June 4, 1957 R. LIEBMANN 2,794,530

VARIABLE ESCAPEMENT MECHANISM FOR TYPEWRITERS

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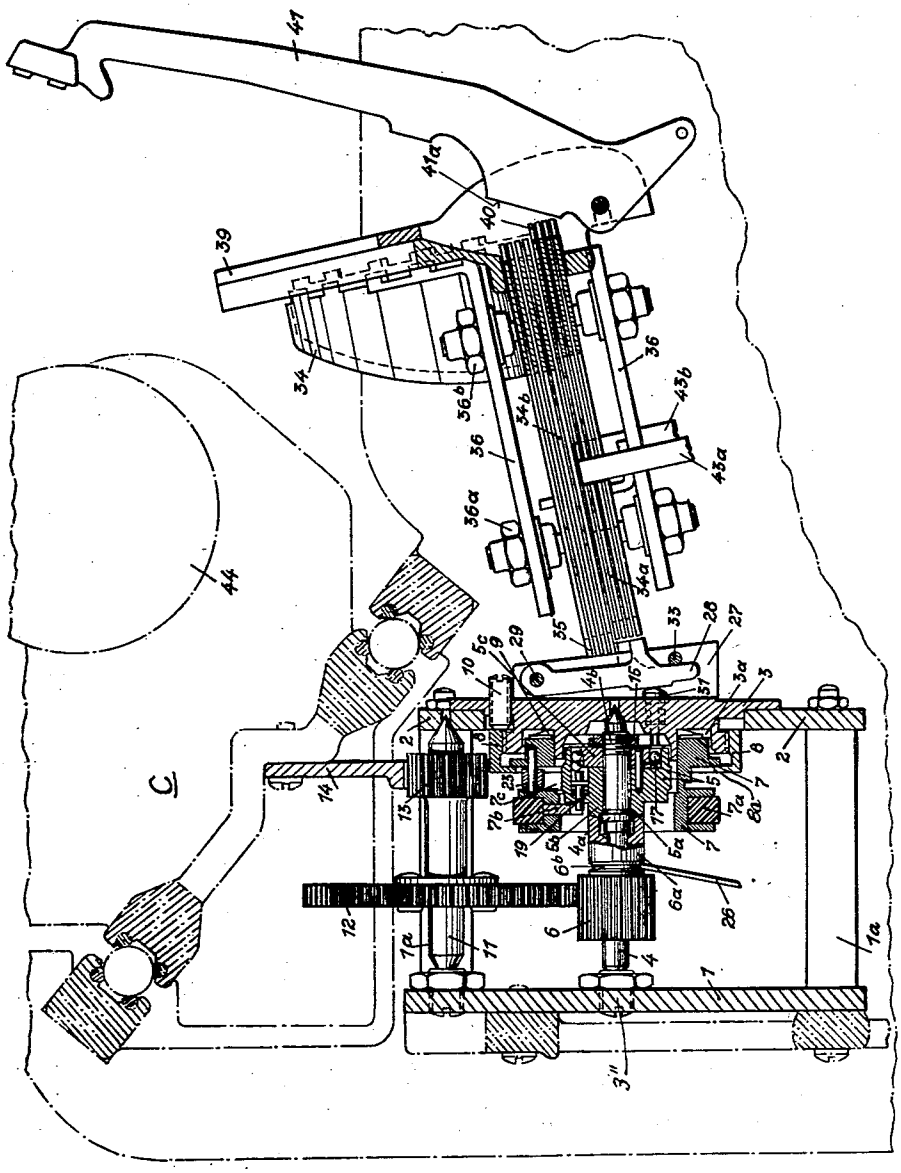


Fig. 1

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Fig. 2

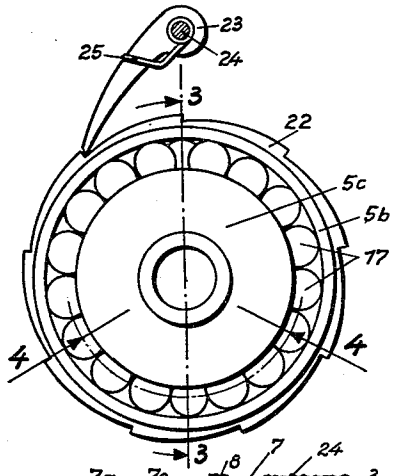


Fig. 3

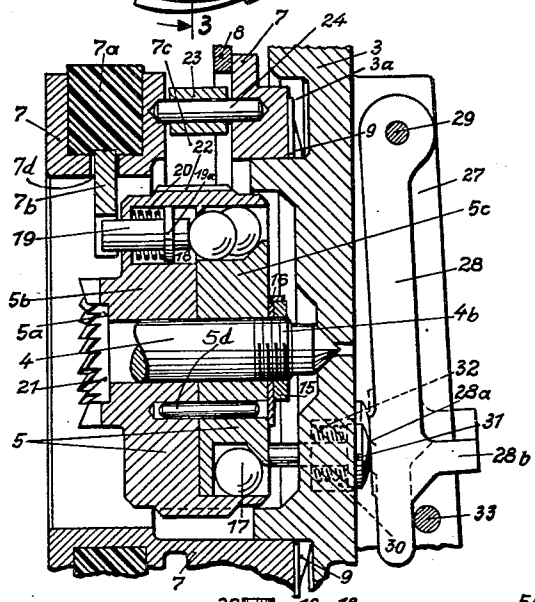
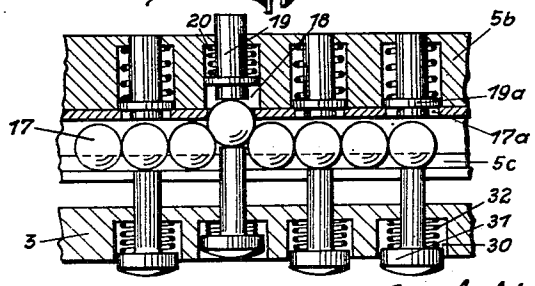


Fig. 4



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Fig.5

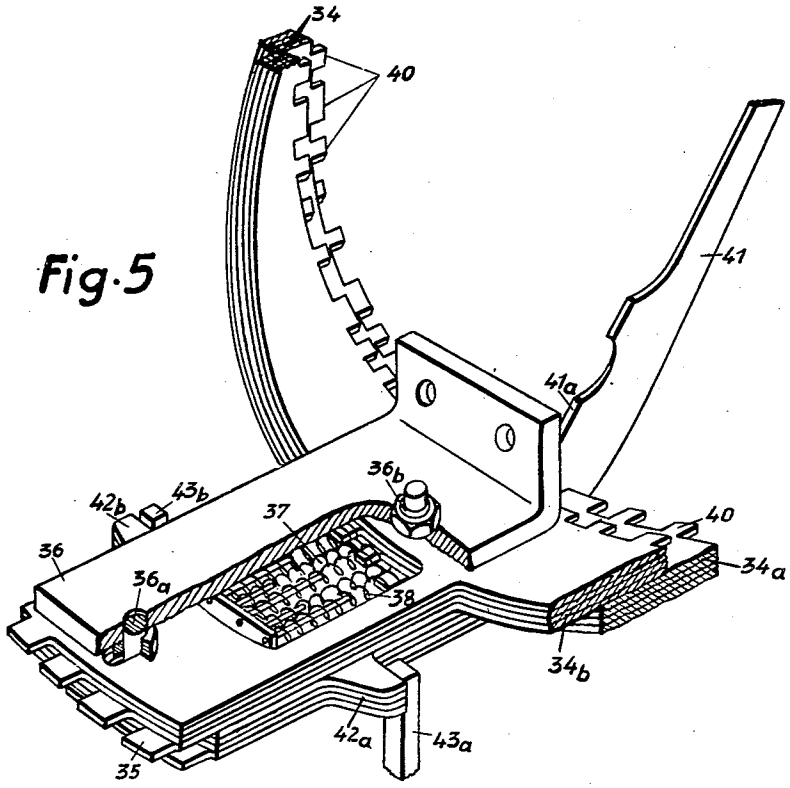


Fig.6

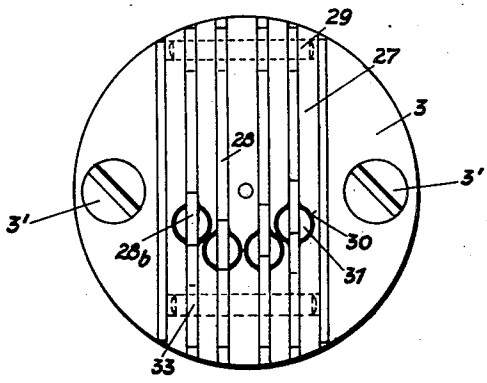
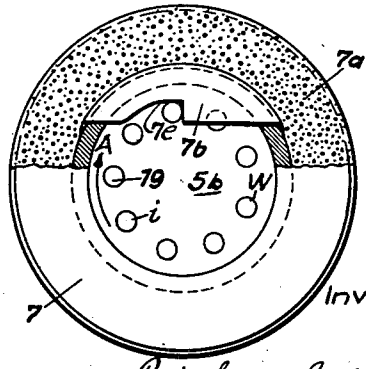


Fig.7



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VARIABLE ESCAPEMENT MECHANISM FOR TYPEWRITERS

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Application March 17, 1955, Serial No. 494,848

10 Claims. (Cl. 197—84)

This invention relates to a variable escapement mechanism for typewriters.

It is known to provide typewriters with escapement mechanisms which alter the letter spacing in accordance with the widths of the type characters, thereby to improve the appearance of the typed page, but the prior mechanisms have been relatively complex and therefore expensive to manufacture. In place of providing a single pawl and a ratchet wheel with relative large ratchet teeth to obtain the conventional uniform letter spacing, it has been proposed to divide the large ratchet teeth into fine unit teeth and to employ pawls of different length which, under proper control, permit a carriage advance of one or more unit escapement steps.

Objects of the present invention are to provide a variable escapement mechanism having relatively simple and rugged elements for the control of the step movement of the carriage by the type lever of the particular letter or character which is typed. More particularly, an object is to provide an escapement control mechanism including a control drum carrying slidable pins and a ring of balls for locking one of the pins in actuated position for cooperation with a stop to determine the extent of the carriage movement, and slides selectively displaceable by the type levers to displace one of the balls to move the appropriate pin into actuated position. A further object is to provide an escapement control mechanism of the character stated which includes a separate set of slides for the upper case and lower case positions of adjustment of the typewriter.

These and other objects and the advantages of the invention will be apparent from the following specification when taken with the accompanying drawings in which:

Fig. 1 is a fragmetary longitudinal section through a typewriter having a variable escapement mechanism embodying the invention;

Fig. 2 is an end elevation, on a larger scale, of the control drum as seen when removed from the mechanism;

Figs. 3 and 4 are fragmentary sections through the mechanism as taken on lines 3—3 and 4—4 respectively of Fig. 2;

Fig. 5 is a fragmentary perspective view of the sets of slides of the mechanism;

Fig. 6 is an end elevation of the transmission levers and their supporting plate; and

Fig. 7 is an end elevation, with part broken away, of the pin-carrying control drum and associated stop plate.

In Fig. 1 of the drawings, the reference numerals 1 and 2 identify two metal plates which are secured to the rear portion of the typewriter frame and held in parallel relation by spacer rods 1*a*. A bearing support 3 is secured by screws 3', see Fig. 6, over an opening in the forward plate 2, and a shaft 4 having an intermediate collar 4*a* and a threaded front end 4*b* is mounted between the bearing support 3 and a bearing 3'' carried by the rear plate 1. A control drum 5 and a small gear 6 are slidably supported on shaft 4 for a small degree of axial movement necessary to permit engagement and disengagement of a clutch, to be described later, which couples a part of the control drum to the gear. The bearing support 3 has an annular groove 3*a* at its rear surface in which a cylindrical stop support 7 is seated. A cap 8 is threaded upon the bearing support 3 and has a rear flange 8*a* against which the support 7 is resiliently pressed by an annular leaf spring 9 within the groove 3*a*. A set screw 10 is threaded through the bearing support 3 to engage and prevent inadvertent angular movement of the cylindrical stop support 7.

An intermediate shaft 11 is journalled in plates 1 and 2 parallel to the shaft 4 and has fixed thereto a large gear 12 in mesh with gear 6 on shaft 4 and a small gear 13 in mesh with a rack 14 of the paper carriage C.

The control drum 5 comprises two portions, there being an annular recess 5*a* in the rear portion 5*b* for receiving the collar 4*a* of shaft 4, and the forward portion 5*c* is held in assembled relation to the rear portion 5*b* by a nut 15 threaded upon the forward threaded portion 4*b* of shaft 4 and locked thereto by a plate 16. The rim of portion 5*b* of the drum projects forwardly to provide an annular recess within which portion 5*c* is seated and forms a race for a row of balls 17, the portions 5*b* and 5*c* being secured against relative angular movement by a pin 5*d*. As shown in Figs. 3 and 4, the dimensions of the ball race are chosen so that one ball always lies about halfway out of circumferential alinement with the remaining balls. The rearward portion 5*b* of the control drum is provided with a circular array of bores 18 in which pins 19 having collars 19*a* are slidably supported and urged forwardly by springs 20. The pins are guided for rectilinear movement parallel to the axis of shaft 4 and the drum 5 by the sliding of the pins in the small diameter rear portions of the bores 18 and the sliding of their collars 19*a* in the large diameter forward portions of the bores. To reduce friction and facilitate smooth operation, the number of pins 19 is only one half the number of balls 17 in the race of the ball carrying portion 5*c* of the control drum. The rear wall of the portion 5 is provided with openings 17*a* which aline with the several bores of the pin carrier 5*b*.

The rearward end of the hub of the pin carrier portion 5*b* of the control drum 5 is provided with inclined teeth 21, see Fig. 3, which mate with a complementary set of teeth on the forward end 6*a* of the hub of gear wheel 6 to form a one-way clutch which permits the control drum to rotate the gear 6 only when turning in a clockwise direction, as viewed in Fig. 7, for movement of the carriage in the writing direction. The gear hub is provided with a circumferential groove 6*b* in which the end of a lever 26 is seated; the lever being operable by a coupling, not shown, to the carriage return lever to disengage the clutch 6*a*, 21, to release shaft 11 and gear 6 for free-wheeling during the carriage return movement.

Reverting to the stop support 7, this member is provided with a circumferential groove in which an annulus of synthetic rubber 7*a* is seated to support a segmental stop plate 7*b* for the pins 19. Plate 7*b* extends through a slot 7*d* in the stop support 7 and has its forward portion, as viewed in the direction of control drum movement, cut away along an arcuate line 7*e* which lies outside of the path of the pins 19, see Fig. 7.

The outer rim of the pin support 5*b* is provided with ratchet teeth 22 for engagement by a pawl 23 mounted in a recess 7*c* of the stop support 7 by a pin 24 and held in engagement with the teeth 22 by a light spring 25, see Figs. 1, 2 and 3.

The forward face of the bearing support 3 is provided with five vertical ribs 27 between which four transmission levers 28 are arranged; the levers being pivotally supported on a shaft 29 and having small pro-

jections **28***a* on their rearward faces opposite projections **28***b* on their forward faces, see Figs. 3 and 6. An arcuate array of counterbored openings **30** is provided in the bearing support **3** in line with the projections **28***a* of the transmission levers, and striker rods **31** are slidably supported in these openings and held forwardly by springs **32** to retain the transmission levers **18** in normal rest position against a stop rod **33**. The rear ends of the striker rods extend through the annular space between the rim of the pin carrier **5***b* and the forward outer edge of the ball carrier **5***c* and rest against alternately positioned balls **17**.

The transmission levers **28** are selectively actuated by one of the slides of two groups **34***a*, **34***b* in accordance with the adjustment of the typewriter for upper case and lower case characters. The slides have selectively arranged projections **35** on their rear ends for engagement with projections **28***b* of the transmission levers **28**, and both groups of slides are supported between holding plates **36** by screws **36***a* and **36***b* and have central recesses **37** in which springs **38** are located to urge the slides forwardly towards the segment carrier **39** on which the plates **36** are mounted. The forward ends of the slides are arcuate to conform to the curvature of the segment carrier and are provided with projections **40** which are struck by projections **41***a* of the type levers **41** to move the slides rearwardly in opposition to their restoring springs **38**.

It is of course essential that a key lever actuate only one escapement-controlling slide, and the slides of group **34***a* for control of the escapement for lower case characters have lateral projections **42***a* at one side for engagement with a stop **43***a* while the slides **34***b* for control of the escapement for upper case characters have similar lateral projections **42***b* at the opposite side of the groups for engagement with a stop **43***b*. The stops **43***a* and **43***b* are actuated by the lower case-upper case shift key through means, not shown, to move the respective groups of slides between a rearward inoperative position and a forward operative position. As shown in Figs. 1 and 5, the machine is adjusted for the typing of lower case characters on the paper supported by the platen **44**, and only the slides of group **34***a* are in the forward position in which the projections **41***a* of the type levers **41** can contact the projections **40** of the slides.

The carriage is yieldingly urged in the writing direction in the usual manner by a spring and is normally blocked against movement by the engagement of one of the pins **19** with the stop **7***b*. Upon striking one of the type keys, the associated type lever **41** is turned counterclockwise, Fig. 1, and its projection **41***a* strikes the projection **40** of one of the slides **34***a* to move it rearwardly. This rearward movement of a slide rocks one of the transmission levers **28** clockwise, thereby moving the associated striker rod **31** rearwardly to force one of the balls **17** rearwardly out of circumferential alinement with the remaining balls. This displacement of a ball **17** moves its associated pin **19** rearwardly and makes room in the ball race for the return of the previously actuated ball since its pin **19** is moved forwardly by the associated spring **20** and thus is no longer seated against the stop **7***b*. The newly actuated pin **19** is locked in rearward position, however, by its ball **17**, see Figs. 3 and 4, since by construction the ball race is so dimensioned that one ball **17** is always displaced somewhat from circumferential alinement with the remaining balls. The return of the previously actuated pin **19** to normal rest position frees the carriage for an advance by its spring, and the carriage moves until the newly actuated pin is carried into engagement with stop **7***b* by angular movement of control drum **5** in the direction of arrow A, Fig. 7.

The extent of the carriage movement is determined by position of the newly actuated pin with respect to the stop **7***b* when a type key is depressed, see Fig. 7. A minimum width escapement step results when the slide actuated by the type lever **41** displaces the pin *i* rearwardly, since pin *i* is relatively close to the stop **7***b*, and the maximum width escapement step results when pin W is displaced rearwardly. For returning the carriage to starting position, the lever **26** shifts the gear **6** rearwardly to release it from the control drum **5**, thus permitting the gearing to move freely and without disturbing noise from the one-way clutch. The control drum **5** does not rotate during the carriage return since it is locked against such movement by its ratchet teeth **22** and the pawl **23**. This locking of the control drum against reverse movement results in a uniform return of the carriage to the same starting position regardless of the length of the previously typed line and the particular pin **19** then in engagement with the stop **7***b*.

Since the upper case and lower case characters of the type bars usually differ in width, the two sets of control slides **34***a* and **34***b* are provided and are automatically shifted into operative position by the adjustment of the machine between the typing of lower case and of upper case characters.

I claim:

1. In a typewriter having type levers, a paper carriage provided with a rack and spring means urging the carriage in the writing direction; a variable escapement mechanism comprising a control drum including a portion slidably supporting an annular array of pins and a ball lock portion having a circumferential race supporting a plurality of balls, spring means yieldingly urging the respective pins towards a normal position with one set of ends thereof circumferentially alined adjacent said ball lock portion of the control drum, the dimensions of the ball race of the ball lock portion of the control drum being such that one of the balls projects laterally from alinement with the remaining balls to move one of said pins from normal to actuated position, a shaft on which said control drum is mounted, a gear on said shaft and connected to said control drum by a one-way clutch, gearing coupling said gear with the rack on the carriage, transmission means actuated by the several type levers for selectively projecting a ball from said race to move a pin into actuated position, and stop means extending into the path of an actuated pin to arrest angular movement of said control drum.

2. A variable escapement mechanism as recited in claim 1, in combination with means supporting said shaft, said supporting means comprising a pair of parallel plates, one of said plates having an opening therethrough, a bearing support secured over said opening to support one end of said shaft, and a cooperating shaft bearing mounted on the other plate.

3. A variable escapement mechanism as recited in claim 2, wherein said transmission means includes striker rods having rear ends seated against balls in said ball race, transmission levers bearing against the forward ends of the respective striker rods, and slides having projections at their rear ends positioned adjacent the several transmission levers and projections at their forward ends positioned for selective engagement by projections on the type levers upon typing actuation thereof.

4. A variable escapement mechanism as recited in claim 3, wherein said transmission levers are pivotally mounted on said bearing support.

5. A variable escapement mechanism as recited in claim 3, wherein said striker rods are slidably supported by said bearing support, in combination with spring means yieldingly retaining said striker rods seated against said transmission levers.

6. A variable escapement mechanism as recited in claim 3, wherein separate groups of slides are provided for upper case and lower case characters; said separate groups of slides being movable between operative and inoperative positions by the case shift of the typewriter.

7. A variable escapement mechanism as recited in

claim 1, wherein the number of balls in said race is twice the number of pins in said control drum.

8. A variable escapement mechanism as recited in claim 1, wherein said pin-supporting portion of said control drum has a projecting rim providing an annular recess in which said ball lock portion is seated, in combination with means securing said control drum portions against relative rotation with respect to each other.

9. A variable escapement mechanism as recited in claim 1, in combination with pawl and ratchet means preventing rotation of said control drum on return movement of the carriage to starting position.

10. A variable escapement mechanism as recited in claim 1, in combination with means actuating said one-way clutch to disengage said control drum from said gear on return movement of said carriage to starting position.

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