Jan. 5, 1932. C. KNUUTILA 1,840,042

CONVEYING APPARATUS

Filed Feb. 12, 1931 2 Sheets-Sheet 1

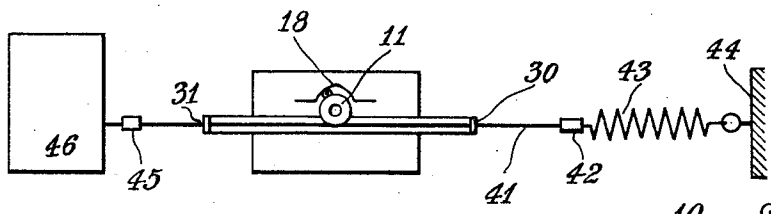


Fig.1.

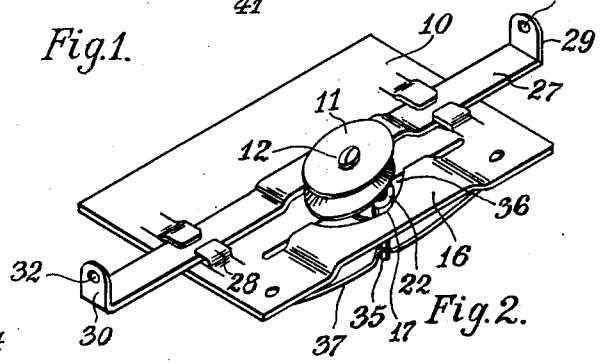


Fig.2.

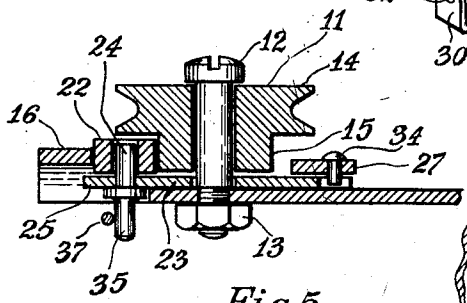


Fig.5.

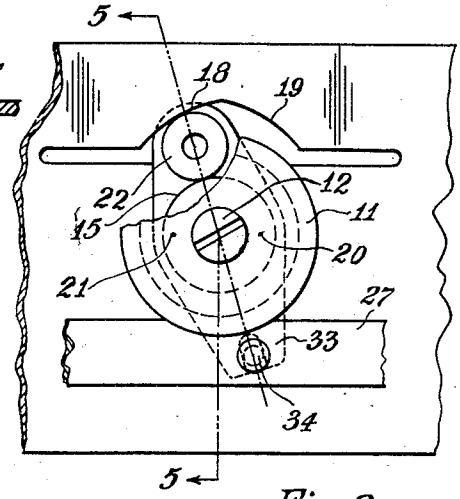


Fig.3.

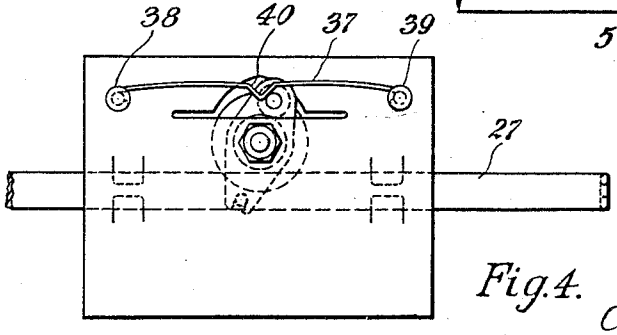


Fig.4.

Charles Knuutila INVENTOR.

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CONVEYING APPARATUS

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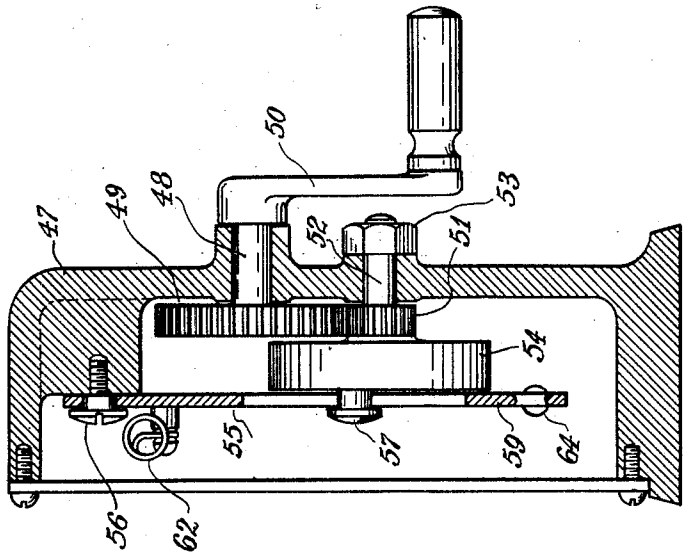


Fig. 7.

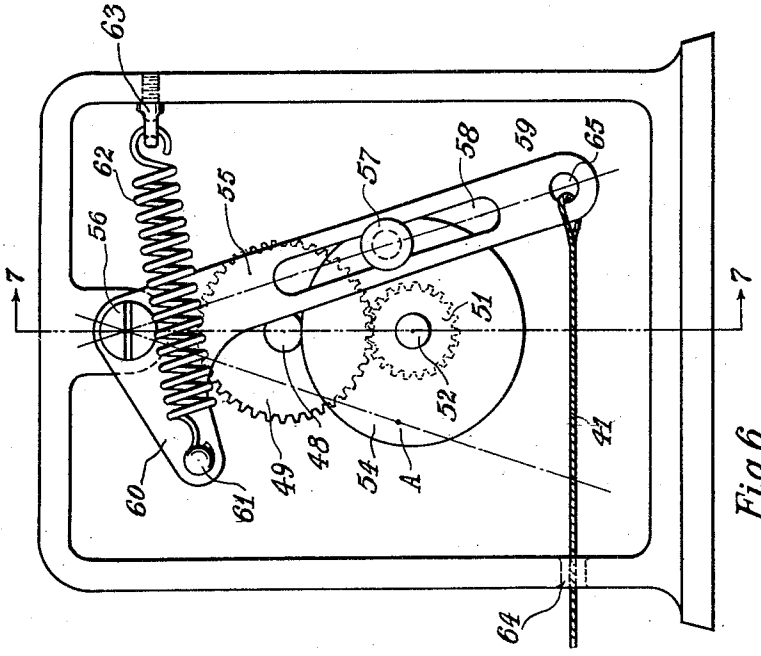


Fig. 6.

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Patented Jan. 5, 1932 1,840,042

UNITED STATES PATENT OFFICE

CHARLES KNUUTILA, OF NEWARK, NEW JERSEY

CONVEYING APPARATUS

Application filed February 12, 1931. Serial No. 515,131.

This invention relates to a conveying mechanism.

One of the objects of the invention is to provide a conveying mechanism which will be of strong and thoroughly durable construction. Another object of this invention is to provide a device of the above character which will be of simple construction and thoroughly practical operation. Another object of this invention is to provide a device of the above character which will be of economical and ready manufacture. Another object of this invention is to provide a device of the above character which may be easily and efficiently assembled and installed. Another object of this invention is to provide a device of the above character which will utilize as a motive force an easily obtainable source of energy. Other objects will be in part obvious and in part pointed out hereinafter.

This invention accordingly consists in the features of construction, combinations of elements, and arrangements of parts as will be exemplified in the construction to be hereinafter described and the scope of the application of which will be indicated in the appended claims.

In the accompanying drawings in which is shown one of the various possible embodiments of the mechanical features of my invention:

Figure 1 is a diagrammatic view showing a manner in which my device may be installed for operation;

Figure 2 is a perspective view on a larger scale, of certain of the parts in this embodiment of my invention;

Figure 3 is a top plan view of certain details of my device, certain parts being broken away for clearness of illustration;

Figure 4 is a bottom plan view of the device as shown in Figure 2;

Figure 5 is a cross section taken along the line 5—5 of Figure 3;

Figure 6 is a cross section on an enlarged scale of another part of my device, and

Figure 7 is a cross section taken along the line 7—7 of Figure 6.

Similar reference characters refer to similar parts throughout the several views of the drawings.

Referring now to the drawings in detail and more particularly to Figure 2, there is shown a plate 10 upon which is mounted a drum 11. Drum 11 rotates about a sleeved bolt or rivet 12 secured to plate 10 by any convenient means such as a nut 13 (see Figure 5). Flanges generally indicated at 14 extend about the periphery of drum 11 so that a flexible member 41 (see Figure 1), preferably a cable or cord, may be coiled thereabout and rotate the drum according to the longitudinal movement of the flexible member.

Referring to Figure 5, extending from the under side of drum 11 and preferably integral therewith is an extension 15 of the drum preferably having a smaller diameter than the diameter of the drum. As shown in Figure 2, plate 10 is provided at one side with a raised portion 16, and the inner edge generally indicated at 17 of this raised portion is in substantial alignment with extension 15 of drum 11. As best shown in Figure 3, edge 17 is shaped to form two arcs 18 and 19, opposite extension 15. These arcs are off the center or axis of drum 11, so that the center of arc 18 is substantially at a point 20 on the plate and the center of arc 19 is substantially at a point 21 on the plate. Thus if a roll 22, to be described more fully hereinafter, is placed between arcs 18 and 19 and extension 15 of drum 11, a camming action ensues between the drum and roll 22 according to the position of the roll with respect to arcs 18 and 19 and the direction of rotation of drum 11.

A lever 23 is pivoted on bolt 12 so that it may rotate about bolt 12 as an axis. One end 25 of lever 23 extends toward raised portion 16, and roll 22 is rotatably mounted on this end by means of a pin 24 extending through lever 23 and into roll 22. Lever 23 is loosely fitted about bolt 12. Thus roll 22 may move toward extension 15 upon the application of pressure from portion 16. In this manner if transverse motion is applied to the other end 33 of lever 23 in either direction, as will be seen most clearly from Figure 3, roll 22 may be positioned between arc 18 and extension

15 or arc 19 and extension 15. As described above, the centers 21 and 22 of arcs 18 and 19 respectively are off center with respect to the axis of lever 23 and drum 11. Thus if lever 23 is in the position shown in Figure 3 so that roll 22 rests between arc 18 and extension 15, a counter clockwise rotation of drum 11 is stopped due to the jam created between arc 18, roll 22 and extension 15, but clockwise rotation of drum 11 may take place, for in this case roll 22 is rotated and moves to a portion of cam 18 more distant from extension 15 to stop the jamming action. In a similar manner, if lever 23 is forced to the left, as viewed in Figure 3, roll 22 is positioned between arc 19 and extension 15 to prevent a clockwise rotation of drum 11 while permitting a counter-clockwise rotation thereof. Thus drum 11 is limited to rotation in one direction, the direction in which this rotation may take place being controlled by the position of lever 23.

As shown in Figure 2, a member 27 is slidably mounted on plate 10 and secured thereto by any desired means such as lips generally indicated at 28 extending from the plate. The opposite ends 29 and 30 of member 27 are preferably bent at right angles thereto and holes 31 and 32 respectively are provided in these right angle projections. Member 27 is pivotally connected to end 33 of lever 23 by means of a pivot or bolt 34. Thus transverse motion applied at either end of member 27 is transmitted to lever 23 to position roll 22 between arc 18 and extension 15 or arc 19 and extension 15, and as will now be clear the direction in which drum 11 may rotate may be controlled by the relative position of arm 27 with respect to plate 10.

In order to hold lever 23 in either of the above mentioned positions, I provide a portion 35 of pin 24 extending through a slot 36 of plate 10 to engage a resilient member 37 (see Figure 4). This resilient member may be of any desired construction, a convenient form of which is shown in Figure 4, consisting of a resilient wire secured to points 38 and 39 on plate 10 and having a cam-like portion 40 thereon in engagement with portion 35 of pin 24. Thus pressure is applied to portion 35 to keep lever 23 in the position shown in the drawings and upon pressure being applied to member 27 from the left, as viewed in Figure 4 of the drawings, to change the position of lever 23, spring 37 yields to allow portion 35 to slide over cam-like portion 40 and engage the other side thereof to hold lever 23 in the opposite position from that shown in the drawings. Thus a simple and thoroughly practical means is provided for insuring the maintenance of certain of the working parts of this device in proper operative relation to each other.

Turning now to the action of my device, a diagrammatic view of the apparatus as installed is shown in Figure 1. Cable 41 passes through hole 31 of right angle projection 29 and in turn is looped about drum 11, thence passes through hole 32 of right angle projection 30. Cable 41 may be of any convenient length according to the use to which my device is to be applied, and one end thereof (the right hand end in Figure 1) is connected to a resilient member 43 which may take the form of a spiral spring or any other device having the property of elasticity. A stop 42 is secured to the end of cable 41 to stop right angle projection 30 when it is moved thereagainst. The opposite end of member 43 is connected in any desired manner to a substantially fixed support 44. The other end of cable 41 is connected to a convenient form of vibrator 46, an illustrative embodiment of which will be described hereinafter. This end of cable 41 is provided with a stop 45 for right angle projection 29 when this projection is moved thereagainst. The various parts as thus assembled are now in operative position.

Roll 22 is shown in engagement with arc 18 and extension 15. The roll being in this position, drum 11 may rotate in a clockwise direction and is held from a counter-clockwise rotation by the cam-like action of roll 22 coacting with arc 18, as more fully described above.

Upon the actuation of vibrator 46, this vibrator, coacting with resilient member 43, acts to produce longitudinal vibrations in cable 41. For purposes of illustration each complete vibration will be hereinafter referred to as the result of two strokes, one in each longitudinal direction. These longitudinal vibrations are in turn transferred to drum 11 by the loop in cable 41 extending thereabout, and if drum 11 was free to rotate in either direction the vibrations would tend to produce small angular rotations of the drum in either direction according to the length of the strokes. Thus the strokes of these vibrations in a left hand direction, as viewed in the drawings, would under such circumstances tend to rotate drum 11 in a clockwise direction and consequently the strokes of the vibrations in a right hand direction, as viewed in Figure 1, would tend to create a counter-clockwise rotation of drum 11. As described above, however, with the parts in the position shown in Figure 1, drum 11 is incapable of counter-clockwise rotation. Consequently as drum 11 is secured to plate 10 the strokes of cable 41 in a right hand direction tend to pull the entire device along the cable in that direction. The ensuing left hand strokes of the vibrations merely create a rotation of drum 11 in a clockwise direction and thus produce no motion or force to counteract the force above described which tends to move the device toward the right as viewed in the drawings. Thus, as long as longitudinal vibrations are

imparted to cable 41 through the action of vibrator 46, the device travels along cable 41 in a right hand direction.

Upon projection 30 coming into engagement with stop 42, plate 10 is moved along slidable member 27 and as this action is continued, projection 35 of pin 24 exerts a pressure on spring 37 to snap over to the other side of cam-like portion 40. Thus roll 22 is thrown out of engagement with arc 18 and into engagement with arc 19. As these parts have now assumed a new position with respect to each other, roll 22 now has the opposite effect on drum 11. Drum 11 may now rotate in a counter-clockwise direction and is held from rotation in a clockwise direction by roll 22 coacting with arc 19. As the vibrations in cable 41 are continued, the strokes thereof in a left hand direction are prevented from producing rotation in drum 11 and consequently tend to move the entire device along cable 41 in a left hand direction as viewed in Figure 1. Simultaneously with this action, the right hand strokes tend to create a counter-clockwise rotation of drum 11, thus failing to impede the right hand direction of the device along cable 41. Consequently the device now tends to move toward the left, as viewed in Figure 1, and continues in this direction until projection 31 of slidable member 27 comes into engagement with stop 45. The continuation of the action forces projection 35 over cam-like portion 40 of spring 37 to snap roll 22 over into engagement with arc 18. The motion of the device is now continued in a right hand direction, as described above, and this action continues as long as vibrator 46 coacting with resilient member 43 tends to create longitudinal vibrations in cable 41. Thus it will be seen that by this thoroughly practical mechanism of simple and durable construction I have provided a unique and economical means for utilizing and transforming a simple vibratory motion into a longitudinal motion in either direction according to the user's wishes. It will be observed that such a source of energy is very easily obtained and if this device is to be used on a small scale the necessary longitudinal vibrations may be produced manually without the aid of any special form of vibrator with satisfactory results.

Turning now to the means by which cable 41 may be vibrated, it should be understood at this point that the particular mechanism to be employed for this purpose largely depends upon the size of the conveying device and consequently the load which this device is adapted to carry. If the device is to be comparatively small so that the various forces to be imparted to cable 41 to cause longitudinal vibration thereof will not have to be great, a vibrator such as that shown in Figures 6 and 7 may be employed.

The various operating parts of this mechanism are mounted in a suitable casting or box generally indicated at 47 and journalled in this box is a shaft 48 supporting a gear wheel 49. The other end of shaft 48 may be secured to any suitable driving means, a crank 50 for manual operation thereof being shown as an illustrative embodiment thereof. A pinion 51 in engagement with gear 49 is mounted on a shaft 52 embedded in and secured to casting 49 as by a nut 53. Also secured to shaft 52 is a conveniently weighted fly wheel 54. Thus the rotary motion of shaft 48 as by crank 50 is transmitted to shaft 52 and consequently fly wheel 54 by pinion 51.

A lever generally indicated at 55 is mounted in casting 47 by a screw or rivet 56 acting as a pivot point and preferably above gear 49. The depending portion of pivot 55 is slidably mounted on fly wheel 54 by a flanged lug 57 extending through a slotted portion 58 thereof. Thus upon rotation of fly wheel 54 transverse vibratory motion is created at the free end 59 of lever 55 pivoting about point 56.

Secured to a substantially right angle projection 60 of lever 55 by any desired means such as a lug 61, is a resilient member 62 which may take the form of a spiral spring for purposes of convenience. The opposite end of member 62 is secured to casting 47 as by an eye 63. An opening 64 is provided near the base of the casting 47 and preferably in alignment with end 59 of lever 55 so that cable 41 may be passed therethrough and secured to end 59 as by a hole 65 therein.

Assuming that the opposite end of cable 41 is secured to a resilient member such as that shown in Figure 1, and that there is no slack in this cable, a tension is created by resilient member 43 (Figure 1) when the operating parts are in the position shown in Figure 6. If crank 50 is now actuated to rotate fly wheel 54 in a clockwise direction, the tension of member 43 is combined with the force applied to crank 50 until lug 57 reaches a point A in its path of rotation. During this half of the rotation of fly wheel 54, spring 62 is gradually being expanded from its neutral position thus increasing its tension on projection 60 and consequently partially counteracting the tension of member 43 on lever 55. When lug 57 reaches point A, spring 62 is at maximum tension and member 43 is at minimum tension so that fly wheel 54 depends for rotation past this small point on the actuation of crank 50. However, as soon as lug 57 passes point A, the tension of spring 62 acts with crank 50 to move fly wheel 54 and consequently lug 57 to the position shown in the drawings. The neutral position being reached on this side, crank 50 serves to rotate the wheel past this point so that the action may repeat itself. Thus by the coaction of member 43 and spring 62 the force necessary

for rotating crank 50 to create transverse motion in end 59 of lever 55 is greatly diminished. Furthermore, the action of these two springs tends to create a snapping action of lever 55 in both directions thus pronouncing the resultant strokes of the vibrations produced in cable 41. In this manner, I have provided a means for vibrating cable 41, which, although simple and economical in construction, is adapted to create the necessary longitudinal vibrations in cable 41 for the actuation of my conveying mechanism. It should be understood however that the scope of this invention is not limited to this particular type of vibrating means as I fully realize that many different forms of apparatus might be employed to perform this particular function in the operation of my conveying device.

As used in the specification and claims, the word "cable" will be understood to include a cord, wire, chain, cable, or other flexible member capable of being coiled about the drum 11.

It will thus be seen that I have provided a thoroughly practical and efficient construction and apparatus in which the several objects hereinbefore mentioned as well as many others are successfully achieved.

The invention is particularly advantageous for use in toys, as a means for moving a toy automobile, airplane, locomotive or the like.

As many possible embodiments may be made of the above invention and as many changes may be made in the embodiments above set forth, it is to be understood that all matter hereinbefore set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

I claim:

1. In a device of the character described, in combination, means including a cable adapted to be vibrated, means coacting with said cable and adapted to utilize the vibrations of said cable for longitudinal motion with respect to said cable.

2. In a device of the character described, in combination, means including a cable, and means coacting with said cable and adapted to utilize the vibrations of said cable for longitudinal motion in either direction with respect to said cable.

3. In a device of the character described, in combination, means including a cable, means coacting with said cable and adapted to utilize the vibrations of said cable for longitudinal motion in either direction with respect to said cable, and means adapted to control the direction of said motion.

4. In a device of the character described, in combination, means including a cable, means adapted to travel along said cable, means included in said last mentioned means adapted to coact with the vibrations of said cable to move said last mentioned means along said cable.

5. In a device of the character described, in combination, means including a cable, means for vibrating said cable longitudinally, a member adapted to move along said cable; and means on said member operatively related to said cable and adapted to rotate freely in one direction while being held against rotation in the opposite direction, whereby said member is moved longitudinally of the cable.

6. In a device of the character described, in combination, means including a cable, means for vibrating said cable longitudinally, a member adapted to move along said cable; means on said member operatively related to said cable and adapted to rotate freely in one direction while being held against rotation in the opposite direction, whereby said member is moved longitudinally of the cable, and means to control the direction of rotation of said rotatable means.

7. In a device of the character described, in combination, means including a cable, means for vibrating said cable, a member adapted to move along said cable, means adapted to rotate with respect to the vibrations of said cable, and means permitting rotation of said last mentioned means in one direction and preventing rotation thereof in the other direction to impart longitudinal motion to said member.

8. In a device of the character described, in combination, means including a cable, means for vibrating said cable, a member adapted to move along said cable, means adapted to rotate with respect to the vibrations of said cable, means permitting rotation of said last mentioned means in one direction and preventing rotation thereof in the other direction to impart longitudinal motion to said member, and means to reverse the action of said rotating means.

9. In a device of the character described, in combination, means including a cable, means for vibrating said cable, a member adapted to move along said cable, means adapted to rotate with respect to the vibrations of said cable, means for preventing said last mentioned means from rotating in a clockwise direction in one position and for preventing said last mentioned means from rotating in a counter clockwise direction when in another position to impart motion to said member in a direction according to its position.

10. In a device of the character described, in combination, a device adapted to travel along a cable, means included in said device operatively related to said cable and adapted to rotate in one direction; and means for imparting vibrations to said cable, said vibrations imparting motion to said device in one

direction and being compensated for by said rotating means in the other direction.

11. In a device of the character described, in combination, means including a cable, a device to travel along said cable, means operatively related to said cable included in said device and capable of rotation in one direction; and means for imparting longitudinal vibrations to said cable, the stroke of each vibration in one direction acting against said last mentioned means to impart motion to said device and the stroke of each vibration in the other direction being compensated for by the rotation of said rotating means.

12. In a device of the character described, in combination, means including a cable, a device adapted to travel along said cable; means associated with said cable and coacting therewith and capable of rotation; means for controlling the direction in which said last mentioned means is capable of rotation; and means for imparting vibrations to said cable, one half of each vibration imparting motion to said device in a direction in accordance with the operative condition of said controlling means.

13. In a device of the character described, in combination, means including a cable, a device adapted to travel along said cable; means included in said cable coacting therewith and capable of rotation; means for controlling the direction in which said last mentioned means is capable of rotation according to its position, and means for imparting vibrations to said cable, the strokes of said vibrations imparting motion to said device in a direction according to the position at said controlling means and the strokes of said vibrations in the other direction, when said controlling means is in one position, being compensated for by said rotating member.

14. In a device of the character described, in combination, means including a cable, a device adapted to travel along said cable; means included in said cable coacting therewith and capable of rotation; means for controlling the direction in which said last mentioned means is capable of rotation and adapted to be actuated by the application of pressure at either end thereof; and means for imparting vibrations to said cable, one half of each vibration imparting motion to said device in a direction in accordance with the operative condition of said controlling means.

15. In a device of the character described, in combination, means including a cable, a device adapted to travel along said cable, a drum operatively related to said cable and capable of rotation in either direction, means in engagement with said drum for stopping rotation in one direction and permitting rotation in the other direction; and means for imparting vibrations to said cable, the strokes of said vibrations in one direction acting to impart motion to said device.

16. In a device of the character described in combination, means including a cable, a device adapted to travel along said cable, a drum operatively related to said cable and capable of rotation in either direction, means in engagement with said drum for stopping rotation in one direction and permitting rotation in the other direction, means for reversing the action of said last mentioned means, and means for imparting vibrations to said cable, the strokes of said vibrations acting to impart motion to said device in a direction according to the action of said reversing means.

17. In a device of the character described, in combination, means including a cable, a device adapted to travel along said cable; a drum included in said device operatively related to said cable, the longitudinal vibrations of said cable producing a corresponding rotation of said drum about its axis, a roll adapted to engage said drum, guiding means for said roll; means adapted to position said roll with respect to said guiding means to permit clockwise rotation of said drum and stop rotation in a counter clockwise direction, when in one position, and adapted to position said roll with respect to said guiding means to permit said drum to rotate in a counter clockwise direction and stop clockwise rotation thereof, when in another position; means for controlling the position of said last mentioned means, and means for vibrating said cable to impart motion to said device in a direction according to the effective position of said controlling means.

18. In a device of the character described, in combination, means including a cable, a device adapted to travel along said cable, a drum included in said device, a cable passing by said device and encircling said drum, a roll in engagement with said drum and adapted to engage guiding means consisting of two arcs having centers spaced from the center of said drum, means for placing said roll between either of said arcs and said drum to permit rotation of said drum in one direction according to the position of said roll, and means for imparting longitudinal vibrations to said cable, said device moving in response to the strokes of said vibrations in a direction in which said drum cannot rotate, and said drum rotating to compensate for the strokes of said vibrations in the opposite direction.

19. In a device of the character described, in combination, means having a rotatable drum mounted thereon, a cable encircling said drum and capable of longitudinal vibration to impart corresponding rotary movement to said drum, camming means in engagement with said drum for preventing rotation of said drum in one direction or the

other direction according to its position with respect to said drum, means for controlling the position of said camming means, and means for vibrating said cable, the strokes of said vibrations pulling said first mentioned means along said cable in a direction in accordance with the action of said controlling means.

20. In vibratory apparatus, in combination, a rotatably mounted drum, an arm pivotally mounted above said drum and slidably mounted on said drum at a point spaced from the axis of said drum, resilient means secured to said arm and adapted to exert a tension on said arm in one direction with respect to the pivotal point of said arm; means including a cable secured to said arm at a point spaced from said pivotal point, said means being resilient and tending to exert a tension on said arm in the opposite direction to the direction of tension of said first mentioned means, and means for rotating said drum.

In testimony whereof, I have signed my name to this specification this 11th day of February, 1931.

CHARLES KNUUTILA.