Oct. 11, 1955 W. E. SPRINGER 2,720,186

ACTUATOR-POSITION INDICATOR DEVICE

Filed Jan. 25, 1954 2 Sheets-Sheet 1

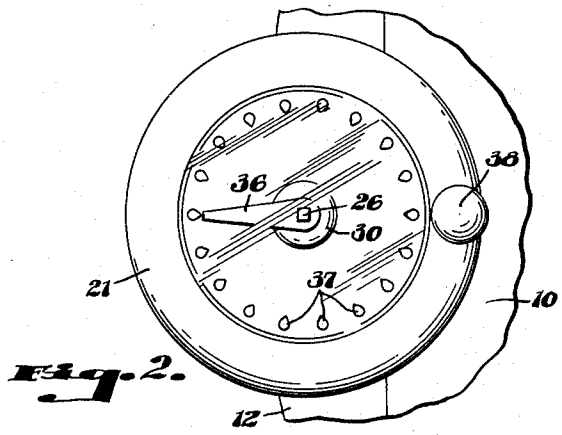


Fig. 2.

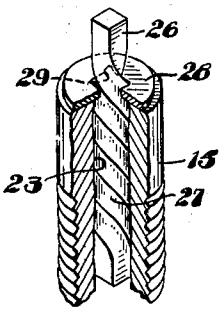


Fig. 3.

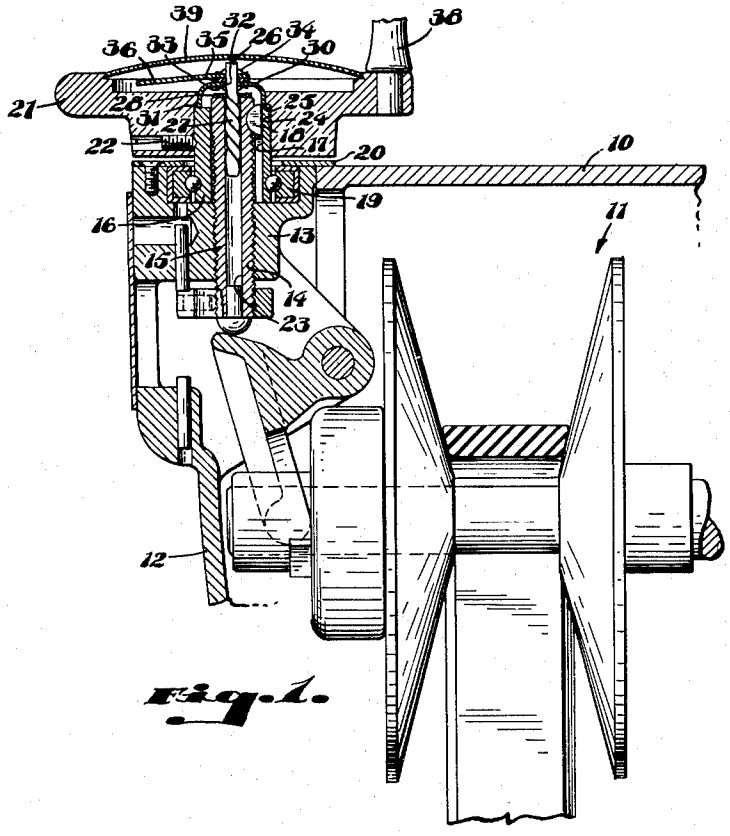


Fig. 1.

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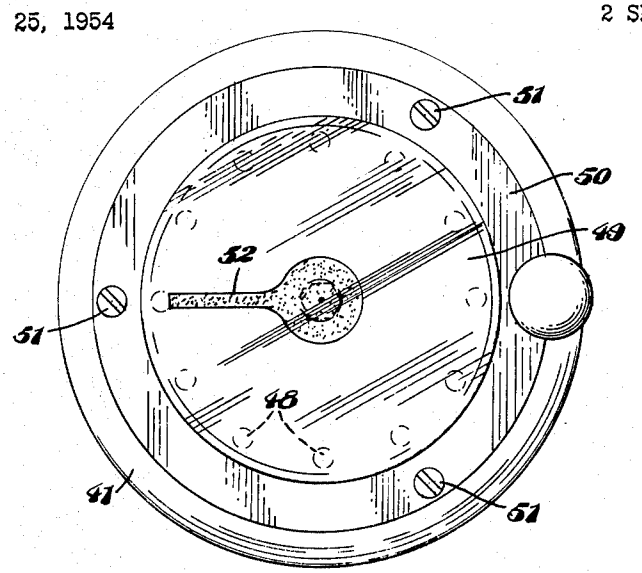


Fig. 5.

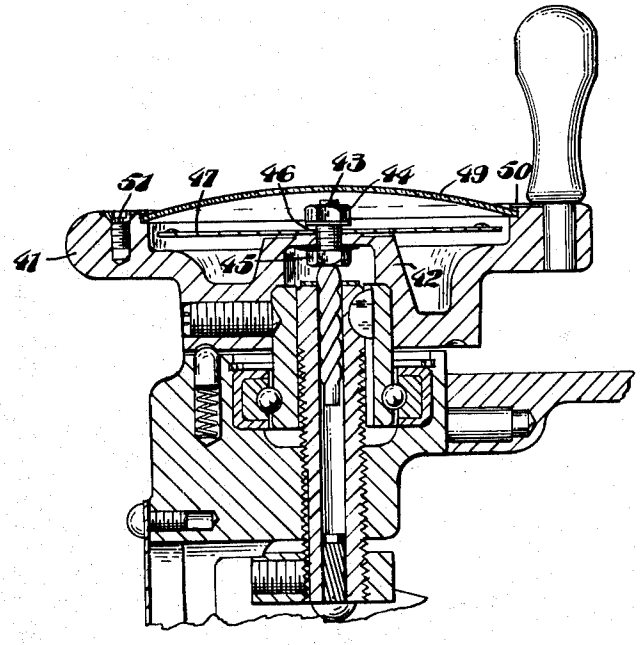


Fig. 4.

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ACTUATOR-POSITION INDICATOR DEVICE

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Application January 25, 1954, Serial No. 405,967

8 Claims. (Cl. 116—124)

The present invention relates to an actuator-position indicating device, and the primary object of the invention is to provide a device of the character under consideration which shall be effective to indicate, with a high degree of accuracy, the current position of an actuated element, the device as a whole being very simple in construction and composed of parts which may be inexpensively produced and assembled.

My indicating device finds its primary utility in connection with an actuating mechanism of the character disclosed and claimed in my copending application Serial No. 398,518 filed December 16, 1953, for Actuating Mechanism for Reciprocable Element, and therefore, it has been illustrated, and will be described, in that environment. It will be obvious, however, that the indicating device of the present application may readily be used in other environments such, for instance, as nonrising stem valves, and others which will readily occur to those skilled in the art; and the invention is to be understood to have broad application.

Further objects of the invention will appear as the description proceeds.

To the accomplishment of the above and related objects, my invention may be embodied in the forms illustrated in the accompanying drawings, attention being called to the fact, however, that the drawings are illustrative only, and that change may be made in the specific constructions illustrated and described, so long as the scope of the appended claims is not violated.

Fig. 1 is a vertical section through an indicating device constructed in accordance with the present invention, and showing such device operatively assembled in an actuating mechanism of the character disclosed in my said copending application;

Fig. 2 is a plan view of the indicator;

Fig. 3 is an enlarged perspective of certain parts of the indicating device, parts being broken away for clarity of illustration;

Fig. 4 is a sectional view, to a somewhat larger scale, of a modified form of indicating device; and

Fig. 5 is a plan view thereof.

Referring more particularly to the form of invention illustrated in Figs. 1–3, it will be seen that I have illustrated a fragment of a housing 10 enclosing a variable speed transmission mechanism, parts of which are indicated generally by the reference numeral 11, said housing being formed with a port through which parts of the transmission project, and said port being closed by a cover 12. A portion of the cover 12 is thickened, as at 13, to provide what may be termed a base for the actuating mechanism with which the indicator device of the present application is operatively associated.

The base 13 is formed with a threaded bore 14 in which is threadedly mounted a screw 15. A collar 16, having an axially-extending keyway 17, is sleeved on that portion of the screw 15 which projects beyond the base, and said screw carries a key 18 which is slidably engaged in the keyway 17.

In the illustrated embodiment of the invention, the collar 16 comprises the inner race of a ball bearing whose outer race 19 is received in a pocket in the base 13 coaxial with the bore 14, and is held in place in said pocket, against axial movement, by retainer means 20 suitably secured to the base and overlying the race 19. The bearing is so designed and constructed that the inner race 16 thereof is held against axial movement relative to the base 13.

As is clearly to be seen from an inspection of Fig. 1, the bearing race 16 is axially elongated to project outwardly beyond the base 13; and a wheel, which may be a hand wheel 21, is sleeved on the projecting portion of the race 16 and is secured thereto by suitable means such as, for instance, the set screw 22.

The screw 15 is formed with an axial socket 23 opening through its outer end. In the illustrated embodiment of the invention, the socket 23 comprises a bore extending from end to end of the screw, the inner end of said bore being closed by a suitable plug; but, for the purposes of the present invention, this detail is not essential.

The wheel 21 is formd with an axial bore 24 which, near its outer end, is reduced in diameter to define an inwardly facing shoulder 25.

A stem 26 is reciprocably mounted in the screw socket 23, and said stem is provided with a quick-pitch thread 27 intermediate its ends. Means 28, operatively engaging the thread 27, is fixedly carried at the outer end of the screw 15. In the illustrated embodiment of the invention, the stem 26 is formed from square key stock, twisted to provide the thread 27; and the means 28 comprises a washer centrally provided with a square perforation 29 in which the twisted shank of the stem 26 snugly fits.

A domed cap 30 is provided, at its base, with an outturned peripheral flange 31 which, as the parts are assembled, is gripped between the outer end of the collar 16 and the inwardly facing surface of the shoulder 25. Said cap is centrally perforated, as at 32, to pass the stem 26; and circular, self-locking retaining rings 33 and 34 are mounted on the stem 26 and cooperate with the cap 30 to restrain the stem against reciprocable movement relative to the cap 30. In the illustrated embodiment of the invention, an indicator finger 36, having a square perforation, is sleeved on the stem 26 outside the cap 30 and is retained between the retaining ring 34 and a spacer washer 35. The outer surface of the wheel 21 carries a scale, indicated by the reference numeral 37; and the finger 36 is so constructed and arranged as to sweep the scale 37.

It will be clear that the wheel 21 may, if desired, be a pulley, a sprocket or a gear; but in the illustrated embodiment of the invention, it is a hand wheel preferably provided with a manipulating handle 38. As shown, the wheel 21 may be recessed in its outer face, and the scale may be carried within the recess. Preferably, the wheel recess will be closed by a transparent cover member 39; and, if dsired, the scale may be imprinted on said cover 39.

It will be apparent that, since the hand wheel 21 is fixed to the collar 16 by the set screw 22, and since the key 18 in the keyway 17 provides a rotational driving connection between the collar 16 and the screw 15, rotation of the hand wheel will result in rotation of the screw 15; and, because of the threaded engagement of the screw 15 in the bore 14, such rotation will produce axial movement of the screw 15 in one direction or the other, depending upon the direction of rotation of the wheel 21. The stem 26, however, is held against participation in such reciprocation of the screw 15, and as the washer 28 moves axially relative to the stem 26, its perforation 29 will cooperate with the thread 27 to turn the stem 26 relative to the hand wheel 21. The pitch of the thread 27 is of opposite hand relative to

the pitch of the thread on the screw **15**, whereby the rotational movement of the stem **26** resulting from the rotation of the hand wheel **21** is compounded. Of course, a differential effect would be provided if the pitch of the thread **27** were of the same hand relative to the thread on the screw **15**.

Thus, as the hand wheel **21** is turned in one direction or the other, the current position of the screw **15**, in axial adjustment relative to the hand wheel **21**, will be indicated by the position of the finger **36** relative to the scale **37**. In the illustrated assembly, that indication will, of course, reflect the current state of adjustment of the speed varying transmission **11**.

In Figs. 4 and 5, I have illustrated a slightly modified form of indicating device. In this form of the invention, the wheel **41** differs somewhat from the wheel **21** of the formerly-described embodiment, being provided with a central domed portion **42** which is centrally perforated and through which passes the upper, threaded end of the stem **43**, which otherwise corresponds with the stem **26**. Nuts **44** and **45** secure the stem **43** against axial reciprocation relative to the wheel **41**; and a resilient collar **46**, mounted on the stem, engages and secures to the stem a disc-like dial **47** preferably provided with suitable indicia or graduations **48**. The arrangement is such that the dial is fixed to move with the stem **43**.

The hand-wheel **41** is formed to define an outwardly opening socket, and a domed, transparent cap **49** is mounted to close the socket and to enclose the dial **47**, said cap being secured in place by suitable means, such as a ring **50** which is fastened to the wheel **41** by means of screws **51** or other suitable fastening means. The ring **50** overlies the periphery of the cap **49** and holds the same in place; but it will be apparent that, by loosening the screws **51**, the cap **49** may readily be rotationally adjusted relative to the wheel **41**.

By any suitable means, a reference device **52** is made to appear upon the disc or cap **49**. The reference device may be imprinted on the disc, it may be cast thereon during the manufacture of the disc, or it may be applied by decalcomania or any other means. The only essential is that the reference device **52** shall be so arranged as to sweep the dial **47** upon relative rotational movement between the wheel **41** and said dial.

In other respects, the embodiment of my invention illustrated in Figs. 4 and 5 is entirely equivalent to the embodiment illustrated in Figs. 1 to 3.

I claim as my invention:

1. In a device of the class described, a base having a threaded bore, a screw threadedly mounted in said bore, a rotary element concentric with said bore, means restraining said rotary element against axial movement, means providing an axially-slidable, rotational driving connection between said rotary element and said screw, a stem having a quick-thread engagement with said screw, means restraining said stem against axial movement with said screw, and indicator means carried by said stem.

2. In a device of the class described, a base having a threaded bore, a screw threadedly mounted in said bore, a rotary element concentric with said bore, means restraining said rotary element against axial movement, means providing an axially-slidable, rotational driving connection between said rotary element and said screw, a wheel rotationally fixed to said rotary element and carrying a scale, a stem having a quick-thread engagement with said screw, means cooperating with said stem and said wheel to restrain said stem against axial movement relative to said wheel, and indicator means carried by said stem in position to sweep the scale on said wheel.

3. In a device of the class described, a base having a threaded bore, a screw threadedly mounted in said bore and having an axially-extending socket therein, a stem relatively reciprocably mounted in said socket and having a quick-thread engagement with said screw, a wheel carrying a scale, means providing a relatively-reciprocable, rotational driving connection between said wheel and said screw, means restraining said wheel against axial movement relative to said base, means restraining said stem against axial movement relative to said wheel, and indicator means carried by said stem in position to sweep the scale on said wheel.

4. In a device of the class described, a screw having a concentric, axially-extending socket, a collar sleeved on said screw, means providing an axially-reciprocable, rotational driving connection between said collar and said screw, a wheel sleeved on said collar, means securing said wheel against movement relative to said collar, a stem reciprocably mounted in said screw socket and having a quick-thread engagement with said screw, and means restraining said stem against axial movement relative to said wheel, said wheel being provided with a scale and said stem carrying indicator means arranged to sweep said scale upon relative rotational movement between said stem and said wheel.

5. In a device of the class described, a base having a threaded bore therein, a screw threadedly mounted in said bore and having a portion of its length projecting therefrom, a collar sleeved on the projecting portion of said screw, said collar being provided with a longitudinally-extending, internal keyway, a key carried by said screw and engaged in said keyway, means restraining said collar against axial reciprocation, said screw being formed with an axially-extending socket opening through the end of its projecting portion, a stem formed, throughout a portion of its length, with a quick-pitch thread, said stem being partially received in said socket, means secured to said end of said screw and cooperating with said stem thread to produce relative rotational movement between said stem and said screw upon relative reciprocatory movement therebetween, a wheel having a central bore sleeved on said collar, said wheel bore being formed to define an internal shoulder facing in a direction opposite the said end of said screw, means securing said wheel to said collar, a cap having a peripheral flange, said cap being received in said wheel bore with its flange gripped between said shoulder and the adjacent end of said collar, said stem projecting through a perforation in said cap, said wheel carrying a scale on a surface outside said cap, an indicator carried on said stem outside said cap and arranged to sweep said scale, and means cooperating with said stem and with said cap to restrain said stem against axial movement relative to said cap.

6. In a device of the class described, a base having a threaded bore, a screw threadedly mounted in said bore, a rotary element concentric with said bore, means restraining said rotary element against axial movement, means providing an axially-slidable, rotational driving connection between said rotary element and said screw, a wheel rotationally fixed to said rotary element, a stem having a quick-thread engagement with said screw, means, cooperating with said stem and said wheel to restrain said stem against axial movement relative to said wheel, a graduated dial fixed to rotate with said stem, and means moving with said wheel and defining a reference point arranged to sweep said dial upon relative rotation between said wheel and said dial.

7. In a device of the class described, a screw having a concentric, axially-extending socket, a collar sleeved on said screw, means providing an axially reciprocable, rotational driving connection between said collar and said screw, a wheel sleeved on said collar, means securing said wheel against movement relative to said collar, a stem reciprocably mounted in said screw socket and having a quick-thread engagement with said screw, means restraining said stem against axial movement relative to said wheel, a graduated dial fixed to rotate with said stem, a transparent disc fixed to rotate with said wheel and provided with a reference device, said disc overlying said dial and

arranged to cause said reference device to sweep said dial upon relative rotation between said wheel and said dial.

8. In a device of the class described, a base having a threaded bore therein, a screw threadedly mounted in said bore and having a portion of its length projecting therefrom, a collar sleeved on the projecting portion of said screw, said collar being provided with a longitudinally-extending, internal keyway, a key carried by said screw and engaged in said keyway, means restraining said collar against axial reciprocation, said screw being formed with an axially-extending socket opening through the end of its projecting portion, a stem formed, throughout a portion of its length, with a quick-pitch thread, said stem being partially received in said socket, means secured to said end of said screw and cooperating with said stem thread to produce relative rotational movement between said stem and said screw upon relative reciprocating movement

therebetween, a wheel having a central bore sleeved on said collar, means securing said wheel to said collar, said stem projecting through a perforation in said wheel, a graduated dial fixed on the projecting portion of said stem to move therewith, a transparent cap carried by said wheel and cooperating therewith to enclose said dial, said cap being provided with a reference device arranged to sweep said dial upon relative rotation between said wheel and said dial, and means cooperating with said stem and with said wheel to restrain said stem against axial movement relative to said wheel.

References Cited in the file of this patent

UNITED STATES PATENTS

2,398,235	Luenberger	Apr. 9, 1946
2,636,396	Reeves	Apr. 28, 1953