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J. J. LYNOTT

2,847,859

POSITIONING DEVICE

Filed April 28, 1954

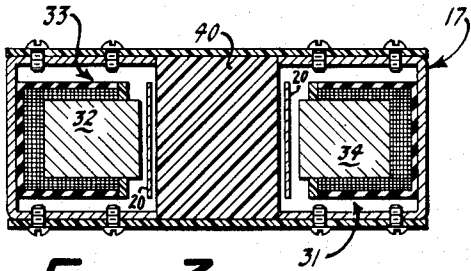


FIG. 3

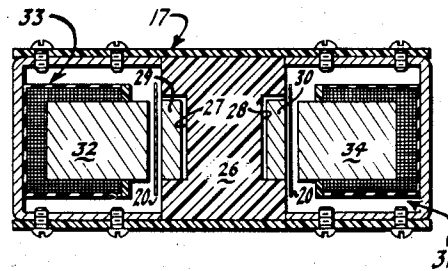


FIG. 2

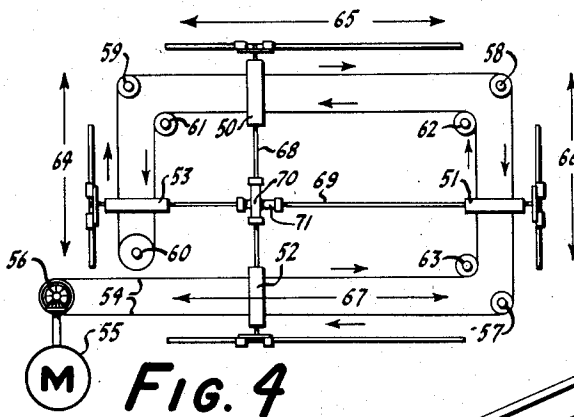


FIG. 4

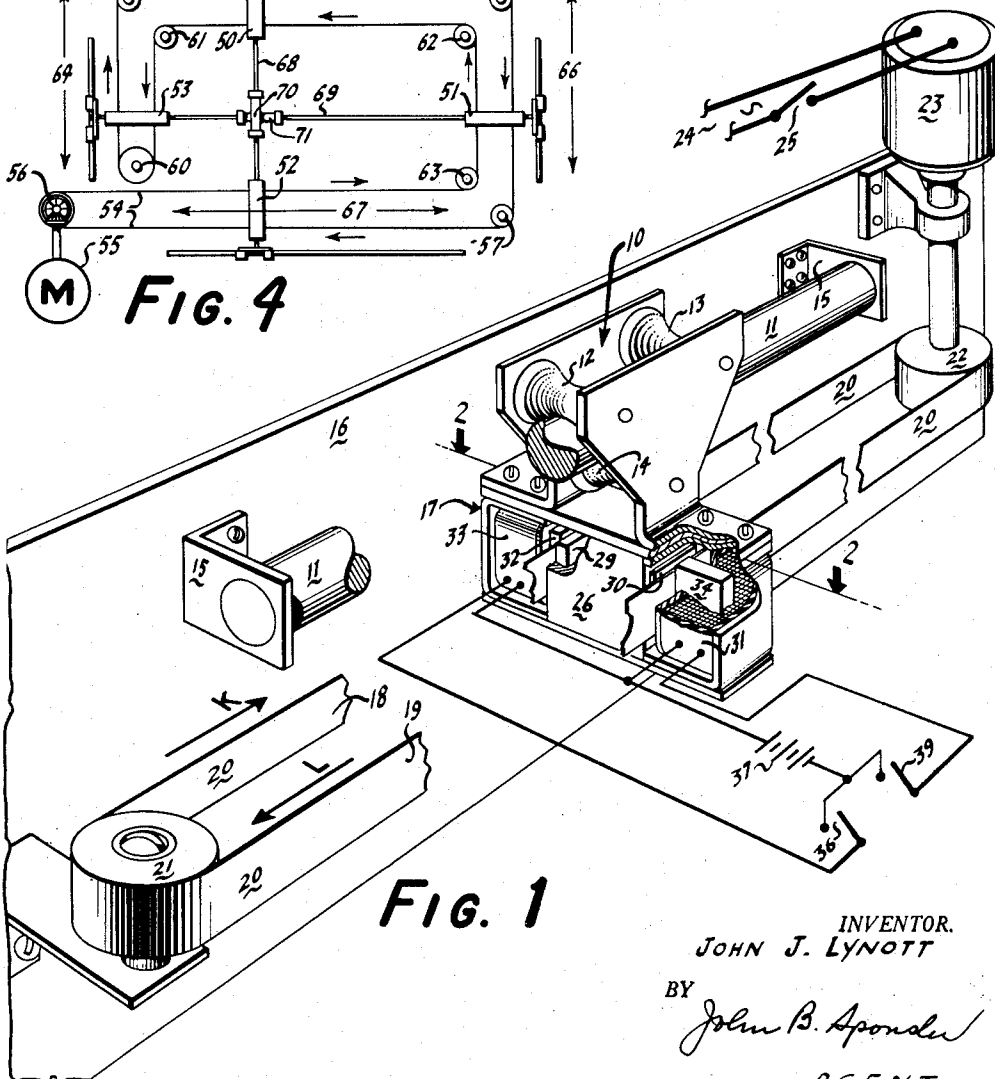


FIG. 1

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POSITIONING DEVICE

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5 Claims. (Cl. 74—37)

This invention relates to a translating device; more particularly, the invention is concerned with a mechanism for selectively moving a carrier over a predetermined linear path to position the carrier at some predetermined location thereon.

The invention has application in many ways to devices wherein a movable member is desired to be positioned and repositioned at various intervals along a linear path of travel by making use of a simple control and drive apparatus. For example, an endless belt is provided and driven continuously in a predetermined direction, thereby forming two parallel stretches of belt, each moving in an opposite direction to the other. A movable member or carrier is arranged to travel parallel with the stretches of the belt along a guide member, and is designed to partially embrace each stretch of the belt. The movable member is provided at the aforementioned embracing positions with a pair of electromagnets, each having an armature whereby, upon energization of either electromagnet, one of the aforesaid stretches is seized between the energized electromagnet and its respective armature. This causes the movable member to be driven by the stretch of belt to which it is clamped to a new position along the guide member. The new position is determined by the speed of the belt and the duration of the electromagnet's attraction for its respective armature. In this manner, every time either electromagnet is energized, the movable member is moved by the belt stretch to which it is clamped in either direction along a guide rail, coming to rest in a new position whenever the current of energization of the electromagnet is removed or reduced to a predetermined level. Accordingly, an object of the invention is to provide an improved translating mechanism.

Another object is to provide a bidirectional motion translating device.

A further object of the invention is to provide a magnetically controlled translating device capable of bidirectional motion.

A still further object is to provide an improved magnetic clamping device.

Other objects of the invention will be pointed out in the following description and claims and illustrated in the accompanying drawings, which disclose, by way of example, the principle of the invention and the best mode which has been contemplated of applying that principle.

In the drawings:

Fig. 1 is a diagrammatic view of an embodiment of the invention.

Fig. 2 is a sectional view of the device of Fig. 1 along line 2—2.

Fig. 3 is a modification of the view of Fig. 2, with certain parts eliminated, and pertains to a different mode of operation.

Fig. 4 is a diagrammatic view of the invention adapted to use in a plotting mechanism.

Referring to Figs. 1 and 2, a carrier 10 is slidably mounted on a rod 11 by bearing rollers 12, 13 and 14. The rod 11 is suspended from a base 16 by brackets 15 attached to each end of the rod 11. The rod 11 is extended from the base 16 sufficiently to allow free motion

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of the carrier 10 along the rod 11. A magnetic clamping unit 17 is provided on the underside of the carrier 10, through which two stretches 18 and 19 of an endless tape 20 travel. The continuous tape 20 is supported by an idler pulley 21 rotatably supported from the base 16 at a position near one end of the rod 11 and a driving pulley 22 rotatably supported from the base 16 at a comparable position near the opposite end of the rod 11. Both stretches 18 and 19 thus travel in a path adjacent the rod 11 in opposite directions. The tape 20 may be made of structurally suitable material which may be of a magnetic or non-magnetic character. The magnetic clamping unit 17 has a non-magnetic spacer 26 made of nylon, plastic or the like, provided between the stretches 18 and 19, as shown. The spacer 26 has a recess 27 in the area over which the stretch 18 travels, and a recess 28 in the area over which the stretch 19 travels. Within the recess 27 is a magnetic armature 29 free to move within the recess 27 but retained therein by pressure of the stretch 18 on the spacer 26. Similarly, a magnetic armature 30 is within the recess 28 and is also free to move but is retained by the pressure of the stretch 19 thereon. An electromagnet 31 is affixed to the clamping unit 17 so that the stretch 18 will travel between a core 32 of the electromagnet 31 and the armature 29, but separated sufficiently to normally allow free movement of the tape 20 therebetween. Similarly, an electromagnet 33 is affixed to the clamping unit 17 so that the stretch 19 will travel between a core 34 of the electromagnet 33 and the armature 30. A winding 35 of the electromagnet 31 is connected serially to a switch 36 and a battery 37, and, similarly, a winding 38 of the electromagnet 33 is connected with the battery 37 and a switch 39.

When switch 25 is closed, the motor 23 then rotates the pulley 22 in a clockwise direction, which causes the tape 20 to travel around pulleys 21 and 22. Stretch 18 is, therefore, caused to move toward the driving pulley 22 in a K direction, while the stretch 19 moves away from the driving pulley 22 in an L direction. With switches 36 and 39 open, the forces of stretches 18 and 19 dragging over the spacer 26 are approximately the same and therefore tend to equalize each other. No force is therefore exerted to move the carrier 10, and it accordingly remains in a relatively static position. If switch 36 is closed, the electromagnet 33 is energized, which pulls the armature 29 toward the core 32, and causes a clamping force to exist between the armature 29 and the core 32, which fastens the stretch 18 to the clamping unit 17. The carrier 10 is thereby forced to move in the K direction by force transmitted from stretch 18. It is to be noted that, although the transmission of force is quite rapid, smooth acceleration of the carrier 10 is obtained as a result of some momentary slippage of the tape 20 through the clamping unit 17 at the instant of application of the force. When switch 36 is open, the carrier 10 will again be held static as the force between core 32 and armature 29 is eliminated, thereby releasing stretch 18 from the clamping force. If switch 39 is closed, electromagnet 31 is energized, thereby causing a similar force to exist between core 34 and armature 30 to cause the clamping unit 17 to fasten to the stretch 19, thereby translating the motion of the tape 20 to the carrier 10 and causing it to move in an L direction.

A braking action can be obtained when the carrier is being moved in one direction, by applying the clamping force of the electromagnet which would normally move the carrier in the opposite direction. This action is obtained by the manipulation of switches 36 and 39 so that, assuming the tape 20 to be moving in the direc-

tion indicated in Fig. 1 of the drawing as a result of switch 39 being closed, the carrier 10 will be moved to the left (in the direction of pulley 21). Since the carrier 10 has inertia, there is a tendency for the positioning device to overshoot, particularly for long increments of travel. Consequently, when switch 36 is closed while carrier 10 is moving as described, a braking action is provided to quickly arrest the travel of the carrier 10 through the clamping effect on the stretch 18 of the armature 29 and the core 32 tending to reverse the carrier 10 and thereby rapidly halting its movement.

As the contact between the clamping unit 17 and the tape 20 is, in this embodiment, frictional, some slippage can occur during all phases of operation, which may be taken advantage of for some applications where slippage is required. The amount of slippage, the power transmittable, and the rate of deceleration and acceleration may be increased or decreased from variations of certain parameters; for example, the number of turns of the electromagnets 31 and 33 and the amount of current applied thereto determines the amount of magnetic clamping force available, within saturable limits. Obviously, the greater the magnetic force available, the greater will be the adhesion between the tape 20 and the clamping unit 17. The areas and the type of material of the armatures 29 and 30 and of the cores 32 and 34 will similarly vary the tape-holding force. While any type material may be used to form the tape 20, it is to be noted that a magnetizable tape will transmit additional power when used with a magnetic clamping device, since the tape 20 itself is acted upon by the magnetic fields of the electromagnets 31 and 33.

Figure 3 shows a modified form of the carrier illustrated in Fig. 2, wherein the tape 20 is made of a magnetizable material and it is unnecessary to provide armatures such as 29 and 30, since the tape 20 itself is acted upon directly by the magnetic fields of the electromagnets 31 and 33. Fastening of the carrier to the tape occurs, due to the magnetic attraction between the tape 20 and the electromagnets 31 or 33, rather than by the clamping of the tape between a core and a separate armature.

A further embodiment of this invention is illustrated in Fig. 4 wherein the translating device is shown adapted to a type of plotting mechanism. Four carriers 50, 51, 52 and 53 are provided for cooperating with an endless tape 54 driven by a motor 55 via a driving pulley 56, around idlers 57, 58, 59, 60, 61, 62 and 63. The carrier elements 50 and 52 travel together horizontally along sides 65 and 67, respectively, and the carrier elements 51 and 53 travel together vertically along sides 64 and 66, respectively, as in Fig. 4. A rod 68 connects carriers 50 and 52, and a rod 69 connects carriers 51 and 53, the rod 68 having a sleeve 70 and the rod 69 having a sleeve 71. By joining the sleeves 70 and 71 and providing synchronous movements of the elements 50 and 52 and of the elements 51 and 53, respectively, a marking device (not shown) placed at the junction of the sleeves 70 and 71 can be positioned in either direction along the X axis or the Y axis, to form graphic plotting device.

While there have been shown and described and pointed out the fundamental novel features of the invention as applied to a preferred embodiment, it will be understood that various omissions and substitutions and changes in the form and details of the device illustrated and in its operation may be made by those skilled in the art, without departing from the spirit of the invention. It is the intention, therefore, to be limited only as indicated by the scope of the following claims.

What is claimed is:

1. A translating device including an endless tape supported between pulleys, a motor continuously driving the said tape in a predetermined direction thereby providing two oppositely moving parallel stretches of tape,

a carrier, a support member for said carrier to allow said carrier to travel lengthwise of said stretches, a pair of electromagnets on said carrier, an armature coating with each said electromagnet for clamping one of said stretches therebetween, means capable of being operated to cause energization of one electromagnet whereby the said carrier is engaged by one said stretch of tape and moved in a predetermined direction, and means capable of being operated to cause energization of the other electromagnet while said one electromagnet is energized whereby the said carrier is engaged by the other said stretch of tape and retarded in its motion in the said predetermined direction.

2. A positioning device having two rigid intersecting members interconnected by slidable sleeves thereon and disposed at right angles to each other including guide means to support said members, a moving tape comprising two stretches moving in opposite directions in the direction of travel of said rigid members, and latching means for each said member to selectively latch each said member to one or the other of the stretches of said carrier.

3. A positioning device having two members, supporting means for said members to allow said members to move at right angles to each other, an endless moving tape comprising two stretches moving in opposite directions in the direction of travel of each member, a carrier for each member, a pair of electromagnets for each said carrier, an armature coating with each said electromagnet for clamping one of said stretches therebetween, and means for energizing one said electromagnet whereby a said carrier is engaged by one said stretch of tape and moved in a predetermined direction.

4. A plotting mechanism for movement of a marking device in either direction along an X or Y axis having a member movable along an X axis, a second member movable along a Y axis, an endless tape having two stretches moving in opposite directions in the direction of the X axis and two stretches moving in opposite directions in the direction of the Y axis, a carrier for each of said members, a pair of electromagnets on each said carrier, an armature coating with each said electromagnet for clamping one of said stretches therebetween, means capable of being operated to cause energization of one said electromagnet whereby the said carrier of one said member is engaged by one said stretch of tape and moved in a predetermined direction, and means capable of being operated to cause energization of the other electromagnet of said moved member while said one electromagnet is energized whereby the said carrier is energized by the other said stretch of tape and said member retarded in its motion in the said predetermined direction.

5. A translating device including an endless tape supported between pulleys, a motor continuously driving the said tape in a predetermined direction thereby providing two oppositely moving parallel stretches of tape, a carrier, a supporting member for said carrier to allow said carrier to travel lengthwise of said stretches, a pair of electromagnets on said carrier, an armature coating with each said electromagnet for clamping one of said stretches therebetween, means capable of being operated to energize one said electromagnet whereby the said carrier is engaged by one said stretch of tape and moved in a predetermined direction, and means capable of being operated for simultaneously energizing the other said electromagnet whereby the said carrier is engaged by the other said stretch of tape and retarded in its motion in the said predetermined direction.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 2,847,859

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John J. Lynott

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 4, line 21, for "carrier" read -- tape --.

Signed and sealed this 3rd day of May 1960.

(SEAL)

Attest:

KARL H. AXLINE
Attesting Officer

ROBERT C. WATSON
Commissioner of Patents

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