STROKE LENGTH ADJUSTING MECHANISM


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10 Chins. (Cl. 74—59)

This invention relates to reciprocating mechanisms and more particularly to a device for adjusting the stroke length of a reciprocating member.

Modern industrial machines are generally constructed with readily interchangeable parts so as to reduce the cost of both assembly and maintenance. However, when extremely close tolerances are required, it has often been found to be cheaper to meet these requirements by designing a part which can be adjusted after it has been placed in the utilization mechanism rather than to attempt to machine the part to precise specifications.

Adjustment problems of this type sometimes occur in reciprocating mechanisms where the stroke length is fixed by the driving mechanism (cam, wheel, crankshaft, or other suitable member) but where the desired end-of-stroke positions vary with the utilization device. An example of this is a device using reciprocating mechanism to either contact or pick up an element at each end of its stroke the positions of these elements varying from device to device.

Present stroke-length adjusting mechanisms are capable of acting only on the reciprocated member and are also limited in that a change at one end of the stroke generally causes an equal but opposite change at the other end of the stroke.

It is therefore an object of this invention to provide an improved device which allows the stroke length of a reciprocated member to be adjusted after the mechanism is incorporated in the utilization device.

Another object of this invention is to provide a device of the type described above which makes possible the use of a single reciprocating mechanism with a plurality of contact or pick up elements, each requiring a slightly different stroke length.

A further object of this invention is to provide a device as described above wherein the stroke may be adjusted independently at either end.

A still further object of this invention is to provide a compact, simple, relatively inexpensive device for varying the stroke length of a reciprocating mechanism.

In accordance with these objects this invention utilizes a reciprocated member which is driven from a starting position to a desired end-of-stroke position. A yieldable means is provided to normally maintain this member in a fixed relative position to an element which is driven through a fixed stroke by a primary moving means. The yieldable means may, for example, include a lever fixed at a first point to said element and at a second point to said member. The primary reciprocating movement imparted to the member through this connection is utilized by an auxiliary means to produce a supplementary movement of said member relative to said element as said member approaches its end of stroke position. The auxiliary means includes an adjustable means such as a cam, the fixed position of which may be varied to control the amount of relative movement between the element and the member to cause the member to arrive exactly at the desired end-of-stroke position as the stroke of said element terminates.

In one embodiment of the invention a block is reciprocated by a drum cam. A rocker lever having at least two arms is pivotally connected at its hub to the block and is normally yieldably maintained in a centered position on the block. One arm of the rocker lever is attached to a cam follower forming the only connection between the block and the drum cam. The other arm or each other arm of the rocker lever has a cam follower on it which coacts with an adjustable cam to rotate the rocker lever about its pivot a controlled amount at the end of a stroke. This allows the pivot point and the block which is attached to it to be advanced a controlled distance either past or short of the point where they would normally be stopped by the cam follower if the rocker lever had remained in its centered position.

The foregoing and other objects, features and advantages of the invention will be apparent from the following more particular description of a preferred embodiment of the invention, as illustrated in the accompanying drawings.

FIGS. 1 and 2 are, respectively, diagrammatic elevation and plan views of a record-tape transporting mechanism embodying this invention.

FIGS. 3 and 4 are, respectively, enlarged diagrammatic front and side elevational views of portions of the mechanism shown in FIG. 1.

FIG. 5 is an enlarged diagrammatic view of an alternative embodiment of the portion of the mechanism shown in FIG. 3.

FIG. 6 is a diagrammatic elevation view of an alternative embodiment of the mechanism shown in FIG. 5.

FIGS. 1 and 2 show the chosen embodiment of this invention as it is applied in a carriage mechanism 8 for transporting cartridges 10 containing magnetic tapes, this mechanism being similar to that shown in copending application Serial Number 741,544 of T. U. Burke, et al., filed June 12, 1958 now Patent Number 2,941,739. The carriage 8 is supported by rollers 14 on two parallel rails 12 and is adapted to be driven along these rails by a program controlled motor (not shown). A cylindrical cam 18 rotates either clockwise or counterclockwise (when looking in the direction of arrow 30) on a shaft 28 mounted on the carriage 8. A motor 16 mounted on the carriage 8 rotates bevelled gears 22. Clutches 15L and 15R are operated by external control mechanisms (not shown) to selectively connect the bevel gears to rotatable shafts 24L or 24R. These shafts act through respective bevels 26L and 26R to rotate shaft 28 in either the clockwise or the counterclockwise direction. Externally controlled brakes 46L and 46R are provided on the shafts 24L and 24R respectively to immediately stop the rotation of these shafts at any desired instant.

A cam follower 32 rides in a helical groove 34 on the surface of cam 18. The groove 34 terminates at either end of the cam in vertical dwells 48L and 48R respectively and also has a vertical dwell 48C at its center. The cam follower 32 is attached to a block 36 in a manner to be described later. Block 36 rides on rails 38 which are supported by posts 37L and 37R mounted on the carriage 8. A clevis 49 mounted below the block has an arm 14 pinned thereto by a pin 42. An arm 52 also mounted on the underside of the block 36 controls the position of arm 14. The lower portion of arm 14 passes through a slot 44 in carriage 8.

The carriage 8 is positioned over two modules 20L and 20R each containing a plurality of tape cartridges 10 supported by rollers 54 on tracks 56L and 56R respectively. Each cartridge has a slot 50 in its upper surface. In operation, carriage 8 is driven by its motor along rails 12 until pickup arm 14 is positioned in line with a selected cartridge 10. Assuming, for example, that the selected cartridge is in the left module 20L, left clutch 15L is activated and motor 16 started. This results in rotation of shaft 24L causing belt 26L to rotate shaft 28 and drum cam 18 in the counterclockwise direction. Cam 28 rotating in this direction causes block 36 to be driven...
to the left by cam follower 34. Brake 46L is operated by its external control circuitry to stop the rotation of cam 18 when cam follower 33 reaches vertical dwell 48L of cam groove 34. At this time, if everything is properly aligned, arm 14, which has moved with block 36, will be positioned over the slot 50 of the selected cartridge.

Assume for the moment that everything is properly aligned. The activation of solenoid 52 then causes arm 14 to rotate in a counterclockwise direction about pin 42 dropping the lower end of arm 14 into slot 50. The activation of clutch 15R and the starting of motor 16R causes cam 18 to be rotated in a direction to drive cam follower 32, block 36, and arm 14 to the right. Arm 14 being locked in the position 50, will put the selected cartridge 10 along with it; the rollers 54 of the selected cartridge being transferred from track 56L associated with the selected cartridge to a track 58 attached to the lower surface of carriage 8. Cam follower 32 will be riding in vertical dwell 48C when cam 18 is stopped by brake 46R. If it had been desired to select a cartridge 10 from the right (module 20R) a similar procedure would have been followed.

The selected cartridge 10 is held in a centered position on track 58 by arm 14 and is in this way transported by carriage 8 to a magnetic tape utilization device (not shown).

It can be seen that arm 1 must be positioned exactly over the slot 50 in cartridge 10 when solenoid 52 is activated. If arm 14 is positioned past slot 50, it may be damaged when its lower surface hits the top of the cartridge 10; and, more important, if arm 14 is positioned short of the slot 50 at the end of the stroke, the selected cartridge 10 will never be picked up. Also, since the same mechanism is used to pick up cartridges from both the left module 20L and right module 20R, it is essential that it be possible to adjust the end-of-stroke position on either side without interfering with the adjustment on the other side.

FIGS. 3 and 4 show in detail a stroke-length-adjusting mechanism embodying the invention, suitable for use in the before-described carriage mechanism. It comprises a three-armed rocker lever 60 which is pivotally connected at its hub, point 62, to block 36 and has a bolt 64 passing through its upper arm to connect the lever to cam follower 32. Cam follower rollers 66L and 66R are rotatably mounted, one on each of the lower arms of the lever 60. Two spring biased containing arms 68L and 68R are pivotally connected at their hubs to block 36 and bear against stud 70 on the upper arm of lever 60 to normally maintain the lever 60 in a centered position.

A stud 72 attached to the block 36 rides above the stud 70 preventing the balance in the springs 69 from moving the lever 60 from its centered position. The cam follower 32 and the bolt 64 pass through a large opening 74 in the block 36 and are therefore free to move relative to the block 36.

At each end of the stroke a cam 76L and 76R respectively (reference FIG. 1) is connected to its associated side post 37L or 37R by a screw 78 riding in a slot 79 and is pivoted about a stud 81 mounted on bracket 82L or 82R. When the associated screw 78 is loosened the back end of either cam 76 may be moved up or down rotatating cam 76 about its stud 81 to alter the slope which the cam surface presents to its associated cam follower 65L or 66R. These cams, 76L and 76R, may be adjusted independently and, as will be seen, are the means used to adjust the final position of the arm 14 at the end of a stroke.

With the arrangement shown in FIGS. 1 and 3, the position of the vertical ends dwells 48L and 48R would be such that, with no adjustment, the arm 14 would always fall short of the slot 50. Assume, as before, that the selected cartridge is in the left module 20L. Cam 48 would initially be rotated so as to drive block 36 to the left. Just before cam follower 32 reaches the vertical dwell
be made therein without departing from the spirit and scope of the invention.

We claim:

1. A mechanism for driving a reciprocated member from a starting position to a desired end-of-stroke position comprising in combination a primary moving means for driving an element through a fixed stroke; yieldable means operatively connecting said element and said member for normally maintaining said element and member in a fixed relative position to each other, whereby a primary reciprocating movement is imparted to said member; and auxiliary means including said yieldable means for deriving from said primary reciprocating movement a supplementary movement of said member relative to said element as said member approaches the end-of-stroke position, said auxiliary means including means for controlling the amount of said relative movement to cause said member to arrive exactly at said desired end-of-stroke position as the stroke of said element terminates.

2. A mechanism as described in claim 1, wherein said yieldable relative means includes a lever fixed at a first point to said element and at a second point to said member, and within said adjustable means is a cam the fixed position of which may be varied; said lever being actuated on said cam as said member approaches said end-of-stroke position to alter the alignment of said points.

3. A mechanism as described in claim 2, wherein said auxiliary means includes a cam follower located at a third point of said lever, said cam follower acting with said cam as said element approaches the end-of-stroke position to rotate the lever, whereby said alteration in alignment of points is attained.

4. A mechanism for driving a reciprocated member through a stroke of controlled length, the two end-of-stroke positions of said member being independently variable, comprising in combination a primary moving means for driving an element to two fixed end-of-stroke positions; yieldable means operatively connecting said element and said member for normally maintaining said element and said member in a fixed relative position to each other, whereby said primary reciprocating movement is imparted to said member; and auxiliary means including said yieldable means for deriving from said primary reciprocating movement a supplementary movement of said member relative to said element as said member approaches each of said end-of-stroke positions, said auxiliary means including adjustable means positioned one near each of said end-of-stroke positions for controlling the amount of said relative movement at the associated end of the stroke.

5. A mechanism for driving a reciprocated member mounted on a movable carriage to each of a plurality of desired end-of-stroke positions, the desired end-of-stroke position varying with the position of the carriage, comprising in combination a primary moving means for driving an element through a fixed stroke; yieldable means operatively connecting said element and said member for normally maintaining said element and member in a fixed relative position to each other, whereby a primary reciprocating movement is imparted to said member; and auxiliary means including said yieldable means for deriving from said primary reciprocating movement of supplementary movement of said member relative to said element as said member approaches each of said end-of-stroke positions, said auxiliary means including a plurality of adjustable means, one for each of said desired end-of-stroke positions, for controlling the amount of said relative movement to cause said member to arrive exactly at the desired end-of-stroke position as the stroke of said element terminates.

6. A mechanism for adjusting the stroke of a reciprocated member actuated by a fixed length driving means comprising in combination a rocker lever having at least two arms and pivotally connected at its hub to said reciprocated member; means for connecting said driving means to one arm of said lever, said connection being the only link between said driving means and said reciprocated member; yieldable means for normally maintaining said lever in a centered position; and means acting on a second arm of said lever at least one end of the stroke for causing said lever to rotate about its hub, said last-mentioned means including means for adjusting the amount of rotation of said lever, whereby said hub and therefore said reciprocated member will be displaced at that end of the stroke a controlled amount relative to their position if the lever had remained centered.

7. A mechanism for adjusting the position of each end of its stroke of a reciprocated member driven by a fixed length driving means comprising in combination a three-armed rocker lever pivotally connected at its hub to said reciprocated member; means for connecting said driving means to one arm of said lever, said connection being the only link between said driving means and said reciprocated member; yieldable means for normally maintaining said lever in a centered position; adjustable means including a cam follower mounted on said cam as said member approaches the end of each of its stroke to rotate said lever about its hub a controlled amount; whereby said lever and therefore said reciprocated member will be displaced at each end of the stroke a controlled amount relative to their position if the lever had remained centered.

8. A mechanism for adjusting the position of a reciprocated member at each end of its stroke independent of the adjustment at the other end, the means adapted to drive the reciprocated member having a fixed stroke length, comprising in combination a three-armed rocker lever pivotally connected at its hub to said reciprocated member; means for connecting one arm of said lever to said driving means, said lever forming the only link between said driving means and said reciprocated member; yieldable means for normally maintaining said lever in a centered position; a cam follower mounted on said cam as said member approaches one end of its stroke; and an adjustable cam mounted to cause a similar rotation of said lever when said reciprocated member approaches the other end of its stroke.

9. A mechanism for adjusting the position to which a reciprocated member mounted on a movable carriage will be advanced at each of a plurality of carriage positions where the position the reciprocated member is advanced to is to vary with the carriage position and the means adapted to drive the reciprocated member has a fixed stroke length, comprising in combination a rocker lever having at least two arms pivotally connected at its hub to said reciprocated member; means for connecting one arm of said lever to said driving means, said lever forming the only link between said driving means and said reciprocated member; yieldable means for normally maintaining said lever in a centered position; and a plurality of means located one at each of said carriage positions for acting on a second arm of said lever to cause said lever to rotate about its hub as the reciprocated member approaches one end of its stroke, each of said plurality of means including means for adjusting the amount of said rotational movement to cause said hub and therefore said reciprocated member to be displaced at the end of each stroke a controlled amount relative to its position if said lever had remained centered.

10. The combination comprising:

- carriage means, said carriage means being capable of being advanced to a plurality of carriage positions;
- a reciprocated member, said reciprocated member being mounted on said carriage means and adapted to move relative thereto;
driving means associated with said carriage means for driving said reciprocated member through a fixed stroke;
a rocker lever having at least two arms pivotally connected at its hub to said reciprocated member;
means for connecting one arm of said lever to said driving means, said lever forming the only link between said driving means and said reciprocated member;
yieldable means for normally maintaining said lever in a centered position; and
a plurality of means located one at each of said carriage positions for acting on a second arm of said lever to cause said lever to rotate about its hub as the reciprocated member approaches one end of its stroke, each of said plurality of means including means for adjusting the amount of said rotation, whereby said hub and therefore said reciprocated member is displaced at the end of each stroke a controlled amount relative to its position if said lever had remained centered.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,122,026
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Eugene S. Pearson et al.

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 3, line 14, for "put" read -- pull --; line 16, for "tack" read -- track --; line 27, for "l" read -- 14 --; same column, line 59, for "screy" read -- screw --; column 5, line 75, for "leveer" read -- lever --.

Signed and sealed this 14th day of July 1964.

(SEAL)
Attest:

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