ADJUSTABLE X AND Y AXIS CONTROLLED MOVEMENT MECHANISM

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Filed: Dec. 20, 1973
Appl. No.: 426,604

References Cited
UNITED STATES PATENTS
3,703,834 11/1972 Beezer
3,751,996 8/1973 Beezer

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ABSTRACT
A device for transmitting controlled movements in both an X-axis and Y-axis direction comprises a rotatable shaft having separate drive cams for separately driving levers which are connected through slides to a first member which is guided for movement backwardly and forwardly in a first direction such as an X-direction and is also connected through a cam drive and an adjustable slide to a second member which is mounted for movement on the first member in a separate direction at an angle to the movement of the first member for example along a Y-axis. A feature of the invention is that the drive is through two oscillatable lever members each of which is adjustable connected to a slide carried on the associated first and second moving members. The connection to the slide is an adjustable one so that the magnitude of the movement along both X- and Y-directions for the given cam motion may be separately adjusted. A changing of the stroke along each axis does not affect the outer top position of the movable member since the termination of the movement of the member both in an X- and a Y-direction is chosen such that the slides which are connected to these members are positioned in respect to the driving lever in an in line vertically and horizontally aligned position in respect to the respective shaft of the drive levers which are driven by the cams.

7 Claims, 7 Drawing Figures
ADJUSTABLE X AND Y AXIS CONTROLLED MOVEMENT MECHANISM

REFERENCE TO A U.S. APPLICATION

The present invention is an improvement over the invention disclosed and described in U.S. Pat. No. 3,751,996 which issued on Aug. 14, 1973.

DESCRIPTION OF THE PRIOR ART

At the present time it is known to mount members so that they are guided for movement along respective X- and Y-directions and to separately drive these members so that the rate of movement along these axes may be separately controlled. The second member is carried on the first member so that the control of the movement of the first member also controls the movement of the second member at least along the particular axis. A disadvantage in the known mechanisms is that it is difficult to adjust the zero position so as to obtain a desired control of the movement of the parts and a return to a specific point during each rotative cycle. It is also difficult to regulate the movement of each member so as to control the magnitude of movement along each independent axis.

SUMMARY OF THE INVENTION

In accordance with the present invention there is provided an improved device which includes a rotative shaft which drives through cams two separate oscillatable lever members. The first lever member is provided with a slide member which engages on a slide of a first movable member which is guided for movement backwardly and forwardly along a first axis such as an X-axis. In accordance with a feature of the invention the slide may be adjustably positioned in respect to the lever member so as to vary the magnitude of the movement which is effected during each oscillation. A second member is guided for movement along a second axis on the first member and the inventive arrangement includes a second oscillatable lever connection to a separate slide which is also adjustable in respect to its associated lever member. The invention is an improvement over the known device of applicant's previous patent inasmuch as it provides the separate adjustable connection between the second lever member to the slide member and this has been accomplished by driving both of the movable members through oscillatable levers rather than directly through a follower which was carried on one of the members and which must be biased into engagement with a groove of a drive cam. The invention is based on the realization that the simple adjustable connection could be made by the use of two separately controlled lever members each of which was driven by a separate groove which may for example be designed on opposite faces of the same cam plate. A simple change in the drive mechanism has provided a new and unusual result inasmuch as the parts may be arranged in a compact manner and the motion transmitted from the respective cam elements of the same plate through adjustable lever connections which make possible the adjustment of the members along each respective axis.

Accordingly it is an object of the invention to provide an improved device for transmitting motion along separate X- and Y-axis directions by transmission of the motion through separate cams driving through separate oscillatable lever members which are adjustably connected to a first slide member which moves in a first axis direction and a second slide member which is movable on the first member in a second axis direction.

A further object of the invention is to provide a device for transmitting motion in a controlled magnitude and with controlled velocity by transmitting the motion through two separate pivotal lever members each of which are adjustably connected to a movable member which moves along a respective axis.

A further object of the invention is to provide a mechanism for transmitting controlled X- and Y-axis movements which is simple in design, rugged in construction and economical to manufacture.

For an understanding of the principles of the invention reference is made to the following description of a typical embodiment thereof as illustrated in the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

In the Drawing:

FIG. 1 is a front perspective view partly broken away of a mechanism for moving a member through a controlled movement through X- and Y-directions constructed in accordance with the invention;

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

FIG. 3 is a front view of the mechanism shown in FIG. 1 with the cover removed;

FIG. 4 is a section taken along the line 4—4 of FIG. 3; and

FIGS. 5a, 5b and 5c are drawings showing standard movement sequences which can be carried out with the device.

GENERAL DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings in particular, the invention embodied therein comprises a motion transmitting device which includes a mounting frame generally designated 10 having a top wall 12 and a bottom wall 14 which supports two upright members or guides 16 and 18 which provide a guideway for the movement of a first movable member or part 20 along a first axis, for example a vertical axis or a wide axis on guide bearings which are contained within the member 20.

As shown in FIG. 4, the mounting frame 10 includes a rear wall or plate 22 which carries a ball bearing assembly 24 for rotatably supporting a drive shaft 26 which for example may be driven by a motor shaft having a worm 25 driving through a worm gear 27.

In accordance with the invention the drive shaft 26 carries cam means in the form of a cam cylinder or disc 28 having a separate cam control groove 30 on one side and a control groove 32 on the opposite side. The first member 20 carries roller guide bushings 40 and 42 which provide linear rolling contact movement for guide rods 44 and 46 as shown in FIG. 1. The guide rods 44 and 46 are part of a second member generally designated 48 which includes a cross block or end block 50 at one end of the guide rods 44 and 46 and a control slide assembly 52 at the other end of the rods 44 and 46 and beyond the first member 20. The block 50 may be arranged in a machine part for example and it may be the end member mounting the control mechanism which is to be moved along a selective X- and Y-direction. The second member 48 may move for exam-
ple at an angle to the first member 20 and preferably moves along a separate axis for example an X-axis while a first member is capable of moving along a first axis for example the Y-axis.

In accordance with a further feature of the invention the member 20 is provided with a motion transmitting control slide assembly 52. The slide member 52 has a slide way 56 which is engaged by a slide member or block 58 which is carried on the end of an adjustment arm portion 60 of an oscillatable lever generally designated 62. The slide member 58 may be adjusted along the length of the adjustment arm 60 by unfastening bolt members 64 to release the slide member and permit it to be moved along its associated adjustment arm 60 upon rotation of a screw 66 which causes the slide 58 in the form of a nut which engages with the screw to move backwardly and forwardly along the adjustment arm. The lever 62 also includes a drive arm portion 69 having a roller follower 70 carried on the arm portion 69 which engages in the control grove 30 of the cam 28. A second control lever generally designated 72 includes a follower 74 which rides in a control groove 32 on the opposite side of the cam plate 28 and it is carried on an arm 76 which is moved by the cam so as to oscillate an adjustment arm 78 having a slide follower 80 which engages in the slide way 54 which forms part of the second member 48. In accordance with a feature of the invention a slide block 80 (FIG. 3) is adjustable along the adjustment arm 78 in the same manner as the slide block 58 on its arm 60. The arrangement is such that the magnitude of movement of the first member 20 may be adjusted by adjusting the connection of the oscillatable lever 72 to the slide 54 carried by the first member 20. Similarly the amount of movement of the second member 50 relative to the first member 20 may be adjusted by adjusting the lever connection of the lever 62 to the slide 52 which is part of the second member 48.

The described mechanism provides a simple arrangement for providing both controlled movement and selection of the magnitude of the controlled movements along a plurality of separate axes such as X- and Y-axes. With the inventive arrangement it is possible to effect drive through a single disc cam plate and separate control grooves on respective sides thereof to separate oscillatable levers each of which may be adjustably connected to a slide carried by one of the members which is movable along a selected axis. The first member 20 is guided on ball bearing supports on a support rod 16 and 18 for movement along for example the Y-axis and the second member 48 is guided for movement on linear ball bearings 40 and 42 carried by the first member 20 for movement along a second axis such as the X-axis. The entire unit is driven by rotation of a single external shaft and the whole unit may be contained within a simple rectangular housing and the drive is advantageously through two separate oscillatable levers.

While adjustable levers 62 and 72 for varying X- and Y-strokes are described fixed strokes are also desired where there is no need for varying the stroke. In these cases a fixed roller is employed rather than the adjustable slide 64 and screw 66.

Examples of some of the possible types of motions of the end block 50 which are possible are indicated in FIGS. 5a. 5b and 5c. The movement may begin at station and carry out movements along the X- and Y-axes to effect the general motion paths, or variations thereof, through each of stations B, D, C and back to A. It should be appreciated that any motion in a plane such as movement in a path which is a circle, ellipse, irregular shape etc. is possible.

While a specific embodiment of the invention has been shown and described in detail to illustrate the application of the principles of the invention, it will be understood that the invention may be embodied otherwise without departing from such principles.

What is claimed is:

1. A motion transmitting device, particularly for positioning one machine part in relation to another, comprising a first direction guide means, a first member movable to and fro on said first direction guide means, a second direction guide means carried on said first member extending at an angle to said first direction guide means, a second member movable to and fro on said second direction guide means, rotatable shaft means, first drive means connected between said shaft means and said first member for moving said first member, second drive means connected between said shaft means and said second member for moving said second member, each of said first and second drive means having means for adjusting its connection to the associated first and second member for varying the magnitude of movement of said member in accordance with the rotation of said shaft means.

2. A motion transmitting device according to claim 1, wherein said first drive means comprises a first cam rotatable with said shaft means, said second drive means comprising a second cam rotatable with said shaft means, first and second levers connected between said first and second cams and said first and second members respectively and being oscillatable by said first and second cams, the connection between each of said first and second levers with said first and second members being adjustable.

3. A motion transmitting device according to claim 1, wherein each of said first and second drive means comprise an oscillatable double arm lever, each double arm lever having a follower and each double arm lever carrying a slide which adjustable along the length thereof, said first and second movable members each carrying a sideway engageable with said slide of the associated lever.

4. A motion transmitting device according to claim 1, wherein each of said first and second members carries a slideway, said first and second drive means comprising oscillatable levers each having a follower arm engageable with a cam and each having an adjustment arm with a slide member thereon adjustably movable along the length thereof, said slide member being engageable in a sideway of the respective member.

5. A motion transmitting device according to claim 4, wherein said slide member comprises a nut, said adjustment arm of said lever having a rotatable spindle engaged with said nut and being rotatable to shift said nut along the length thereof to adjust the position of said slide member.

6. A device for moving a member along a defined path with an adjustable movement comprising a rotatable shaft, a cam carried on said shaft and being rotatable therewith and having two separate first and second control surfaces, first and second lever members pivotally mounted adjacent said shaft and each having a first follower arm portion engaged with a respective surface
of said cam and being movable thereon and having a second adjustment arm, first and second movable members, first guide means for guiding said first movable member along a first direction, said second member having guide means for said second member for moving it along a second direction, each of said first and second movable members having slideway, said adjustment arm having a slide pivot thereon engageable in said slideway and means for adjusting said slide pivot along said drive arm for varying the magnitude of motion of each respective first and second member with oscillation of said respective levers.

7. An apparatus according to claim 6, wherein said drive arm carries a rotatable spindle, said slide pivot having a threaded portion engaged with said spindle, said spindle being rotatable to shift said slide pivot.