fig. 8

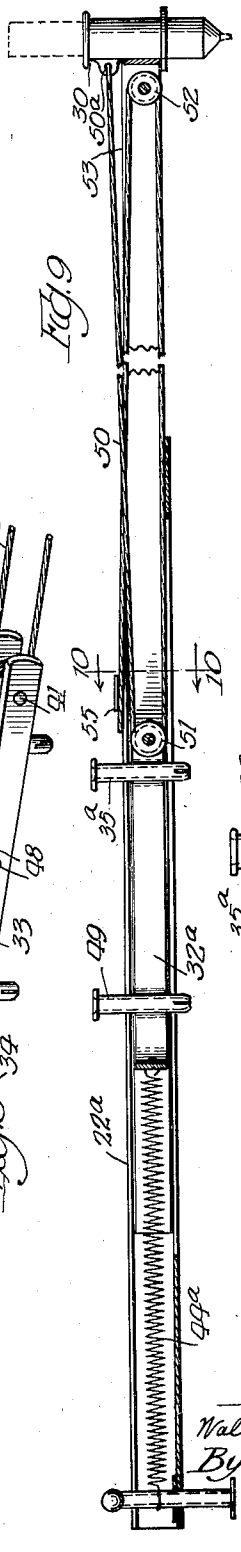

Fig. 9

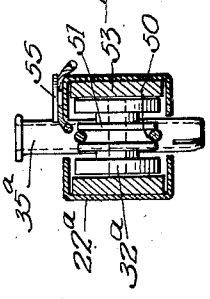

Fig. 10

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Patented Nov. 26, 1935 2,021,931

UNITED STATES PATENT OFFICE

2,021,931

PANTOGRAPHIC DEVICE

Walter A. Bockius, Evanston, Ill.

Application April 2, 1934, Serial No. 718,545

7 Claims. (Cl. 33—23)

The invention relates to pantographic devices.

One object of the invention is to provide an improved pantographic device in which the members are slidably connected in such manner that the stylus member for tracing a picture or design, and the marker carrying member will be proportionately multiplied by relative sliding movement of the members of, and pivotal movement with a pivoted supporting member.

Another object of the invention is to provide a pantographic device whereby cartoons or distorted pictures may be produced.

Other objects of the invention will appear from the detailed description.

The invention consists in the several novel features hereinafter set forth and more particularly defined by claims at the conclusion hereof.

In the drawings:

Fig. 1 is a plan of a device embodying the preferred form of the invention;

Fig. 2 is a vertical section through the pantographic device;

Fig. 3 is a horizontal section of the pantographic device;

Fig. 4 is an illustration of a cartoon or distorted picture which may be produced by the device from the design shown in Fig. 1;

Fig. 5 is an inverted plan;

Fig. 6 is a perspective of the slidable marker carrying member;

Fig. 7 is a perspective of the pivotally sustained supporting member in which the stylus carrying and marker members are slidably supported;

Fig. 8 is a perspective of the stylus slidable carrying member;

Fig. 9 is a longitudinal section of a device embodying a modified form of the invention; and

Fig. 10 is a section on line 10—10 of Fig. 9.

The invention is exemplified with a folder which comprises stiff back sections 15 and 16, which are hinged together at 17 by a flexible strip so they may be folded together into book form when not in use. The section 15 has secured to its face by rivets 18 adjacent the hinge 17, a transparent sheet 19, preferably of flexible celluloid. The left hand portion of the celluloid sheet is free so it can be lifted to permit a sheet *a* with a picture thereon to be placed under it and be protected thereby. The sheet *a* having the design or picture to be reproduced is placed under the celluloid sheet 19 and is held thereunder in fixed position. Outlines 15ª may be marked on the section 15 to locate the proper places for the sheet *a* according to the positions of the stylus hereinafter described. The back section 16 is adapted to hold a sheet 21 to which the design picture placed under the celluloid sheet 19 is to be transferred and enlarged, and is provided with clips 20 for removably holding the sheets 21.

The improved pantographic device comprises a supporting member 22 which is provided adjacent one end with a socket 23 to receive a fulcrum pin or stud 24 on the back section 15, so the member 22 and the parts carried thereby can swing laterally about a fixed point. The supporting member 22 is preferably formed of sheet metal bent into channel-shaped bars, and comprises a bottom wall 26, side walls 27, and inturned top flanges 28 which are spaced apart to form, in effect, a longitudinal slot in the top of member 22. A marker carrying member 25 comprises side-bars 29 which are integrally connected at one end and a socket 30 fixedly secured to the bars 29 and adapted to carry a marker 31, such as a pencil. Said bars 29 fit between the bottom wall 26 and the top flanges 28 of the supporting member 22 so the member 25 will be longitudinally slidable in the supporting member 22 to permit the marker 31 held in the socket to move to and from the fulcrum pin 24 in the socket 23 of the supporting member 22. The member 25 is also pivotally movable with the supporting member 22 about said fulcrum pin 24. A stylus carrying member or bar 32 which is pivotally movable with the members 22, 25 comprises a pair of side bars 33 integrally connected at one end as at 34. The side-bars 33 of member 32 fit between the bars 29 of the slidable member 25 and between the bottom wall 26 and flanges 28 of the supporting member 22. This permits the stylus carrying member 32 to slide longitudinally in and relatively to members 25 and 22. A socket 35 is permanently secured in the stylus carrying member 32 between the bars 33 and is adapted to receive and slidably retain a stylus 36 so it rests on sheet 19 and so the stylus can be traced over the lines of the picture on the sheet *a*.

A device is provided between the stylus carrying member 32 and the marker carrying member 32 and supporting member 22 proportionately to multiply the movement of the marker relative to the stylus when the latter is shifted longitudinally of member 22 or to and from the pivot 23. In the form of the invention illustrated in Figs. 1 to 7, inclusive, this device is adapted to increase the movement of the marker at the ratio of 2 to 1 with respect to the sliding movement of the stylus 36, so that the size of the reproduced picture on sheet 21 will be twice the size of the picture on the sheet *a*. This multiplying device

comprises a cord or other suitable flexible element 38 which has one of its ends tied through holes 39 in the side bars 29 of the marker carrying member 25 adjacent the socket 30. This cord 38 passes longitudinally between the bars 29 to and around a sheave 40 which is rotatably mounted on a pin 41 at the outer end of the stylus carrying member 32 and between the bars 33 of said member. From the sheave the cord 38 is looped around a notch 42 in the outer end of the bottom wall 26 of the supporting member 22 and thence around a button 43 which is secured to the under side of the wall 26 of member 22 and is adapted to tie one end of the cord to said member. A coil spring 44 is disposed in the supporting member 22, and has its outer end hooked to the end wall 34 between the bars 33 of the stylus carrying member 32 and has its other end hooked to the pivot socket 23. This spring acts to retract the stylus carrying member 32 and to hold it normally in its innermost or normal position. Said spring also keeps the cord 38 taut at all times and through the member 32 and cord 38 slidably retracts the member 25. When the marker is drawn outwardly the cord 38 will cause the stylus to slide outwardly a distance equal to one-half of the outward movement of the marker 31, because the cord is looped around the sheave 40 between its ends which are tied to the marker carrying member 25 and the supporting member 22. As a result, when the market 31 is slidably shifted while the stylus is traced over the picture on the sheet *a*, the marker 31 will move double the distance which the stylus is moved. The socket 35 is properly positioned between the pivot and the marker, so that the pivotal movement of the marker will also be double the pivotal travel of the stylus. As a result, the picture produced by the marker on the sheet 21 will correspond in all proportions to the picture on the sheet *a* when the stylus 36 is traced over the picture and the reproduced picture will be, in all respects, double the size of the picture on the sheet *a*.

In operating the device the operator will grasp the marker and manipulate it by pivotal and sliding movements in the proper directions to cause the stylus to trace the lines of the picture. The spring 44 will exert a pull on the stylus carrying member which will be transmitted through the sheave 40 and cord 38 to the marker carrying member to retract both of the slidable members toward the pivot 23. The sliding movement of the marker away from the pivot and the conjoint pivotal movement of the members 22, 25, and 32 will be controlled by the operator and the spring will, when the marker is released, pull the slidable members into their normal position.

In order to effect a proper normal setting of the cord 38, holes 46 are formed in the side walls 27 of the supporting member 22 which are adapted to register with the holes 47 in the bars 29 of the marker carrying member and holes 48 in the side-bars 33 of the stylus carrying member. The stylus 36, when removed from the socket 35, may be passed through openings 46, 47, and 48 which will register when the marker and slidable members are in correct normal correlative positions. When all of these bars are secured together against longitudinal movement by the stylus, the cord 38 can be lapped around the sheave, drawn taut through the notch 42 and secured to the abutment 43. As a result, the proper relationship for 2 to 1 enlargement will be established. When the cord has been thus connected, the stylus 36 can be removed from the holes 46, 47, and 48.

The invention exemplifies a pantographic device in which the supporting member is pivotally sustained and the marker and stylus carrying members are pivotally movable with and mounted to slide longitudinally in the supporting member and are slidable relative to each other so that the movement of the stylus 36 will always be correctly multiplied in the desired ratio at the marker by pivotal and sliding movement of the marker.

The invention also provides a pantographic device whereby distortions or cartoons may be reproduced in resemblance of the picture of the sheet *a*. For this purpose, a second socket 49 is fixed adjacent the inner end of the stylus carrying member 32, to receive and hold the stylus 36. The socket 49 is located closer to the pivot point of the supporting member than socket 35. When tracing the picture with the stylus in the socket 49 the pivotal travel of the marker will be greater than 2 to 1 with respect to the stylus, while the relative sliding movement of the stylus and marker carrying members will be at the ratio of 2 to 1. As a result, when the picture is moved on the back section 15 so it will be positioned under the stylus 36 in socket 49, and the stylus is traced over the picture, a distorted or vertically elongated picture will be produced, as shown in Fig. 4. When it is desired to distort the picture by relative decrease in the vertical dimensions, the picture on the sheet *a* is turned 90°.

The invention thus exemplifies a pantographic device by which pictures may be distorted by reproduction of the horizontal dimensions at one ratio and the vertical dimensions at a different or greater ratio.

When it is desired to reproduce at the ratio of 3 to 1 the modified form of multiplication device illustrated in Figs. 9 and 10 is used. In this form of the invention the cord 50 has one of its ends attached at 50^a to the marker carrying member 53, and extends thence toward the pivot of the supporting member, and around a sheave 51 which is rotatably mounted in and between the bars 32^a of the slidable stylus carrying member. From the sheave 51 the cord passes outwardly and to a sheave 52 which is journaled on the marker carrying member 53 and between the side bars thereof. The cord passes around the front of sheave 52 and extends thence backwardly to an attaching button 55 fixed to the pivoted supporting member 22^a. In this form of the invention the socket 35^a is properly positioned between the marker and the pivot of the supporting member so the pivotal movement of the marker will be at the ratio of 3 to 1 with respect to the stylus. When sliding movement is imparted to the marker, the cord 50 will control the travel of the stylus carrying member at the ratio of 1 to 3 of the marker. The spring 44^a retracts the slidable members and keeps the cord taut.

The invention exemplifies a pantographic device in which the pivotal travel of the supporting member is utilized to multiply the movement of the marker in one direction and the slidable movement between the marker and the stylus carrying members is properly proportioned to effect a corresponding multiplication in lateral movement. Also a device in which provision is made for reproducing distorted pictures or cartoons. The device is simple in construction and can be produced at a low cost. While the device has been

described more particularly for enlarging pictures, it will be obvious that by reversal of the marker and the stylus, the device can be used for reductional reproduction.

The invention is not to be understood as restricted to the details set forth, since these may be varied within the scope of the appended claims without departing from the spirit and scope of the invention.

Having thus described the invention, what I regard as new and desire to secure by Letters Patent is:

1. In a pantographic device, the combination of an elongated supporting member provided at one end with pivot means to permit it to swing on a fixed point, a pair of carrying members carried by, pivotally movable with, and slidable longitudinally of the supporting member and slidable relatively to each other, means on one of the carrying members for holding a marker, a stylus on the other carrying member, and means for multiplying the sliding movement of one of the carrying members relatively to the other when one of them is shifted longitudinally, comprising a sheave on one of the carrying members and a flexible element looped around the sheave and having one of its ends connected to one of the carrying members and its other end connected to the supporting member.

2. In a pantographic device, the combination of an elongated supporting member provided at one end with pivot means to permit it to swing on a fixed point, a pair of carrying members carried by, pivotally movable with, and slidable longitudinally of the supporting member, and slidable relatively to each other, means on one of the carrying members for holding a marker, a stylus on the other carrying member, and means for multiplying the sliding movement of one of the carrying bars relatively to the other when one of them is shifted longitudinally, comprising a flexible element having one end thereof connected to the supporting member and its other end connected to the one carrying member last mentioned and a sheave mounted on the other carrying member and around which the element is looped.

3. In a pantographic device, the combination of an elongated supporting member provided at one end with pivot means to permit it to swing on a fixed point, a pair of carrying members carried by, pivotally movable with, and slidable longitudinally of the supporting member and slidable longitudinally relatively to each other, means on one of the carrying members for holding a marker, a stylus on the other carrying member, and means, for multiplying the sliding movement of one of the carrying members relatively to the other when one of them is shifted longitudinally, said means including a spring for slidably shifting the carrying members in one direction in the supporting member.

4. In a pantographic device, the combination of an elongated supporting member provided at one end with pivot means to permit it to swing on a fixed point, a carrying member carried by, pivotally movable with, and slidable longitudinally of the supporting member, a second carrying member carried by, pivotally movable with, and slidable longitudinally of the supporting member and slidable relatively to the first mentioned carrying member, a marker on one of the carrying members, a stylus on the other carrying member, and means for multiplying the carrying movement between the slidable members when one of them is slidably shifted, comprising a flexible element having one of its ends connected to the one carrying member last mentioned and the other end thereof connected to the supporting member and a sheave carried by the other carrying member and around which the element is looped and a spring between the supporting member and the sheave carrying member for slidably shifting the latter in one direction.

5. In a pantographic device, the combination of an elongated supporting member provided at one end with pivot means to permit it to swing on a fixed point, a carrying member carried by, pivotally movable with, and slidable longitudinally of the supporting member, a second carrying member carried by, pivotally movable with, and slidable longitudinally of the supporting member, and slidable relatively to the first mentioned carrying member, a marker on one of the carrying members, a stylus on the other carrying member, and means for multiplying the sliding movement between the carrying members when one of them is slidably shifted, comprising a flexible element having its ends secured to the supporting member and the marker carrying member, and a sheave carried by the stylus carrying member, and around which the element is looped.

6. In a pantographic device, the combination of an elongated channelled supporting member provided at one end with pivot means to permit it to swing on a fixed point, a marker carrying member carried by, pivotally movable with, and slidable longitudinally in the supporting member, a stylus carrying member carried by, pivotally movable with, and slidable in the supporting member, and slidable longitudinally relatively to the marker carrying member, and means for multiplying the sliding movement of the stylus carrying member when longitudinal movement is imparted to the marker carrying member, comprising a looped flexible element, and spring means for retracting the slidable members in the supporting member.

7. In a pantographic device, the combination of an elongated supporting member provided at one end with pivot means to permit it to swing on a fixed point, a carrying member carried by, pivotally movable with, and slidable longitudinally of the supporting member, a second carrying member carried by, pivotally movable with, and slidable longitudinally of the supporting member, and slidable relatively to the first mentioned carrying member, a marker on one of the carrying members, a stylus on the other carrying member, and means for multiplying the sliding movement between the carrying members when one of them is slidably shifted, comprising a sheave on each of the carrying members and a flexible element looped around the two sheaves and having one of its ends connected to the supporting member and its other end thereof connected to one of the carrying members.

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