Aug. 19, 1969 D. R. HUMPHREYS 3,461,997

KNOB ASSEMBLY FOR TYPEWRITER PLATEN OR THE LIKE

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Fig. 1

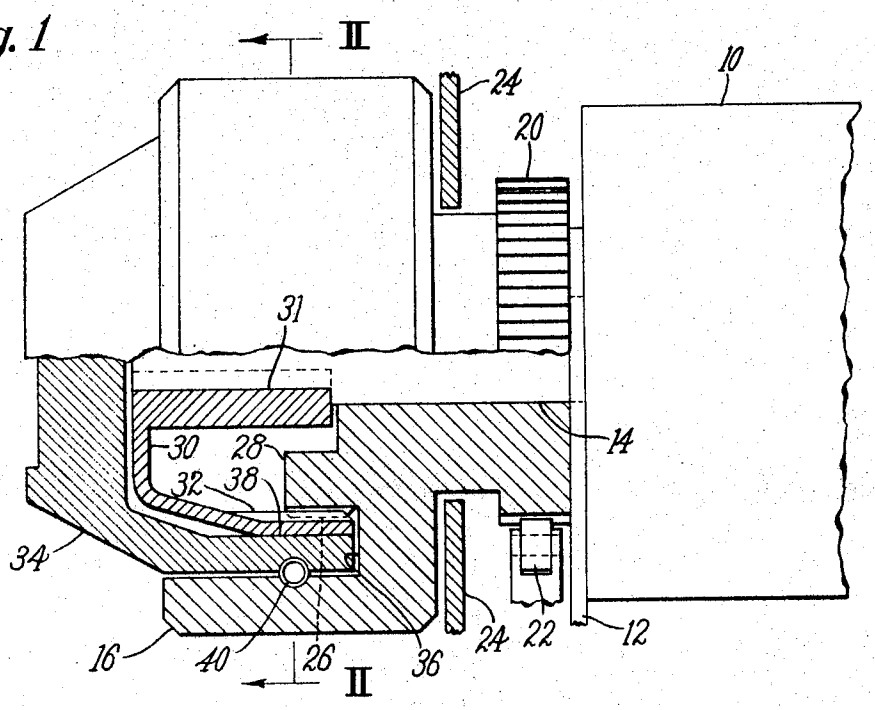

Fig. 2

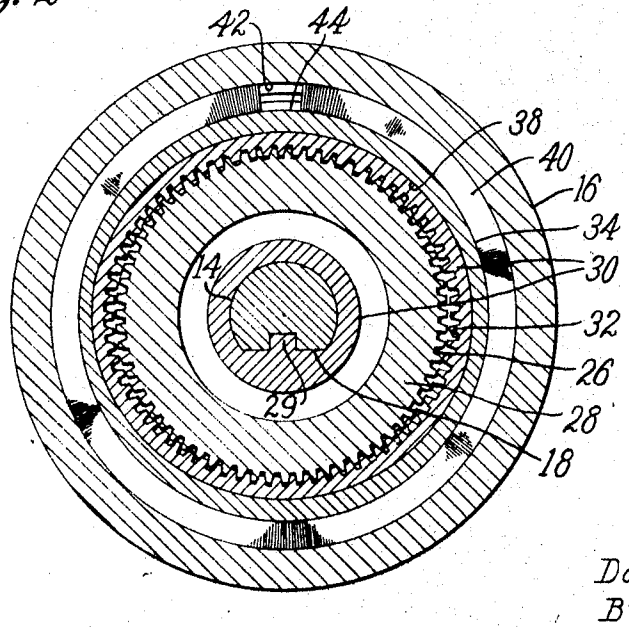

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Fig. 3

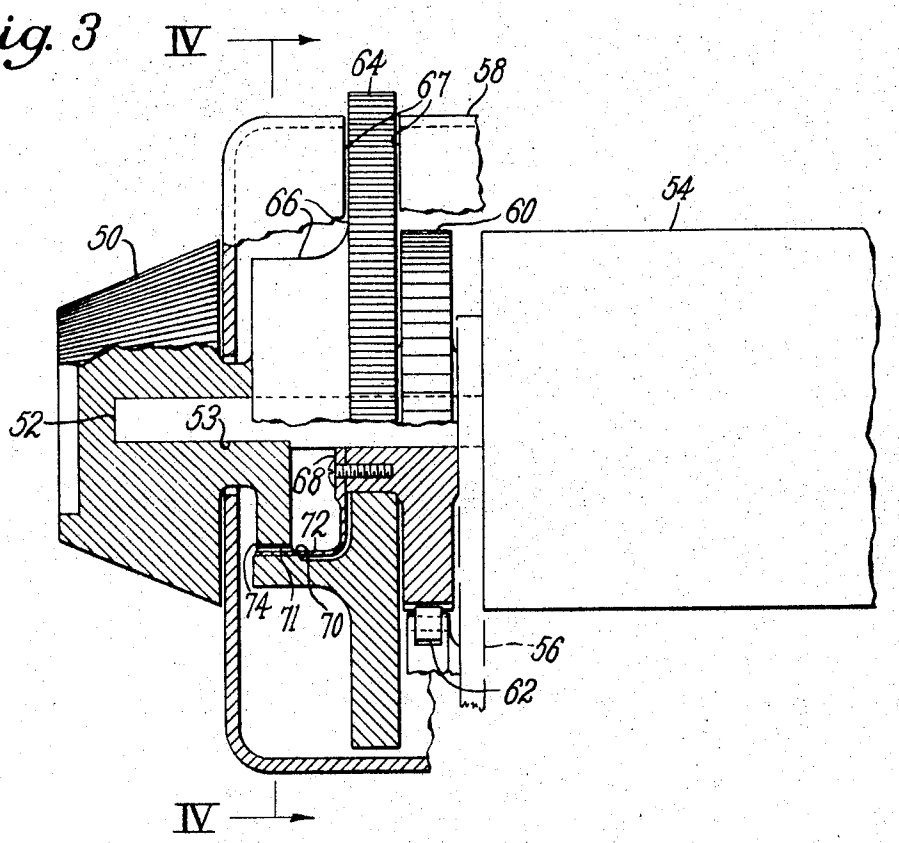
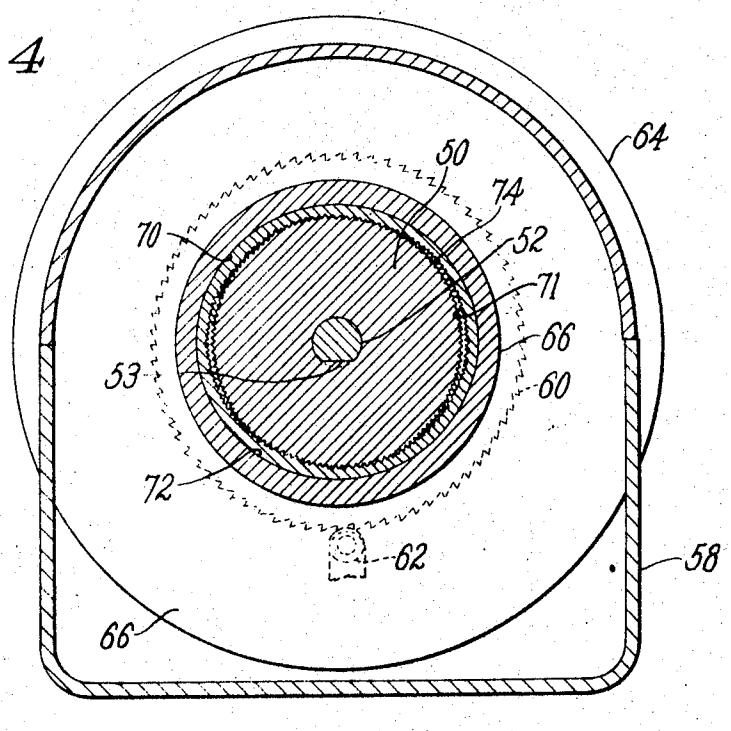


Fig. 4



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3,461,997

KNOB ASSEMBLY FOR TYPEWRITER PLATEN OR THE LIKE

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Continuation-in-part of application Ser. No. 662,700, Aug. 23, 1967. This application Oct. 21, 1968, Ser. No. 769,267

Int. Cl. B41j *19/96, 19/76;* F16h *33/00*

U.S. Cl. 197—121 3 Claims

ABSTRACT OF THE DISCLOSURE

A compact assembly, preferably of molded plastic parts, for angularly moving a typewriter roller or platen about its axis either in discrete steps by means of a coarse adjusting member integrally having a sprocket cooperative with detent means, or with infinitely fine adjustment by means of gearing comprising a harmonic drive actuator having a wave generator surface thereon cooperative with a flexspline. The device, in two illustrative forms, enables a typist using one hand optionally to index the roller or select any angular position without regard to its line spacing means.

CROSS-REFERENCE TO RELATED APPLICATION

This is a continuation-in-part of application Ser. No. 662,700, filed Aug. 23, 1967, now abandoned.

BACKGROUND OF THE INVENTION

The platen in typing machines or the like customarily has at one end a rotary knob and a pawl and ratchet mechanism for effecting discrete line spacing, and release mechanism operable, for instance by means of an axial push button, for enabling the knob to turn the platen so that it may be freely adjusted about its axis without reference to the line spacing. While the known arrangements generally operate in satisfactory manner there are numerous occasions when it is desirable to be able more easily to select any desired angular position of the platen and with greater accuracy and rapidity. The present invention contemplates the combination with a rotary platen of coaxial, economical gearing for manually positioning the platen conveniently and precisely, the gearing comprising a harmonic drive actuator of the type generally disclosed for instance in United States Letters Patent No. 2,906,143, issued Sept. 29, 1959, in the name of C. Walton Musser.

SUMMARY OF THE INVENTION

A primary object of this invention is to provide an improved knob assembly whereby an operator's finger movements may optionally angularly adjust a platen in coarse steps, or, with similar operating movement applied to a different portion of the assembly, angularly adjust in refined increments. To the end stated, a feature of the invention resides in the combination with a carriage having a rotatable platen and detent means for controlling rotation of the platen about its axis, of knob means coaxially mounted on an axial extension of the platen for optionally rotating the platen with coarse or fine adjustment, said knob means comprising a coarse adjusting member rotatable on the extension and having a sprocket cooperative with the detent means and circular spline teeth axially spaced from said sprocket, a flexible spline secured to the extension outboard of said member and having internal spline teeth meshing at circumferentially spaced localities with the circular spline

teeth and greater in number than the circular spline teeth, and a fine adjusting knob having an internal wave generator portion axially extending into the member for circumferentially progressing the localities of spline tooth engagement and hence rotation of the flexible spline relative to the member.

In the arrangement just indicated the fine adjusting knob is outboard of the coarse adjusting knob and its associated sprocket, but in accordance with a further feature of the invention the coarse adjusting knob may, in an alternate arrangement, be outboard of the fine adjusting knob. Unlike the arrangement first indicated wherein the flexspline acts as the output member during fine adjustment, in the alternate arrangement the flexspline is stationary and the circular spline functions as the output member.

BRIEF DESCRIPTION OF THE DRAWING

The foregoing and other features of the invention will now be described with more particularity in connection with two illustrative embodiments and with reference to the accompanying drawing, in which:

FIG. 1 is a view in side elevation of a left-hand portion of a typewriter platen with its control knob assembly, a portion of the latter being broken away and in section to reveal internal construction;

FIG. 2 is a section taken on the line II—II of FIG. 1;

FIG. 3 is a view similar to FIG. 1 but showing a modified arrangement of the parts permitting finger tip fine adjusting; and

FIG. 4 is a section taken on line IV—IV of FIG. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIGS. 1 and 2, a roller or platen **10** is mounted for rotation about its axis in a typewriter carriage comprising a pair of axially spaced brackets **12** only one of which is shown in FIG. 1. The platen **10** has an axial extension **14** journaled in the bracket **12** for coaxially supporting a knob assembly, later to be described, by means of which angular adjustment of the platen **10** may be manually controlled.

The coarse or main adjusting knob **16** is axially bored to receive the extension **14** which is relatively rotatable therein. A right-hand portion of the coarse knob **16**, as seen in FIG. 1, has a sprocket **20** for cooperating in conventional manner with line spacing mechanism (not shown) and a detent roll **22**, the latter normally seating between successive or selected teeth of the sprocket **20** to index it. A cover **24**, only partly shown in FIG. 1, may be provided to exclude dust. For refined platen adjusting purposes to be explained, the knob **16** has a circular set of axial spline teeth **26** externally disposed on an internal hub **28**.

A hollow flexspline **30** is mounted and keyed as at **29** (FIG. 2) on the extension **14** and serves as an output member for finely adjusting rotation of the platen **10** as will be described. For this purpose an extension flat **18** abuts a corresponding flat **31** internally formed in the flexspline **30**. A radially deflected circumference of the flexspline **30** is internally formed with circularly arranged spline teeth **32** greater in number than the teeth **26** in accordance with harmonic drive actuator design principles as disclosed, for instance in the above-mentioned Musser patent. A cup-shaped fine adjusting knob **34** outboard of the flexspline **30** and the coarse adjusting knob **16** has its perimeter axially extending into a recess **36** of the knob **16**. This enables an internal wave generator surface **38** formed on the knob **34** to engage the flexspline **30** radially opposite to its localities of spline engagement with the circular spline teeth **26**. For purposes of illustration the

surface **38** is shown as elliptoidal and thus dimensioned to deflect the flexspline teeth **32** radially inward at diametrically opposite localities of meshing. It will be understood that in accordance with known harmonic drive construction, the surface **38** may alternatively be trilobar for effecting three meshing localities, or otherwise multilobar, providing a suitable difference in the number of teeth **36** and **32** is maintained.

Since it is contemplated that for economy in design the parts may be molded of suitable plastic, lobar configuration of the wave generator surface **38** is preferably stiffened and retained by use of a resilient circular wire or band insert **40** extending about 350° and nested in confronting grooves **42**, **44** (FIG. 2) in the knobs **34** and **16**, the insert **40** further serving to hold the two knobs **34**, **16** against axial separation.

In operation a typist will rotate the knob **16** correspondingly to adjust the platen **10** about its axis, the detent roll **22** or other click means holding the platen in selected discrete position determined by the sprocket teeth of sprocket **20**. The platen **10** rotates in 1:1 ratio with the knob **16** because the teeth **32** of the flexspline **30** mesh with the teeth **26** on the hub **28** of the knob **16** and are driven by the latter. Harmonic drive is not then occurring. If refined positioning of the platen **10** is desired the typist merely rotates the knob **34**. The knob **16** now is relatively stationary, the detent roll **22** serving as a reaction member as the wave shape of the surface **38** is rotated circumferentially to progress the localities of engagement of the flexspline teeth **32** with the nonrotating teeth **26**. By reason of the tooth differential the flexspline **30** is itself rotated to drive the extension **14** at a much reduced ratio, commonly about 50:1, for instance, in the case of an elliptoidal surface **38**. Thus with very little finger effort, and with finger movements essentially like the adjusting motion which may first have been applied to the main knob **16**, the platen **10** is rotated with infinitely fine adjustment to the desired position.

FIGS. 3 and 4 show an alternate arrangement wherein a coarse adjusting knob **50** is secured on a flat **53** on the outboard end of an axial extension **52** affixed to a rotatable platen **54**. In this case the typewriter carriage comprises spaced roll supporting brackets **56** (one only shown in FIG. 3) and a cover **58** through which the knob **50** and the extension **52** project. A sprocket **60** freely rotatable on the extension **52**, a detent roll **62** and other portions of this knob assembly are within the cover **58** except for an upper peripheral portion **64** of a fine adjusting knob **66** which extends through a slot **67** (FIG. 3) in the cover **58**. The knob **66** rotatably mounted on an axial hub **68** of the sprocket **60** is formed with an internal wave generator surface **70** which may be elliptoidal as indicated in FIG. 4 or otherwise lobar as above indicated. In this case the wave generator surface **70** radially deflects internal spline teeth **71** of a cup-shaped flexspline **72** secured to the sprocket hub **68** into meshing engagement diametrically opposite localities with external circular spline teeth **74** formed on the coarse adjusting knob **50**. A larger number of flexspline teeth than circular spline teeth **74** is provided, the difference being two or a multiple thereof, unless a different wave generator shape is employed.

In using the arrangement shown in FIG. 3, the knob **50** will normally first be used for coarse adjusting of the platen **54**. Much finer adjusting is attained by turning the knob **66** by engaging its exposed portion **64**. This rotates the wave generator **70** relative to the flexspline **72** which is now relatively stationary. Accordingly the localities of spline engagement are circumferentially progressed with

reduced output in the knob **50** which accordingly transmits the slower refined rotation through the extension **52** to the platen **54**.

Either of the foregoing illustrative arrangements may be inexpensively mounted on standard business machines having rollers to be angularly adjusted. Advantageously the parts are inexpensively manufactured, easily assembled, and provide no problems in maintenance.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. In a typewriter or the like having a rotatable platen and detent means for controlling rotation of the platen about its axis, an axial extension of the platen, and coaxial knob means mounted on the extension for optionally rotating the platen with coarse or infinitely fine increments, said knob means comprising a coarse adjusting member rotatable on the extension and integrally having a sprocket cooperative with the detent means and circular spline teeth axially spaced from the sprocket, a flexspline secured to the extension outboard of the adjusting member and having internal spline teeth meshing at circumferentially spaced localities with the circular spline teeth and greater in number than the circular spline teeth, and a fine adjusting knob having an internal wave generator surface axially extending in the coarse adjusting member for circumferentially progressing the localities of spline tooth engagement and hence rotation of the flexspline and the platen relative to the coarse adjusting member.

2. A typewritter or the like as set forth in claim **1** wherein a resilient circular insert is arranged between the coarse adjusting member and an exterior portion of the fine adjusting knob for aiding in retention of the wave generator surface shape in the latter.

3. In a typewriter or the like having a rotatable platen and detent means for controlling rotation of the platen about its axis, an axial extension of the platen, a coarse adjusting knob secured outboard of the extension and having circular spline teeth formed thereon, a sprocket rotatable inboard on the extension and cooperatively engageable with the detent means, said sprocket having an axial collar, a fine adjusting knob journaled on said collar and having an internal wave generator surface, and a flexspline coaxially mounted on the sprocket for rotation therewith, the arrangement being such that axial spline teeth of the flexspline are greater in number than the spline teeth of the coarse adjusting knob and are in mesh therewith at circumferentially spaced localities as determined by said wave generator surface, whereby rotation of the fine adjusting knob acts with reduced ratio through the coarse adjusting knob to angularly move the platen.

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