

Nov. 26, 1957

M. A. SCHEG

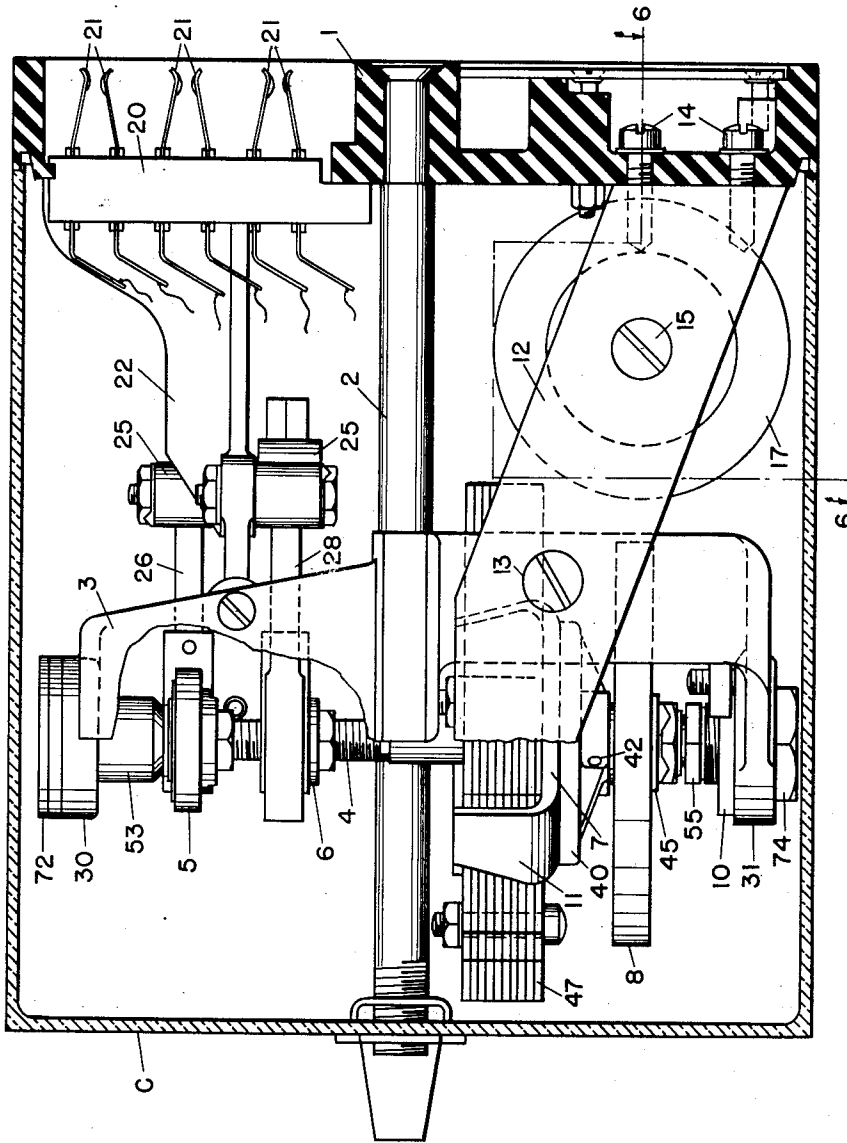
2,814,765

OSCILLATING CODE TRANSMITTER

Filed April 22, 1953

4 Sheets-Sheet 1

FIG. 1.



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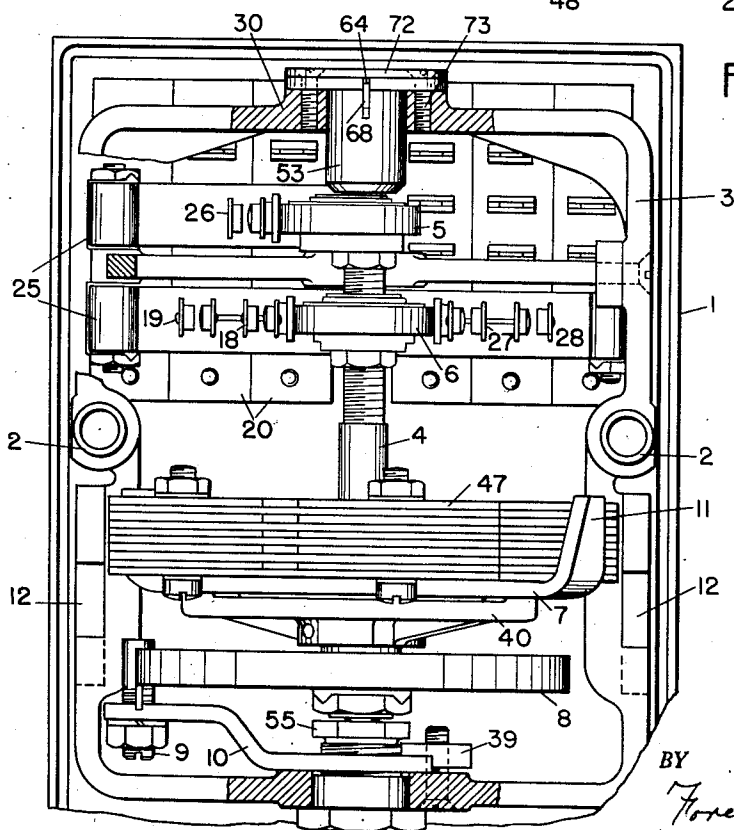
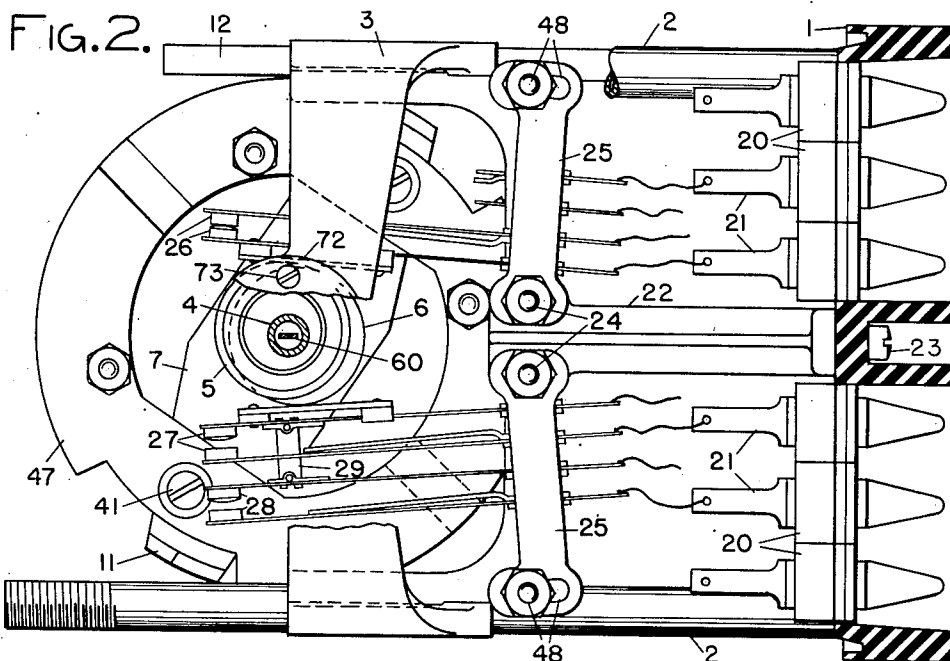
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FIG. 6.

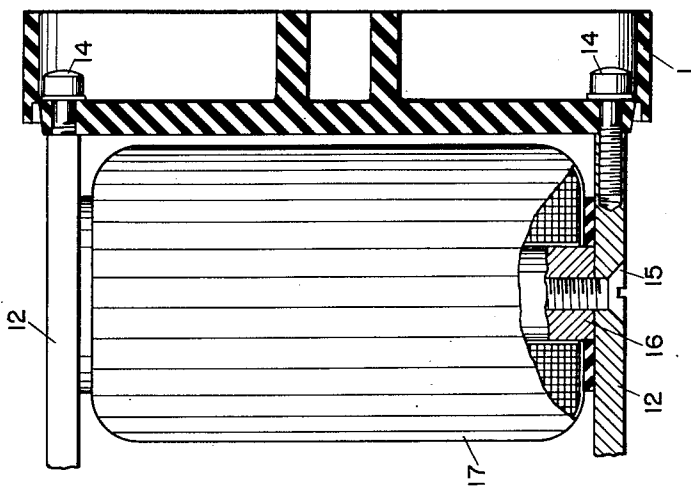


FIG. 5.

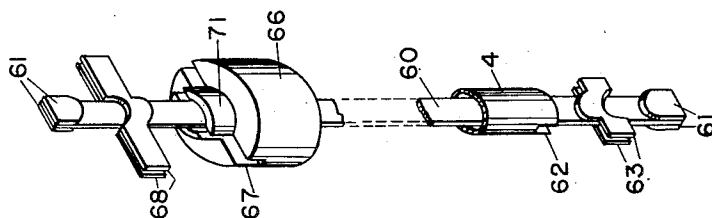
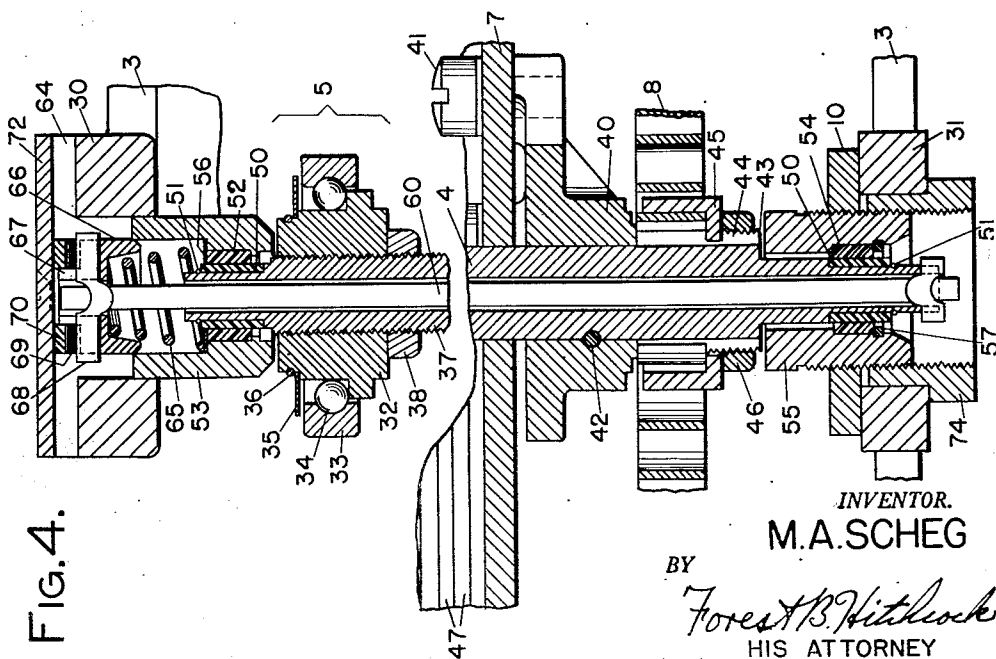


FIG. 4.



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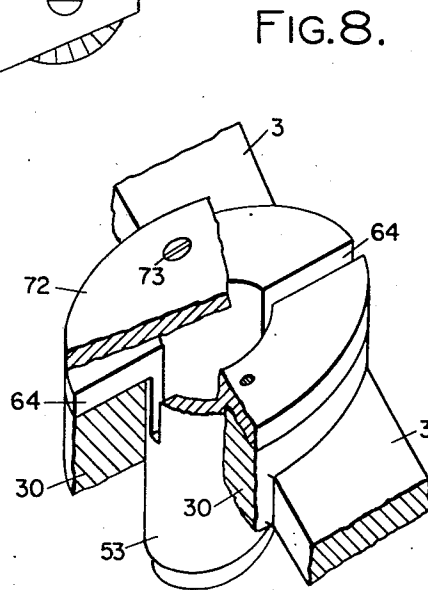
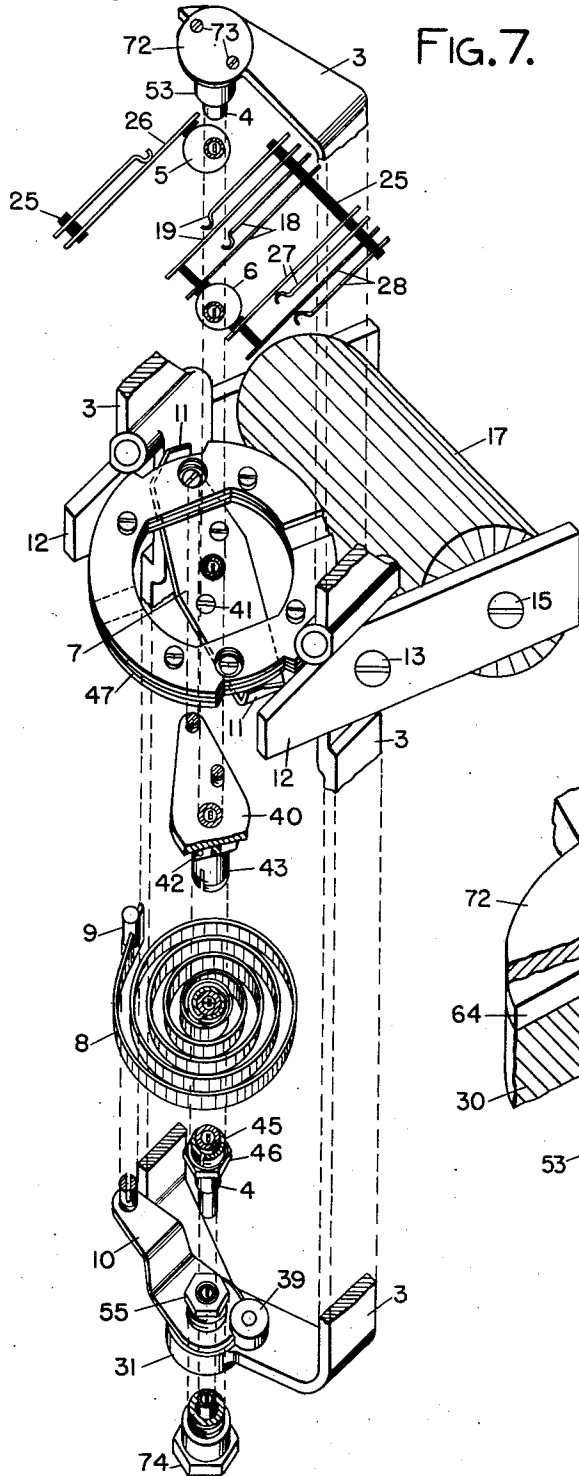
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4 Sheets-Sheet 4



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1

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2,814,765

## OSCILLATING CODE TRANSMITTER

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Application April 22, 1953, Serial No. 350,382

5 Claims. (Cl. 317—198)

This invention relates to oscillating code transmitters used for intermittently closing circuits at predetermined rates, and more particularly pertains to a coding device of the torsional pendulum type.

In railway signalling systems where coded currents in the track circuits are employed, reliability of operation is one of the main requirements. It has been proven in practice that the torsional pendulum type of coder is not only more reliable but also more adaptable to accurate adjustment whereby it can be set to transmit different code rates as required.

Such a type of oscillating code transmitter has been shown in the prior patent to Oscar S. Field, Pat. No. 2,351,588, dated June 20, 1944; and the present invention is to be considered in the nature of an improvement thereon. Experience has shown that due to the continuous operation of these prior coders, it becomes necessary to replace the cams and thrust bearings relatively frequently in order to maintain the efficiency and reliability of the device.

The oscillating coder of the present invention retains all the desirable characteristics of the old type coders and provides improved features such as ball bearing cams and a ribbon type resilient suspension to support the operating mass rather than a thrust bearing support. It also adapts the device for use in a plug-in type of housing rather than a shelf type of housing to thereby facilitate its mounting where space is a chief concern.

More particularly the main object of the present invention is to provide an oscillating code transmitter of the type having a main vertical shaft wherein the shaft supports the operating mass, and said shaft in turn is hung on a flat metal ribbon, said ribbon being resiliently supported and so adapted as to be flexibly rotated in either direction within certain limitations, thereby obviating the necessity of a thrust bearing for supporting the operating mass.

Other objects, purposes, and characteristic features of the invention will be pointed out as the description progresses and reference should be made to the accompanying drawings in which:

Fig. 1 is a side elevation of the coding device mounted in a casing of the plug-in type;

Fig. 2 is a top view of the coding device;

Fig. 3 is a front view of the coding device;

Fig. 4 is a sectional view of the operating shaft assembly with parts broken away and shows the supporting structure;

Fig. 5 is an exploded perspective view of the structure of the metal ribbon support;

Fig. 6 is a sectional view taken on the line 6—6 of Fig. 1 and shows the coil and core structure; and

Fig. 7 is a simplified exploded perspective view of the coder device and is shown to help illustrate the operation thereof.

Fig. 8 is a perspective view of the upper bearing support and the flange of said bearing support showing the cross-slot in the top of said flange.

Referring now more particularly to Figs. 1, 2, and 3 of the drawings the supporting structure of the coding device consists of a base 1 of molded insulating material into which is molded two hollow rods 2, which rods extend outward at right angles to the base 1. Slidably mounted on these rods 2 is a box-like frame 3 which supports the main operating shaft 4. Carried by and attached to the shaft 4 are two eccentrically mounted ball bearing cam members 5 and 6, an armature 7, and the inner end of a spiral spring 8. The outer end of the spiral spring 8 is adjustably clamped, as by screw 9, to an adjustable bracket 10.

Magnetically cooperating with the two upturned ends 11 of the armature 7, are two pole pieces 12, said pole pieces being fastened to the frame 3 and the base plate 1 by screws 13 and 14 respectively. Mounted between the two pole pieces 12, by means of screws 15, is a core 16 upon which is mounted a coil 17, as more clearly shown in Fig. 6.

Also mounted on the base plate 1 are molded insulated plugs 20, having molded therein the plug-in type contact fingers 21 which fingers cooperate with the plugs on a plug board (not shown). The base plate 1 also carries a bracket 22 which is held in place by screws 23. The outer end of this bracket 22 forms pivotal supports 24 for contact blocks 25, the other ends of these contact blocks 25 being adjustably fastened to the frame 3 as shown at 48. These contact blocks 25 are made of molded insulating material and have mounted therein pairs of contact fingers 26, 27, and 28, contact finger 26 being positioned to cooperate with cam 5 and contact fingers 27 and 28, connected by a link 29, being positioned to cooperate with the cam 6. Additional contacts, such as 18 and 19 (see Fig. 7) may also be operated by the cam 6. A suitable transparent casing C is used to enclose the structure.

From the description already given and with reference to Fig. 7 of the drawings, it should be understood that with energy on the coil 17, the flux produced in the pole pieces 12 will attract the armature 7 and cause the operating shaft 4 to turn in a counter clockwise direction. This counter clockwise motion of the shaft 4 causes the cam 5 to open contacts 26, and cam 6 to close contacts 18 and 19 and also builds up energy in the spiral spring 8. With contact 26 open, current is cut off from the coil 17 and the energy built up in the spiral spring 8 takes over and causes the armature 7 to reverse its direction of movement and turn the shaft in a clockwise direction, whereupon the cam 6 will open contacts 18 and 19 and close contacts 27 and 28. In the meantime, the momentary closing of contacts 18 and 19 and 27 and 28 has caused pulses to be transmitted from these contacts by means not shown. Thus, once the armature 7 is set in motion, the spiral spring 8 causes it to oscillate back and forth. Each time the armature 7 approaches the pole pieces 12 in a counter clockwise direction, a momentary pull is applied to supply sufficient energy to keep the armature in motion. Consequently, a constant oscillating motion is produced until energy is completely removed from the device. The contacts 26 are closed for approximately 90° of the armature swing and are so adjusted with respect to the armature position that it will not cause it to swing too violently. As these contacts 26 are opened when the armature 7 swings more than approximately 90° beyond its normal position the armature can not be attracted by the pole pieces 12 as it approaches the limits of its swing in a clockwise direction.

Referring now to Figs. 4 and 5 of the drawings, there has been shown in sectional detail and perspective, the main shaft 4 and its associated parts together with its mounting and suspension means. As previously mentioned, this shaft 4 is mounted in the box-like frame 3

3

and lies in a vertical position between the hub 30 on the upper member of the frame 3 and the hub 31 on the lower member of frame 3.

The ball bearing cams 5 and 6 are identical in shape and only cam 5 has been shown in Fig. 4 of the drawings. This cam 5 has an inner-hub or a ball race 32 and an outer ball race 33 between which lie the balls 34. A retaining washer 35 is mounted on the hub 32 and held in place by the split ring 36. The hub or inner-ball race 32 has an eccentrically located threaded hole therein (see Fig. 2) which allows the cam 5 to be adjustably located on the threaded section 37 of the shaft 4. After the cam 5 has been located with respect to contacts 26, it may be locked in place by the nut 38.

The armature 7 is fastened to a yoke 40 by screws 41 and this yoke 40 is in turn pinned to the enlarged portion of the shaft 4 by a pin 42. A suitable number of counterweight plates 47 (see Fig. 3) are then fastened to the armature 7, to give it proper balance and momentum when it is oscillating. The yoke 40 has a downwardly projecting hub 43 which is cross-slotted and threaded as at 44. A cup shaped spring retainer 45 is keyed to the slotted hub 43 and held in place by a nut 46 so that the spring retainer 45 revolves with the shaft 4. The inner end of the spiral spring 8 is suitably anchored in this retainer 45. As previously mentioned and more clearly shown in Figs. 3 and 7, the outer end of the spiral spring 8 is anchored to the adjustable bracket 10 by means of a slotted screw 9 and its associated lock nut. The adjustable bracket 10 is locked in place by means of a screw tightened clamp 39. This is for the purpose of regulating the length of the spiral spring 8 and consequently the rate of oscillatory motion. Thus, the device can be adjusted to the different code rates.

Both the upper and lower ends of the shaft 4 are reduced in size and are provided with nylon bushings 50 which are pressed onto the shaft 4 and held in place by split rings 51. These bushings 50 form part of the radial bearings for the shaft 4, the other part of the radial bearings comprising nylon bushing 52 pressed into a bearing support 53 located in the upper hub of the frame 3 and nylon bushing 54 pressed into a bearing support 55 located in the lower hub 31 of the frame 3. Nylon bushing 52 is held in place by a washer 56 and a nylon bushing 54 is held in place by a split ring 57. Thus, the shaft 4 is provided with long wearing nylon bushings which center said shaft vertically and allow free turning of the shaft with no horizontal end play and provides bearings which require little or no lubrication.

With reference to the vertical support for the shaft 4, the present invention contemplates that the operating shaft 4 and its associated parts be suspended on a thin metal ribbon 60, which ribbon is supported in the upper bearing support 53, the shaft being positioned within the limits of its vertical bearings 50, 52, and 54, and not requiring a thrust bearing at the bottom to support said shaft and its mass, as is shown and described in the above mentioned Patent No. 2,351,588.

In the present structure, the shaft 4 is hollow and the supporting ribbon 60 passes therethrough. Both the top and bottom ends of the ribbon 60 have rounded shoulder tips 61 spot welded thereto. The bottom of the shaft 4 has a cross slot 62 therein and the ribbon 60 is attached to the bottom of the shaft 4 through the medium of two key plates 63, one on either side of the ribbon 60, these key plates riding on the shoulder tips 61 and extending vertically into the cross slot 62, the assembled position being that shown in Fig. 4.

The supporting ribbon 60 extends through and beyond the top of the shaft 4 and into the upper bearing support 53. This bearing support 53 is flanged at the top and extends through a hole in the frame hub 30, being supported by its flange. This bearing support 53 is also hollowed out and has a cross slot 64 through its upper por-

4

tion. As previously mentioned the hollowed out portion of the bearing support 53 houses a nylon bushing 52 and is also adapted to house a coil spring 65. Mounted on top of the coil spring 65 and also within the hollowed out portion of the bearing support 53, is an inverted cup shaped retainer 66 which also has a cross slot 67 therein. The upper end of the supporting ribbon 60 is now fastened to the retainer 66 by inserting two key plates 68 into place, these key plates 68 bearing against the shoulder tips 61, one on either side of the ribbon 60, and extending horizontally through the cross slot 67 in the retainer 66 and into the cross slot 64 in the bearing support 53, thereby anchoring the upper end of the ribbon 60 in a manner which will prevent turning. Spacing washers 69 and a bearing washer 70 are then placed over the reduced portion 71 of the retainer cup 66 and the whole assembly is then covered by a plate 72 which is fastened to the flange of the bearing support 53 by screws 73.

From the description just given and with reference to Fig. 4 of the drawings, it can be seen that the shaft 4 and its associated mass will rest upon the key plates 63 and shoulder tips 61 attached to the bottom end of the ribbon 60, while the upper end of the ribbon 60 is supported by the retainer cup 66 which rests upon the resilient coil spring 65. The lower bearing support 55 is provided with threads and may now be adjustably positioned within a bushing 74 to take up the slack between the upper part of this bearing support 55 and the shoulder on the enlarged part of the shaft 4.

When the shaft 4 oscillates, as previously described, this oscillation, which is only a matter of about 60 radial degrees in either direction, will cause the metal suspension ribbon 60 to twist back and forth. This slight twisting action tends to shorten the length of the ribbon 60 a very slight amount, but such slight vertical motion tends to give a shift in the relative bearing surfaces between the two plastic bearings sufficient to increase their life and avoid grooving the bearings due to a limited back-and-forth motion. It is well known that an oscillatory motion is more severe in causing wear on bearing surfaces, than is a continuously revolving motion. This slight vertical movement due to the twisting of the ribbon tends to avoid some of these difficulties.

It is of course understood that the ribbon 60 is sufficiently thin and narrow as to have little or no effect upon the oscillating frequency of the armature. The oscillating frequency of the armature is entirely determined by the character of the spring 8, while the ribbon 60 acts merely as a support for the main shaft 4.

Referring to Fig. 4 it will be noted that the ribbon support 60 is adjusted so as to just raise the abutment of the shaft 4 away from the lower bearing support 55. However, if it were not for the resilient coil spring 65, severe shocks to the mechanism would tend to stretch or break the ribbon 60; but with the organization disclosed, any severe shock merely compresses the spring 65 until the lower abutment of shaft 4 comes in contact with the bearing support 55. Similarly, the lower abutment of the upper bearing support 53 prevents any undue upward movement of the shaft 4 and the parts attached to it. However, sufficient space must be provided between the inner hub 32 of the cam 5 and the lower abutment of the upper bearing support 53 at the time the cam is properly located on the threaded portion 37 of the shaft 4 and the shim washers 69 are put in place, to allow for the slight vertical motion of the shaft 4 due to the twisting of the ribbon 60. This obviously protects the ribbon 60 from becoming buckled or deformed. This organization is particularly well adapted to a device of this type which is required to be located along a railroad where passing trains cause severe vibrations.

Having thus described a code oscillator as one specific embodiment of the present invention, it is desired to be understood that this form is selected to facilitate in the disclosure of the invention rather than to limit the num-

5

ber of forms which it may assume; and, it is to be further understood that various modifications, adaptations, and alterations may be applied to the specific form shown to meet the requirements of practice, without in any manner departing from the spirit or scope of the present invention.

What I claim is:

1. In a code oscillator of the torsional pendulum type, a frame having upper and lower members, a hollow shaft extending between said upper and lower members, a metallic ribbon passing through said hollow shaft and fastened to the lower end of said shaft, a coil spring mount connected to said upper member and having the upper end of said ribbon fastened to it, guide bearings at the top and bottom of said hollow shaft to hold said shaft in vertical alignment, whereby said shaft is resiliently supported on said coil spring mount by said ribbon and is so positioned as to permit a slight vertical movement within the limitations of a shoulder on said shaft and said lower member, an armature attached to said shaft, a field core structure having an energizable winding supported by said frame member and cooperating with said armature, a spiral spring having its inner end connected to said hollow shaft and its outer end adjustably attached to said frame, nylon bearing moulded to said shaft and guide bearings, whereby said spiral spring and said field core structure and energizable winding cooperate to oscillate said shaft within its guide bearings, said oscillations of said shaft causing a twisting of said metallic ribbon, said twisting of said ribbon causing said shaft to be slightly raised and lowered as it oscillates to thereby distribute vertically the wear on said guide bearings.

2. In a code oscillator of the torsional pendulum type having a hanger frame with upper and lower members for supporting a code oscillator assembly including, a hollow shaft extending from the upper to the lower members of said hanger frame and suspended from said upper member by means of a metallic ribbon resiliently connected to said upper member and passing through said hollow shaft and attached to the lower end thereof, vertical guide bearings attached to each of said members for housing the respective ends of said hollow shaft, pole pieces and a winding comprising a field core structure attached to said hanger frame, a cooperating armature responsive to said field core structure and attached to said hollow shaft at a point adjacent said field core structure, and a spiral spring having its inner end attached to said hollow shaft and its outer end attached to said hanger frame.

3. In a code oscillator of the torsional pendulum type having an assembly housing frame with upper and lower members, a hollow shaft extending vertically between the upper and lower members of said frame, and supported by a metallic ribbon passing through the entire length of said shaft, said ribbon being resiliently suspended from the upper member of said frame and attached to the lower end of said shaft, a field core structure attached to said frame, a cooperating armature responsive to said field core structure and attached to said shaft at a point adjacent to said field core structure, a spiral spring having its inner end attached to said shaft and its outer end attached to said frame, radial guide bearings attached to

6

the upper and lower members of said frame for maintaining the vertical position of said shaft, self-lubricating bushings moulded to said shaft and said radial guide bearings whereby the wearing surface of said bushings is kept even by virtue of the vertical movement of said shaft resulting from the twisting of said metallic ribbon.

4. In a code oscillator of the torsional pendulum type, a frame member having a field core structure mounted thereon, a vertical hollow shaft disposed within guide bearings attached to upper and lower members of said frame, an armature attached to said shaft adjacent to said field core structure and cooperative therewith, means for supporting said shaft including a metallic ribbon having one end attached to the lower end of said shaft and having its other end resiliently supported by said upper member of said frame, a spiral spring having its inner end connected to said shaft and its outer end adjustably attached to said frame, self-lubricating nylon bushings moulded into said guide bearings and onto said shaft, whereby the wear on said bushings is evenly distributed over the face of said bushings, said wear caused by the oscillatory movement of said hollow shaft which movement alternately twists said metallic ribbon resulting in slight vertical movement of said shaft maintaining such distribution of wear.

5. In a code oscillator of the torsional pendulum type having an assembly housing frame having upper and lower members, a hollow shaft extending vertically between the upper and lower members of said frame and disposed in radial guide bearings to limit horizontal movement of said shaft, a field core structure attached to said frame, a cooperating armature attached to said shaft adjacent to said field core structure, a spiral spring having its inner end attached to said shaft and its outer end adjustably attached to the lower member of said frame, a metallic ribbon passing through the entire length of said hollow shaft and attached to the lower end thereof, the upper end of said ribbon fastened to a coil spring, said coil spring being attached to the upper member of said frame permitting vertical movement of said shaft due to shock or vibration, said vertical movement being limited at the lower end of said shaft by the engagement of a shoulder on said shaft with the lower member of said frame, whereby such spring type suspension will permit the mechanism to absorb severe shocks without severing the metallic ribbon.

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