Feb. 5, 1963 W. ZOBER 3,076,348

REMOTE SIGNALING SYSTEM

Filed June 28, 1960 2 Sheets-Sheet 1

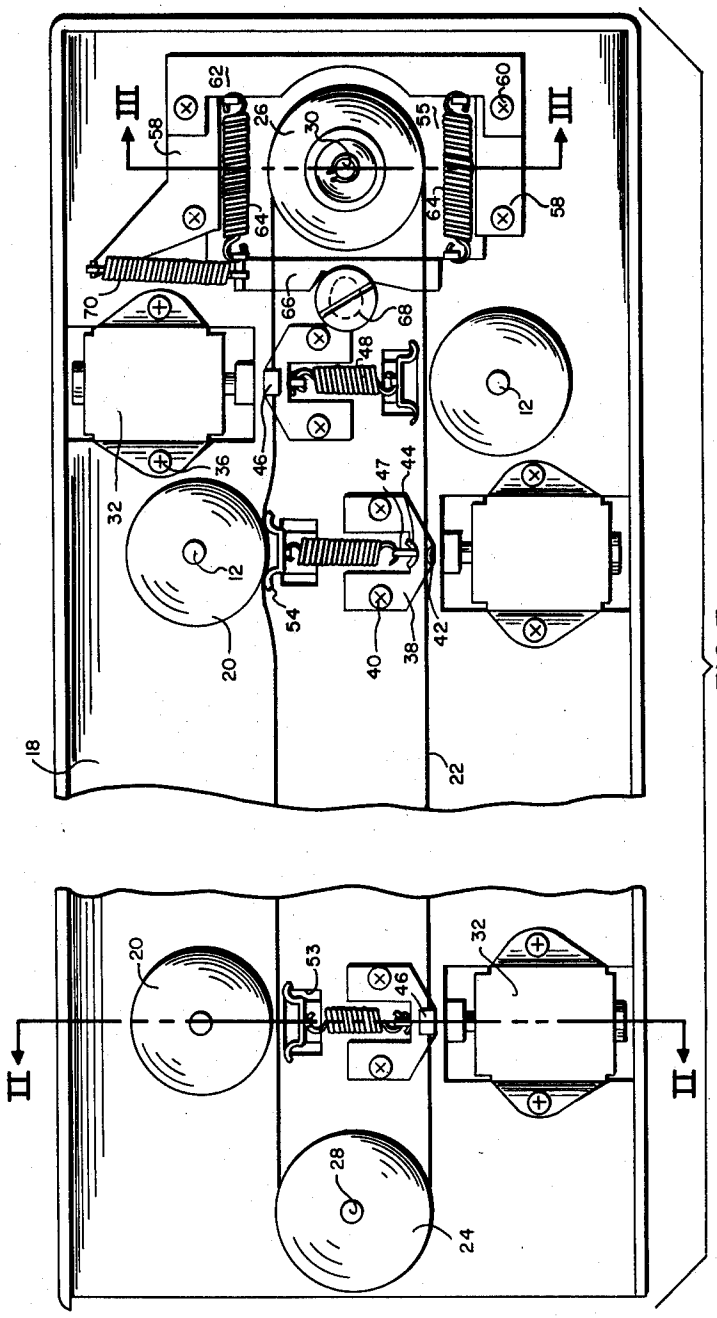


FIG. I.

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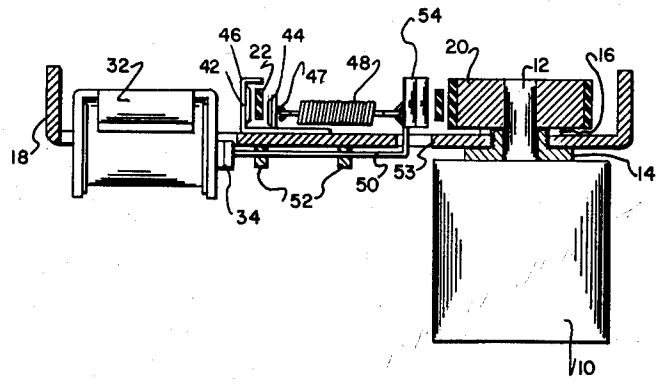


FIG. II.

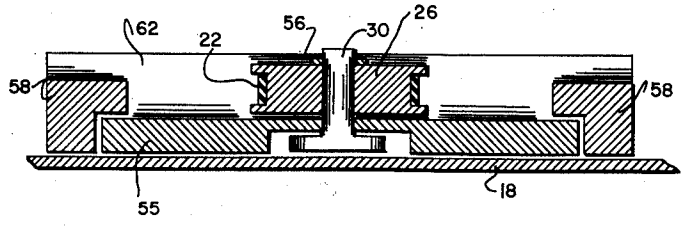


FIG. III.

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REMOTE SIGNALING SYSTEM

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This invention relates generally to a signaling system and more particularly to such a system for setting and interrogating the position of a plurality of remote shafts.

In at least some present day signaling systems it has become customary to utilize the position of a potentiometer wiper arm for the purposes of electrical as well as mechanical indication and/or control. The potentiometers utilized in these signaling systems are often disposed in a plurality of turns, and the associated wiper arms are adapted to traverse the potentiometer length in response to movement of a rotatable shaft. It is not uncommon for the potentiometer shafts to be coupled directly to a suitable indicating device, but in the usual case the shafts are coupled directly to the shafts of conventional servo transmitters or receivers so that the wiper arm positions can be continuously interrogated and/or reset. In expanded systems, utilizing large numbers of potentiometers, the number of components and their interconnecting wiring becomes exceedingly complex. The present invention is directed to a remote signaling system which reduces materially the number of components which were formerly required to set and interrogate the wiper arm positions of a plurality of potentiometers.

In its simplest form, the present invention is directed to a signaling system comprising a plurality of rotatable shafts, each respectively coupled to the wiper arm of a potentiometer. A driving means including an endless belt is provided and adapted to selectively impart rotational movement to any one of said plurality of shafts. Selecting means, such as a relay, are operatively associated with each of the shafts for selectively engaging the belt with a shaft, whereby linear movement of the belt imparts rotational movement to the selected shaft.

It is, therefore, an object of the present invention to reduce the number of drive motors required to set the angular position of a plurality of shafts.

It is another object of the present invention to provide a signaling system where the linear movement of a drive member is utilized to set the angular position of a plurality of shafts.

Another object of the present invention is to selectively set the angular position of a plurality of shafts through the use of a single drive member.

A further object of the present invention is to automatically maintain a constant tension on an endless belt.

Still another object of the present invention is a remote signaling system which is economical in construction and reliable and accurate in operation.

These and other objects, features and advantages will become apparent from the following description of a preferred embodiment of the present invention taken in connection with the accompanying drawings wherein:

FIG. I is a partial front elevation view of the present invention with certain parts shown in an active position, and certain other parts shown in an inactive position;

FIG. II is a fragmentary sectional view of the device of FIG. I taken along the line II—II thereof; and

FIG. III is a fragmentary sectional view similar to FIG. I taken along the line III—III.

Referring now to the drawings, there is illustrated in the figures a device according to the present invention for setting and interrograting the wiper positions of a plurality of potentiometers 10. The potentiometers 10 may

be of conventional design and provided with a wiper arm, not shown, operatively connected to a rotatable shaft 12. Each shaft 12 extends outwardly of one end of the respective potentiometer casing structure through an externally threaded boss 14. Boss 14 is adapted to receive a nut 16 for fixedly mounting a potentiometer 10 on a mounting plate 18 with the shaft 12 extending upwardly through suitable holes provided therein. The mounting plate 18 may be provided with opposed upturned edge portions to increase the rigidity thereof. In FIG. I a plurality of shafts 12 are seen to be disposed along the length of the plate 18 in a staggered arrangement to form two parallel spaced columns. Alternate shafts along the length of mounting plate 18 are seen to be mounted in opposed columns.

There is secured to the end of each shaft 12 a suitable pulley 20 which is adapted to have its peripheral surface engaged by the one or outer surface of a substantially flat belt member 22. The belt member 22 may be made of a suitable rubberized fabric in an endless loop and to have its other or inner surface disposed to engage the peripheral surface of a pair of pulleys 24, 26. The peripheral surface of each pulley may be rubberized to improve the frictional engagement between the pulleys and the belt. The pulleys 24, 26 are preferably provided with upper and lower surface of an increased diameter in order to provide a flanged peripheral edge to retain thereon the belt 22.

A pair of shafts 28, 30 are mounted at opposed ends of the plate 18 substantially intermediate the pair of columns of shafts 12 for rotational movement. The shaft 28 is suitably coupled to a servo motor or other motive device, not shown, and the pulley 24 mounted thereon comprises the driving member for the belt 22. Pulley 26 is mounted on the shaft 30 and constitutes a driven or idler member for the belt. As shown in FIG. I, the diameter of pulleys 24 and 26 is selected to provide a normal small space between the one or outer surface of the belt 22 and the peripheral surface of the pulleys 20.

An actuator or selector means 32 is provided to operate in conjunction with each of the pulleys 20, and is preferably in the form of an electromagnet or solenoid provided with an armature 34 which is disposed to operate in a plane substantially parallel to and spaced from the bottom surface of mounting plate 18. As shown in FIG. II, the armature 34 has its center line disposed at substantially a right angle to the center line of a corresponding pulley shaft 12. The coil structure of each solenoid 32 is disposed in an opposed relationship to the corresponding pulley 20 within a suitable opening provided in the plate 18. The solenoid 32 may be secured to the plate 18 within the openings by means of the screws 36.

A generally U-shaped guide member 38 is disposed intermediate each corresponding pulley 20 and solenoid 32 adjacent to the corresponding solenoid. Guide members 38 are secured on the upper or pulley side of the mounting plate 18 by a pair of suitable machine screws 40. Each guide member 38 includes a pair of arcuate guide bars 42, 44 disposed in an opposed upward arrangement from the base of the U. A space is provided intermediate the guide bars 42, 44 and serves to contain the belt 22 and to guide the normal movement thereof. One of the guide bars such as 42, may include a turned over lip portion 46 which covers the normal space provided between the guide bars in order to prevent the belt 22 from being moved upwardly and outwardly of the guide space. The other of the guide bars, such as 44, includes an apertured tab 47 which is adapted to mount one end of an operating spring 48.

A generally L-shaped operator 50 is associated with

each pulley 20 and actuator 32 and is disposed on the armature side of mounting plate 18 for sliding movement in a pair of guide brackets 52, 52. The elongated end portion of operator 50 is disposed to abut one end of a corresponding armature 34 for movement thereby. The shorter end of each operator 50 is disposed upwardly through a suitable elongated opening 53 provided in mounting plate 18 into an engageable relationship with the inner surface of the belt 22. The end portions of each opening 53 are adapted to engage the side portions of the shorter end of the corresponding operator 50 to limit the movement thereof. The upwardly extending end portion of operator 50 is provided with a generally U-shaped stirrup 54 adapted for engaging a corresponding pulley 20 with the belt 22. The end portions of each stirrup 54 are turned over to provide a bearing surface for the belt 22. The operating spring 48 is disposed between each apertured tab 47 and a similar tab provided on each stirrup 54 to bias movement of the corresponding operator 50 into engagement with the corresponding armature 34.

After mounting all component parts upon the plate 18, the belt 22 is adjusted to a preselected tension by adjustment means to be hereinafter described. A switch or suitable relay, not shown, is operatively connected to each of the solenoids 32 for providing means for selecting same. The potentiometers 10 may further be associated with suitable means adapted to indicate the resistive condition thereof and thereby facilitate in their setting and interrogation. Upon selection of an appropriate solenoid 32, such as the center solenoid in FIG. I, the corresponding armature 34 is caused to move toward the corresponding pulley 20 to engage the corresponding stirrup 54 with the inner surface of the belt 22 adjacent to the corresponding pulley 20.

The turned over edge portions or bearing surfaces of stirrup 54 and the depth thereof to the base of the U are so proportioned that the travel of the stirrup is not limited by engagement with the pulley 20. Instead, travel of the stirrup is limited by engagement of the operator 50 with the forward edge of opening 53 so that only that portion of the belt 22 which is located intermediate the bearing surfaces of the stirrup is permitted to engage a segment of the peripheral surface of the pulley 20, as shown in FIG. I. If, by way of example, it is assumed that travel of a stirrup is limited only by engagement with the surface of the corresponding pulley, and assuming further that some degree of misalignment exists between the axial movement of the stirrup and the rotational axis of the pulley, the peripheral surface of the pulley would be engaged by one turned over portion of the stirrup before it would be engaged by the other turned over portion. Accordingly, the pulley would be caused to rotate slightly until it were engaged by the other turned over portion each time that the corresponding relay would be selected. With the present arrangement, even with some degree of misalignment between the pulley and the stirrup, the pulley is not rotated when a relay is selected. Thus, should the wrong pulley be selected through inadvertence, the setting of the potentiometer will not be disturbed.

When it is desired to set a selected potentiometer 10, the shaft 28 is caused to rotate and the belt 22 is driven linearly about the pulleys 24 and 26 at some preselected speed. As is apparent, linear movement of the belt 22 is frictionally imparted to the selected pulley 20 for imparting rotational movement thereto. The motive means for driving shaft 28 should preferably be of a type to provide either clockwise or counterclockwise movement of the belt 22 so that the potentiometer resistance may be varied in either of two directions. Alternatively, the belt 22 may already be in motion prior to the relay selection to facilitate movement of the pulleys.

As is apparent, the belt 22 must be quite resilient in order to withstand the continual stretching accompanied with engagement and disengagement with the pulleys. In

time, and irrespective of the resilient characteristics of the belt, a certain amount of permanent belt stretch occurs to produce a slackened condition of the belt. In order to compensate for this belt stretch the idler pulley 26 is mounted in a manner to maintain a continuous tension in the belt and prevent it from becoming slackened. To this end, in FIG. III the shaft 30 is seen to be provided with an enlarged lower end portion which abuts the under surface of an apertured bearing plate 55. The shaft 30 extends upwardly through the aperture in plate 55, and the pulley 26 is retained thereon, as by a snap ring 56 disposed on the reduced diameter end of the shaft.

The undersurface of bearing plate 55 is disposed in a sliding engagement with the upper pulley of plate 18. The direction of sliding movement of plate 55 is predetermined by a pair of generally L-shaped guide bars 58, 58 which are disposed to overlap slightly the shorter ends of plate 55. Guide bars 58, 58 are secured to plate 18 by machine screws 60 in a generally parallel spaced arrangement. The guide bars 58, 58 are connected together at one of their respective ends by a stop member 62 which is adapted to be engaged by one end of the bearing plate 55 to limit movement thereof to the right as shown in FIG. I. A pair of springs 64, 64 are disposed in a parallel spaced arrangement to the guide bars 58, 58 with their opposite ends connected respectively to the stop member 62 and to the leading or forward edge of bearing plate 55. The springs 64, 64 bias bearing plate 55 for movement to the right, and are selected to maintain a constant tension on the belt 22.

A wedge member 66 is disposed juxtaposition the front or leading edge of the bearing plate 55 with its tapered edge engaged by an adjustable cam member 68 to prevent movement of plate 55 to the left. A spring 70 is secured to the upper end of wedge 66 and to an extending end of the upper guide bar 58 for biasing movement of the wedge in a generally upward direction.

When the belt 22 is first placed about the pulleys 24, 26, movement of the bearing plate 55 to the right under the bias of springs 64, 64 sets the initial position of the pulley 26 and the proper tension in the belt. Wedge 66 is then set in place intermediate the cam member 68 and plate 55 and moved manually to its maximum downward position. Cam 68 is then rotated to hold wedge 66 snugly in place. As the belt tension tends to relax due to wear and stretch of the belt, the springs 64, 64 will move the bearing plate 55 and the pulley 26 to the right to maintain a constant belt tension. Simultaneously with movement of bearing plate 55, the wedge 66 is moved upwardly under the bias of spring 70 to prevent leftward movement of the bearing plate. With this arrangement, it is apparent that the expected usefulness of the belt is materially increased.

While only one embodiment of this invention has been shown and described herein and inasmuch as this invention is subject to many variations, modifications and reversals of parts, it is intended that all matter contained in the above description shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. In a belt tension adjustment device, the combination comprising a driver and an idler pulley adapted for driving an endless belt, a bearing plate mounting said idler pulley and movable in one or an opposite direction, means biasing said bearing plate for movement in said one direction to maintain a constant tension on said belt, an adjustable bearing member disposed adjacent to one surface of said plate, means generally in the form of a wedge disposed intermediate said bearing member and said one surface of said plate and movable in a direction transverse to the direction of movement of said plate in said one direction for preventing movement thereof in said opposite direction.

2. In a remote signaling system for setting the angular position of a plurality of shafts, the combination com-

prising an endless belt member disposed in a loop and driven linearly in either of two directions, a pulley disposed coaxially of each said shafts, each said pulley being disposed externally of the belt loop adjacent to one surface of said belt, an operator including a generally U-shaped stirrup member corresponding to each of said pulleys and disposed within the belt loop juxtaposition another surface of said belt, means biasing each of said operators to an inactive position thereby permitting unrestricted linear movement of said belt, and means selectively operating each of said stirrup members to an active position for moving said belt transversely of its length to engage the one surface thereof with the peripheral surface of a selected pulley for setting the position thereof upon linear movement of said belt, each of said stirrup members being spaced from the peripheral surface of its corresponding pulley by a greater distance than the cross-sectional thickness of said belt when operated to an active position.

3. In a remote signaling system for setting the angular position of a plurality of shafts, the combination comprising a pulley disposed coaxially of each of said shafts, an endless belt member driven linearly in either of two directions and having one surface adapted for engagement with each of said pulleys for rotating same, an operator member corresponding to each said pulleys and disposed juxtaposition another surface of said belt, means biasing each of said operators to an inactive position thereby permitting free linear movement of said belt, and means selectively operating any one of said operator members to an active position into engagement with said other surface of said belt wherein said operator members are spaced from its corresponding pulley by a greater distance than the cross-sectional thickness of said belt, and whereby said belt is moved transversely of its length to engage said one surface thereof with a selected pulley for setting the position thereof.

4. In a remote signaling system for setting the angular position of a plurality of shafts, the combination comprising a pulley disposed coaxially of each of said shafts, an endless belt member driven linearly in either of two directions and having one surface adapted for engagement with the peripheral surface of each of said pulleys for rotating same, an operator including a stirrup member corresponding to each said pulleys and disposed juxtaposition another surface of said belt, said stirrup member including a base portion and a pair of substantially parallel spaced upstanding portions, means biasing each of said stirrup members to an inactive position thereby permitting unrestricted linear movement of said belt, and means selectively operating said stirrup members to an active position, whereby said upstanding portions engage said other surface of said belt and move said belt transversely of its length to engage that part of said one surface thereof which is located intermediate said upstanding portions with a corresponding pulley for rotating same, the upstanding portions of each of said stirrup members being spaced from the peripheral surface of a corresponding pulley by a greater distance than the cross-sectional thickness of said belt when said stirrup members are operated to an active position.

5. In a remote signaling system for setting the angular position of a plurality of shafts, the combination comprising a driver and an idler pulley adapted for driving an endless belt, a bearing plate mounting said idler pulley and movable in one or an opposite direction, means biasing said plate for movement in said one direction to maintain a constant tension on said belt, means biased for movement along a transverse edge of said plate in a direction transverse to the direction of movement of said plate in response to movement of said plate in said one direction to prevent movement thereof in said opposite direction, a pulley disposed coaxially of each of said shafts, said belt member being driven linearly in either direction and being selectively engageable with each of said pulleys for rotating same, and operator means disposed adjacent to each of said pulleys and movable between active and inactive positions for selectively engaging said pulleys with said belt, said belt being disengaged by said operator means and movable freely in either direction when said operator means associated with said pulleys are in their inactive position, said belt being engaged by said operating means and moved transversely of its length when said operating means are in an active position, said operator means being spaced from the peripheral surface of a selected pulley by a greater distance than the cross-sectional thickness of said belt when operated to an active position.

References Cited in the file of this patent

UNITED STATES PATENTS

479,896	Morrison	Aug. 2, 1892
829,091	Stone	Aug. 21, 1906
1,249,154	McQuarrie	Dec. 4, 1917
1,979,776	Stephenson	Nov. 6, 1934
2,612,988	Andrews	Oct. 7, 1952
2,718,747	Honig	Sept. 27, 1955