

TITLE OF INVENTION**STRUCTURE OF A SYNCHRONOUS RECIPROCATING TRACKING
DEVICE****BACKGROUND OF THE INVENTION****(A) FIELD OF INVENTION**

This invention relates to a structure of a synchronous, reciprocating tracking device and more particularly to a tracking device, which can be employed or mounted onto a moving/rotating shaft or the like or any related components or parts which provides linear reciprocating motion. The tracking device provides an instantaneous detection of allowable forward/backward or clockwise/anticlockwise movement.

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(B) DESCRIPTION OF THE PRIOR ART

Various mechanical devices are employed to limit a moveable member from one limit position to another position. These devices define a range of allowable movement of the moveable member such that when the movable member has moved to one of its limit position, a signal is provide to stop the movement of the moveable member. An example of application of a tracking device is that in a valve assembly having a valve member movable

between open and closed position, a motor is used to drive the valve member through a gear actuator. After the valve is driven to its open or closed position, the motor should be stopped or shut off, avoiding damages to the motor as well as the gear actuator and valve member. For such a case, a tracking device, which can respond to the movement of the valve member, is employed to activate a control circuit mounted on a printed circuit board to shut off the activation of the motor.

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Limiting switch is employed to limit or to control the allowable moving distance traveled by a moveable member or to limit the range of movement. However, the range of movement between the open and closed position, or clockwise or anticlockwise movement is large, and it is desirable that the device needs no adjustment at all in all sorts of applications. When a conventional position limiting switch assembly is used, the limiting switch needs to be adjusted to accommodate a wide range of allowable movement. The adjustability features of the position limiting switch assemblies provide interchangeable among different types of movement to accommodate for minor variations in the range of allowable movement. These conventional limiting switch devices may require certain tools in order to make the desired adjustments. Generally, disassembly of switch assembly or adjusting for various allowable movement is time consuming and may be not practical in certain environment

in which the device used where the appropriate tools is not available.

US Patent No. 5,611,406 issued to Matsuzaki et al discloses an
5 automatic guiding and tracking device comprising a guiding
device moveable to a desired position and a tracking
device for tracking the movement of the guiding device,
wherein the guiding device comprises in turn a guiding signal
generating and transmitting means for generating and
10 transmitting a guiding signal for guiding the tracking device
and wherein the tracking device comprises in turn first and
second guiding signal receiving means disposed apart from
each other at predetermined positions for receiving the
guiding signal, and a control means for detecting direction
15 and distance relative to the guiding device based on
outputs from the first and second guiding signal receiving
means and distances to the predetermined position. The
structure of the tracking device consists of a plurality of
expensive components such as guiding signal generator,
20 transmitter and the structure are complicated which may
not be applicable in a rugged environment. Accordingly, it
is an object of the present invention to provide a structure of
synchronous reciprocating tracking device, which
overcomes the above-mentioned drawbacks.

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SUMMARY OF THE INVENTION

The present invention is directed to the provision of a structure of a synchronous reciprocating tracking device comprising a first and a second urging plate; a compression spring being enclosed by the first and the
5 second urging plate;
a contacting pointer having a tip at one end and a circular disc at the other end thereof and being urged by the surface of the second urging plate and the surface of a first rotating gear, the contacting pointer operable to rotate
10 synchronously with the first rotating gear and to stop at an appropriate position; and
a switching device having a first and the contact points being connected to a control circuit; thereby the clockwise rotation of the first rotating gear urges the tip of the
15 contacting pointer to contact with the first contact point on the switching device, and the anticlockwise rotation of the first rotating gear urges the tip of the contacting pointer to contact with the second contact point on the switching device.

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It is an object of the invention to provide a structure of a synchronous reciprocating tracking device, which is simple, precise, rugged and easy to use.

25 Yet a further object of the present invention is to provide a structure of a synchronous reciprocating tracking device, which is economical and requires little or low maintenance.

It is another object of the present invention to provide a structure of a synchronous reciprocating tracking device, which can be easily installed by any ordinary technician
5 without having to employ a very senior technician to operate the device.

A further object of the present invention is to provide a structure of a synchronous reciprocating tracking device,
10 wherein no expensive electronic components, such as encoder is required to supplement the device in the course of operation the same.

It is another object of the invention is to provide a structure of
15 a synchronous reciprocating tracking device without requiring adjustment in the case of variation of distance of the path of a target object.

According to the present invention, there is provided a
20 structure of a synchronous reciprocating tracking device wherein the device can be incorporated with various types of devices, which produce reciprocating movement.

Features and advantages of the invention will be evident
25 from the following detailed description of the preferred embodiment described in conjunction with the attached drawings.

DESCRIPTION OF THE DRAWINGS

In the accompanying drawings:

- 5 Fig. 1 is an explanatory top view of the synchronous tracking device in accordance with the present invention.
- Fig. 2 is a side elevation view of the synchronous tracking device being mounted onto a moving part of machinery in accordance with the present invention.
- 10 Fig. 3 is an explanatory top view of another preferred embodiment of the synchronous tracking device of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

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With reference the drawings, in particular to Fig. 1, a preferred embodiment of the invention is illustrated and Figs. 1 and 2 show a structure of synchronous reciprocating tracking device 100 capable of precisely direction-changing

20 by providing a contact to an electric circuit producing signals. In accordance with the preferred embodiment of the present invention, referring now to Figs. 1 and 2, there is shown the tracking device 100 comprising a first urging plate 20, and a second urging plate 201 enclosing a compression

25 spring 60 therebetween, a contacting pointer 40, and a switching device 50 having a first contact S1, and a second

contact S2 being connected to a printed circuit board (not shown).

The contact pointer 40 has a pointing tip 42 at one end and
5 a circular disc 44 (refer to Fig. 2) at the other end. The
circular disc 44 is located and urged between the top
surface of a first rotating gear 32 and the bottom surface of
the second urging plate 201. As mentioned earlier, the
compression spring 60 is located between the first urging
10 plate 21 and the second urging plate 201. A bolt 21
rotatably mounts the tracking device 100 with the first
rotating gear 32 onto the rotating shaft 34 or the like of
machinery in such a way that the pointer 40 rotates
synchronously with the rotating of the rotating shaft 34 which
15 drives the first rotating gear 32.

As shown in Fig. 1, if the rotating gear 32 rotates clockwise as
a result of the driving of the rotating shaft 34, the pointer 40
will move upward in a direction shown as A to touch the
20 contact point S1 on the switching device 50. As the pointer
40 is urged by the second urging plate 201 with the surface
of the gear 32, when the rotating gear 32 continues to rotate
clockwise, the tip 42 of the pointer 40 is in contact until the
rotating gear 32 reverse the direction of rotating to
25 counterclockwise and the tip 42 of the pointer 40 moves
downward as shown in the direction of arrow B to touch the
second contact point S2 on the switching device 50. The first

- and the second urging plates 20, 201 are stationery with respect to the first rotating gear 32. Similarly, when the rotating gear 32 rotates counterclockwise as a result of movement of the rotating shaft 34, the tip 42 of the pointer 40 touches the second contact S2. If the rotating gear 32 continues to rotate counterclockwise, the tip 42 is in contact with the second contact point S2 until the rotating gear 32 changes the direction of rotating to clockwise direction.
- 10 When the first contact point S1 is in contact with the tip 42 of the pointer 40 as a result of the gear 32 rotates in a clockwise direction, a signal or the like is produced and is then transmitted to a control device (not shown) via a circuit on the printed circuit board (not shown) to perform a certain
- 15 predetermined operation or a programmed operation. Similarly, when the second contact point S2 is in contact with the tip 42 of the pointer 40 as a result of the gear 32 rotates in an anti- clockwise direction, another signal or the like signal is produced and is then transmitted to the control device (not
- 20 shown) to perform another predetermined or programmed operation.

In view of the present preferred embodiment, the clockwise movement and the anticlockwise movement of the rotating gear 32 cause the change of contact position between the

25 first contact point S1 and the contact point S2.

In another preferred embodiment, a second rotating gear 30 with a small radius than that of the rotating gear 32 is in engagement with the rotating gear 32 as shown in Figs. 1 and 2, the rotating of the second rotating gear 30 (as a result of in engagement with a sliding linear gear (not shown)) drives the first rotating gear 32 to rotate and the change of signal by contacting the first and the second contact points S1, S2. Similarly, if the linear sliding gear (not shown) is in engagement with the first rotating gear 32, the forward and backward movement of the sliding gear (not shown) will cause a change of signal by the contacting of the first and the contact points S1, S2 by the tip 42 of the pointer 40.

In another preferred embodiment of the present invention, LED indicators (not shown) may be provided to the first and the second contact points S1, S2 such that when the tip 42 of the pointer 40 touches any one of the first and the second contact points S1, S2, one of the indicators will be lighted, synchronously showing the change of position from the first contact point S1 to the second contact point S2 or vice versa. At this instance, signals are produced synchronously to a control device so as to motivate a predetermined or programmed operation.

As shown in Fig. 3, in a further preferred embodiment of the present invention, the first rotating gear 32 is connected in horizontal to a connecting bar 34 having a plurality of

fastening holes 320 and in turn, a transverse rod 33 is connected at one end of the connecting bar 34. Thus, when the transverse rod 33 moves forward and backward, the contacting pointer will touch either contact point S1 or
5 the second contact point S2. As a result, signals are produced synchronously to a control device so as to motivate a predetermined or programmed operation.

A characteristic operation of the present preferred
10 embodiment configured as described and depicted in Figs. 1 and 2 may be further described below. The tracking device 100 is mounted onto the rotating shaft 34 of machinery or the moveable parts of the machinery. The movement of the shaft 34 or the like moveable parts of the
15 machinery mounted with the first rotating gear 32 will drive the rotating gear 32 to rotate in one direction, for instance, in a clockwise direction. At this instance, the tip 42 of the contact pointer 40 will touch the contacting point S1 on the switching device 50 and an instantaneous detection is
20 occurred and a signal is produced to any control circuit connected to the switching device 50. If the moveable part or the shaft 34 moves anticlockwise, the first rotating gear 32 is driven to rotate and at this instance, the tip 42 of the contact pointer 40 will touch the second contact point S2
25 and similarly an instantaneous signal is produced to any control circuit connected to the switching device 50. Consequently, a change of signal of the switching device 50

can be easily and conveniently controlled based on the direction of rotating of the first rotating gear 32 as well as the moveable part or the moveable shaft 32 of the machinery. Furthermore, since the precision of the change of signal of the switching device 50 is based on the contact of the tip 42 of the pointer 40 at the contact points S1, S2, therefore the length of the pointer 40 to the switching device 50 is adjusted accurately, and such construction is simple in accordance with the present invention.

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It is to be understood that the description of the preferred embodiment is intended to be only illustrative, rather than exhaustive, of the present invention. Those of ordinary skill will be able to make certain additions, deletions, and/or modifications to the embodiment of the disclosed subject matter without departing from the spirit of the invention or its scope, as defined by the appended claims.

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**CLAIMS**

1. A structure of a tracking device comprising
a first and a second urging plate arranged
5 corresponding to each other;
a compression spring being enclosed by the first and
the second urging plate;
a contacting pointer having a tip at one end and a
circular disc at the other end thereof and being
10 urged by the surface of the second urging plate and
the surface of a first rotating gear, the contacting
pointer operable to rotate synchronously with the first
rotating gear and to stop at an appropriate position;
and
15 a switching device having a first and a second
contact points providing contact with the tip of the
contacting pointer; thereby the clockwise rotation of
the rotating gear urges the tip of the contacting
pointer to contact with the first contact point on the
20 switching device, and the anticlockwise rotation of
the rotating gear urges the tip of the contacting
pointer to contact with the second contact point on
the switching device.
- 25 2. The structure as claimed in claim 1, wherein the first
rotating gear is mounted onto the rotating shaft of a
machinery.



3. The structure as claimed in claim 1, wherein the first rotating gear is mounted onto a moveable component of machinery.
- 5 4. The structure as claimed in claim 1, wherein adjusting the length of the contacting pointer controls the precision of the contact of the first and the second contact point.
- 10 5. The structure as claimed in claim 1, wherein the tip of the contacting pointer touches either the first contact point or the second contact point when the first rotating gear changes the direction of rotation from either clockwise movement to
15 counterclockwise movement or vise-versa.
6. The structure as claimed in claim 1, wherein signals are produced when the tip of the contacting pointer touches either the first contact point or the second
20 contact point.