

[54] **DEVICE FOR TRANSMITTING  
CONTROL TRANSLATORY  
MOVEMENTS**

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[51] Int. Cl. .... **F16h 25/12**

[58] Field of Search ..... **74/57, 58, 110; 33/18 B; 214/1 BB, 1 BT**

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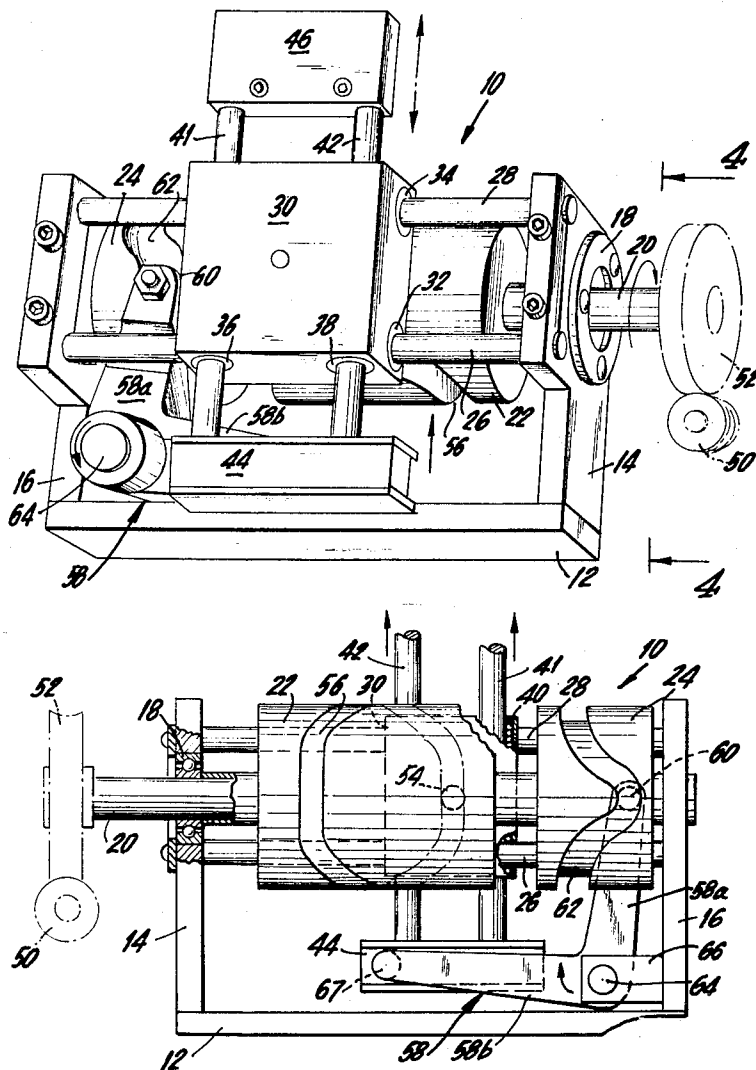
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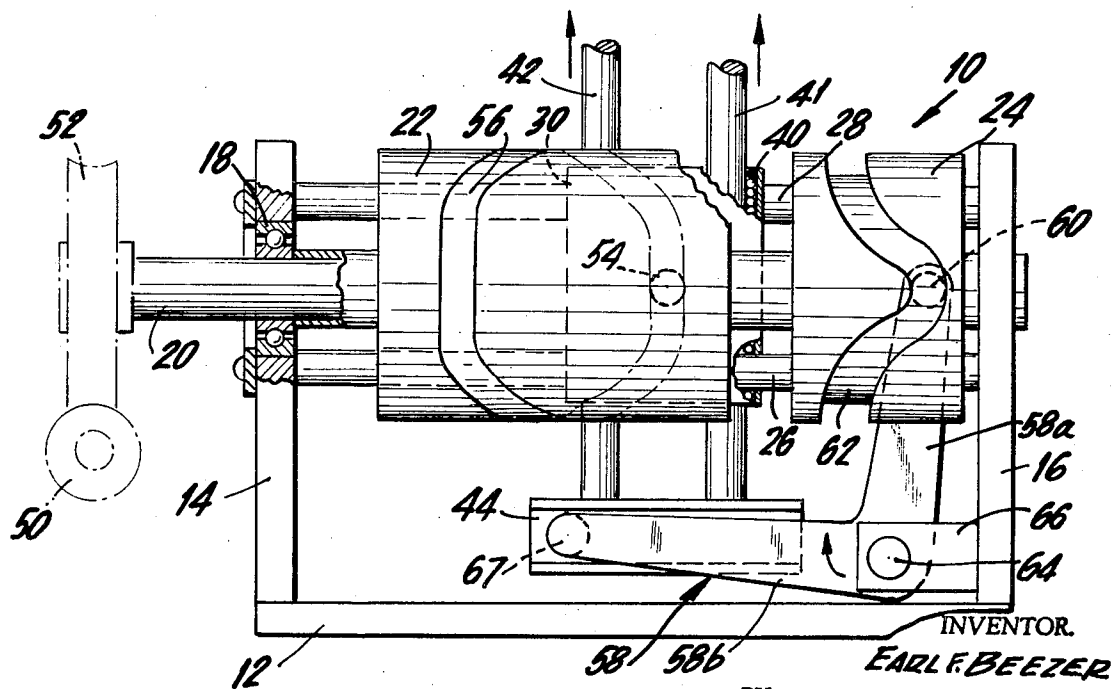
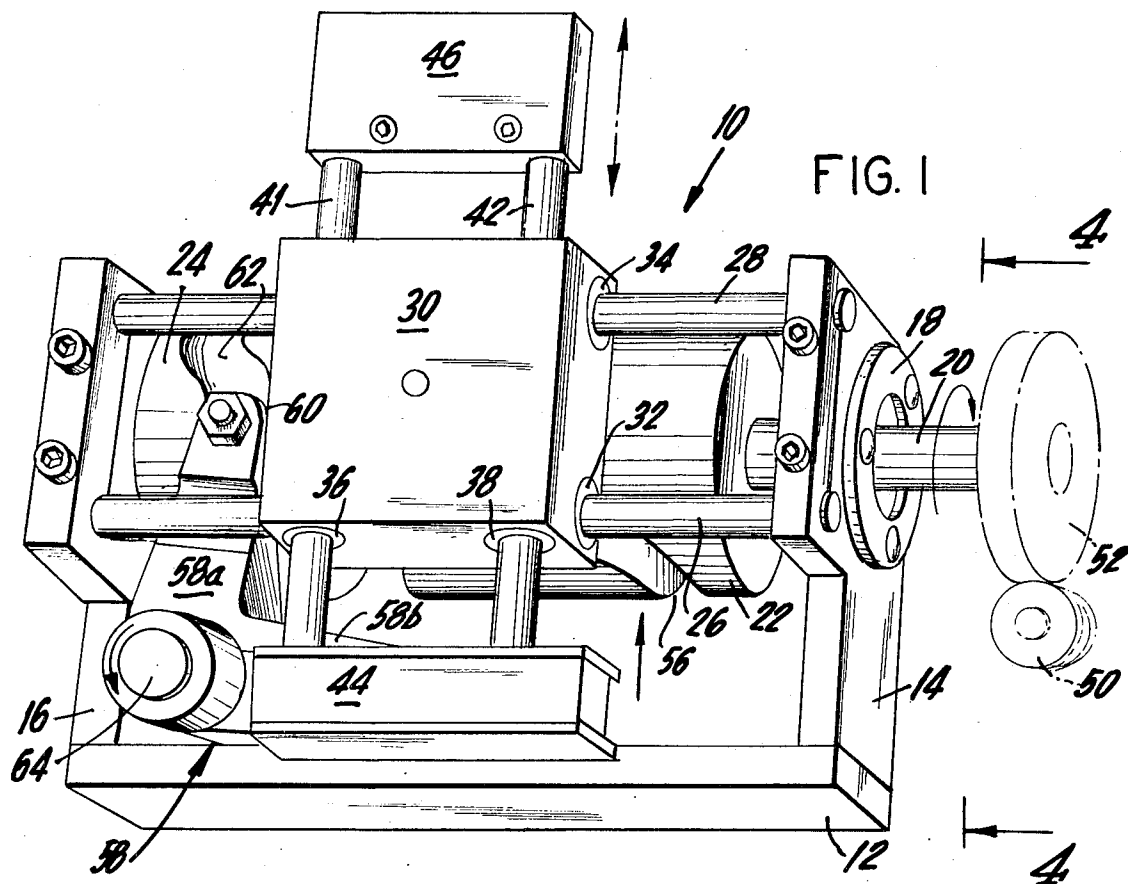
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[57] **ABSTRACT**

A device for transmitting accurate movements from a rotary input shaft to a movable end or top plate member or vice versa includes a longitudinal, (X-direction) guide for a movable block member which carries a follower which is engaged with a groove of a rotary cam and which also provides a slideway for a top plate or end plate member for movement in transverse (Y directions). The transverse movement is guided by a second cam mounted for rotation about the same axis as the first cam and which transmits the transverse movement to the transversely movable plate member through a rocker arm.

**12 Claims, 6 Drawing Figures**





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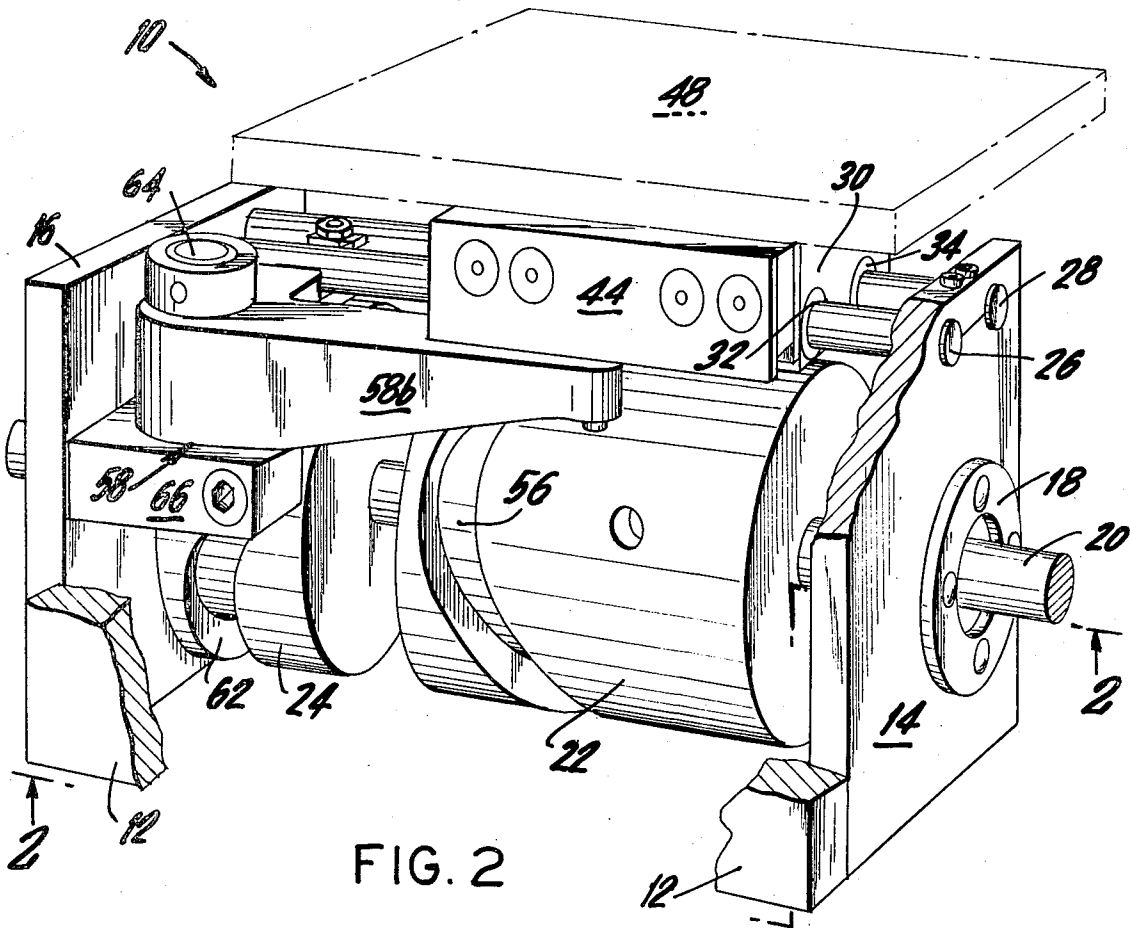


FIG. 2

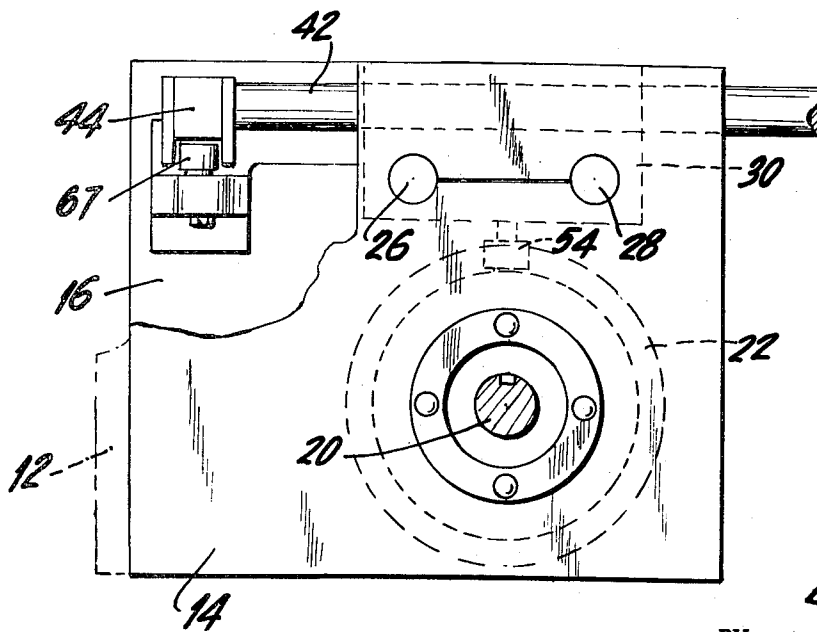


FIG. 4

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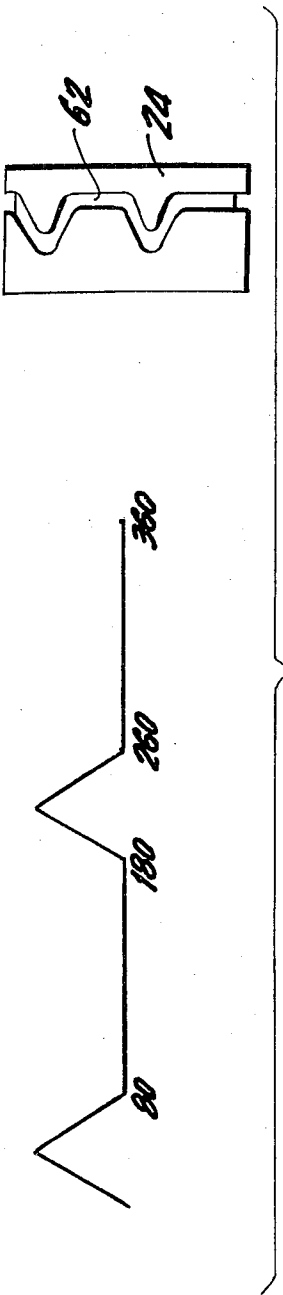


FIG. 5

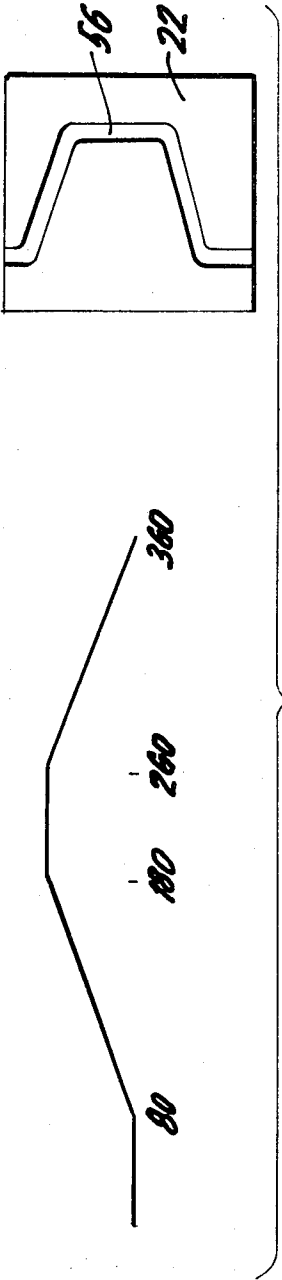


FIG. 6

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## DEVICE FOR TRANSMITTING CONTROL TRANSLATORY MOVEMENTS

### SUMMARY OF THE INVENTION

This invention relates in general to a motion transmitting device and, in particular, to a new and useful device for transmitting accurate translatable movements in a plane in both longitudinal and transverse directions through a rotary driving arrangement.

At the present time, machine parts are moved backwardly and forwardly on machine bases or supporting platforms on guideways which are formed with dovetail guides, plain sleeve bushings and similar arrangements. A disadvantage of devices of this nature is that these dovetail slideways and similar parts tend to jam or become subject to severe overloadings especially when the transmitting force is directed at large pressure angles. In addition, the known devices permit adjustment for accurate positioning in only a single movement direction of a plane and very complicated mechanisms must be interconnected in order to provide control movements in both longitudinal and transverse directions either intermittently or conjointly.

The present invention is an improvement over the prior art inasmuch as it provides a simple and compact mechanism for accurately positioning an end plate or top plate member in a single plane, but both in respect to longitudinal and transverse directions, in response to actuation of a rotatable drive which is rotating in a selected direction. The invention includes a compact guideway in the form of two longitudinally extending guide rods on which is mounted a longitudinally movable block member. A feature of the construction is that the block member includes anti-friction bearings arranged in one or more sleeves extending transversely therethrough, to provide a roller trackway for movement of a rod member of an end plate or top plate. Movement of the block member is controlled by a first cam and movement of the transversely movable member is controlled by a second cam and rocker arm connection so that the end plate or top plate may be accurately positioned in both longitudinal and transverse directions. The arrangement of the two cams and the connecting mechanism is such that the desired part may be accurately positioned in both X and Y-directions independently of each other or in a combined X and Y-positioning movement. Thus, a movement may be obtained in a plane having an infinite variety of motions continuous or sequential, step or intermittent. The motions for each direction are transmitted through a rotary cam for each direction, transverse (Y-direction) or longitudinal (X-direction). Both the block member and the transversely movable member are mounted for movement on rotatable anti-friction bearings so that the friction of the moving parts is reduced to a very small percentage of what it would be in respect to conventional slideways. This makes it possible to use cams having relatively large pressure angles and permits the reduction in size of the unit so that it may be made more compact.

Accordingly, it is an object of the invention to provide a device for accurately positioning one part in relation to another and for accurately transmitting from a rotary motion into a control motion in a single plane in both the longitudinal and transverse directions.

A further object of the invention is to provide a device for accurately positioning a member such as a machine part in respect to both longitudinal and transverse directions which includes a movable block member and a movable transverse member which are mounted on roller bearings for movement in X and Y-directions, respectively.

A further object of the invention is to provide a device for achieving a plurality of control transverse movements in a single plane and which is simple in design, rugged in construction, and economical to manufacture.

The various features of novelty which characterize the invention are pointed out with particularity in the claims annexed to and forming a part of this disclosure. For a better understanding of the invention, its operating advantages and specific objects attained by its uses, reference should be had to the accompanying drawing and descriptive manner in which there is illustrated a preferred embodiment of the invention.

### BRIEF DESCRIPTION OF THE DRAWING

In the Drawing:

FIG. 1 is a top plan view of a device for transmitting controlled translatable movements to a machine part constructed in accordance with the invention;

FIG. 2 is a front elevational view partly broken away of the mechanism indicated in FIG. 1;

FIG. 3 is a section taken along the line 2—2 of FIG. 1;

FIG. 4 is a section taken along the line 4—4 of FIG. 1;

FIGS. 5 and 6 are plans and developmental views of the respective operating cams for each direction of movement.

### GENERAL DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawing in particular, the invention embodied therein comprises, a positioning mechanism generally designated 10 which includes a side plate 12 fastened at each of its ends to an end plate 14 and an end plate 16, respectively. The end plates 14 and 16 carry rotatable ball bearing bushings 18 for rotatably supporting a drive shaft 20. The drive shaft 20 is rotated by a motor (not shown) and it carries a first cam or X-direction control cam 22 and a second cam or Y-direction control cam 24.

In accordance with the invention, the end frames 14 and 16 also provide supports for two spaced parallel rod members 26 and 28 which form longitudinal guideways for a block member 30. The block member 30 carries two ball bearing bushings 32 and 34 which advantageously have linearly acting ball bearings (not shown) which provide anti-friction support means for the movement of the block member 30 in a longitudinal direction along the guides 26 and 28. The block member 30 also carries two longitudinally spaced and transversely parallel ball bearing bushings 36 and 38 having recirculating ball bearings 40 for the anti-frictional guidance of transversely movable rod members 40 and 42. The rod members 40 and 42 are connected, for example, at each end to end members or end plates 44 and 46 or, for example, to a single top plate 48, as shown in dotted lines in FIG. 2.

One of the end plates 44 or 46, or both; or, the top plate 48, as the case may be, is guided in both an X and Y-direction and may be moved in a controlled manner in either the X or the Y-direction or a combination of both upon the rotation of the shaft 20 in one direction or the other. The shaft 20 is advantageously driven through a drive gear 50 and a driven gear 52 from a motor and it may be rotated in either direction as desired.

The X-direction, or longitudinal direction of movement, is effected under the control of the X-cam 22 which transmits a controlled X-movement through a cam follower 54, which is confined for movement in a groove 56 of the X-cam 22. Rotation of the cam 22 causes a backward and forward translation of the block member 30 along with the guide rods 40 and 42 and the associated end plates 44 and 46 in the X or longitudinal direction.

For the control of movement of the members 44 and 46 in the Y-direction, there is provided a rocker arm member generally designated 58 which includes an arm portion 58a having a roller follower 60, which is engaged in a groove 62 of the Y-cam 24. During rotation of the Y-cam 24. The arm 58a is moved backwardly and forwardly to cause a shifting movement of the arm portion 58b in a Y-direction and a corresponding movement of the end plates 44 and 46 or a top plate 48 connected over the end plates. The rocker arm 58 is rotatably mounted about a pin 64 which is journaled on a longitudinally extending block 66 carried on the end plate 16. The arm portion 58b has a roller 67 which is articulated to or pivoted to the end plate 44.

Both the X-cam 22 and the Y-cam 24 are affixed to the associated shaft 20 for rotation therewith and rotation of the shaft 20 therefore provides a combined X and Y-movement which may be in any manner as programmed by the respective cam grooves 56 in the X-cam 22 and 62 in the Y-cam 24.

The cam 22 and the cam 24 are shown in FIGS. 5 and 6 together with a development of the motion effected by the grooves 62 and 56, respectively. These FIGS. 5 and 6 give just one example of the type of motion which may be effected in either of the X or the Y-direction or in both directions at the same time in accordance with the pattern of the groove on the associated cam. These cams may control the movement in the X and Y-directions in a variety of manners. For example, the movements may comprise a so-called linear pick and place movement in which for example, the ends 44 and 46 or the table 48 may be moved in a Y-direction for picking up a part and in an X-direction where the part will be placed in position. The movement in either direction may be a "stop" motion where the movement in a particular direction "X" or "Y" is stopped while the motion in the other direction is carried out. The types of motions which may be effected may include, for example, so-called "walking beam," "hand-over-hand," any motion for performing operations on continuously moving products such as, chains, conveyors, strip feeds, etc., and any number of independent or combined motions in an X and Y-plane.

The inventive device provides means for combining to cam-operated anti-friction slides into an integral assembly. Due to the unique construction, a large variety of movement patterns may be obtained. By appropriate

timing and cam configurations, almost any motion in a plane may be obtained. The cams may be chosen to permit various standard sequences and strokes as desired.

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, second direction guide means carried on said first member extending at substantially right angles to said first direction guide means, a second member adapted to carry the movable machine part and movable to and fro on said second direction guide means, a first cam connected to said first member and being movable to move said first member along said first direction guide means, and a second cam connected to said second member and being movable to move said second member along said second direction guide means.

2. A motion transmitting device, according to claim 1, wherein said first direction guide means comprises a longitudinal guide means said second direction guide means comprising a transverse guide means.

3. A motion transmitting device, according to claim 1, wherein said first and second cams are drum cams and means mounting said drum cams for rotation.

4. A motion transmitting device, according to claim 1, including a rotatable shaft, said first and second cams being mounted on said shaft for rotation therewith.

5. A motion transmitting device, according to claim 1, wherein said first member comprises a block having a follower extending outwardly therefrom said first cam having a groove engaged by said follower.

6. A motion transmitting device comprising a mounting frame, at least one longitudinally extending rod mounted on said frame, a bearing block having first bearing means around said rod member and being movable along said rod member, said bearing block having a second bearing means defining a guide path extending at an angle to said rod member, at least one second rod member carried in said second bearing means and being movable to and fro in directions at an angle to said rod member, at least one member carried by said rod member and adapted to carry a movable machine part, a rotatable shaft mounted in said frame adjacent said block, first and second cams carried on said shaft for rotation therewith each having a groove defined therein, said block having a first follower engaged in the groove of said first cam, a crank arm pivotally mounted adjacent said second cam and having a first arm with a follower therein engaged in the groove of said second cam and having a second arm portion connected to said second rod member for shifting said rod member to and fro upon rotation of said cam.

7. 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, second direction guide means carried on said first member extending at substantially right angles to said first direction guide means, a second member adapted to carry the movable machine part and movable to and fro on said second direction guide means, a first cam connected to said first member and being movable to move said first member along said first direction guide means, and a second cam connected to said second member and being movable to move said second member along said second direction guide means, and a rocker arm pivotally mounted adjacent said second cam and having a first arm portion with a follower guided by said second cam and a second arm portion connected to said second member.

8. A motion transmitting device comprising a mounting frame, at least one longitudinally extending rod mounted on said frame, a bearing block having first bearing means around said rod member and being movable along said rod member, said bearing block having a second bearing means defining a guide path extending at an angle to said rod member, at least one second rod member carried in said second bearing means and being movable to and fro in directions at an angle to said rod member, at least one member carried by said rod member and adapted to carry a movable machine part, a rotatable shaft mounted in said frame adjacent said block, first and second cams carried on said shaft for rotation therewith each having a groove defined therein, said block having a first follower engaged in the groove of said first cam, a crank arm pivotally mounted adjacent said second cam and having a first arm with a follower therein engaged in the groove of said second cam and having a second arm portion connected to said second rod member for shifting said rod member to and fro upon rotation of said cam, said second bearing means comprising roller bearings.

9. A motion transmitting device comprising a mounting frame, at least one longitudinally extending rod mounted on said frame, a bearing block having first bearing means around said rod member and being movable along said rod member, said bearing block having a second bearing means defining a guide path extending at an angle to said rod member, at least one second rod member carried in said second bearing means and being movable to and fro in directions at an angle to said rod member, at least one member carried by said rod member and adapted to carry a movable machine part, a rotatable shaft mounted in said frame adjacent said block, first and second cams carried on said shaft for rotation therewith each having a groove defined therein, said block having a first follower engaged in the groove of said first cam, a crank arm pivotally mounted adjacent said second cam and hav-

ing a first arm with a follower therein engaged in the groove of said second cam and having a second arm portion connected to said second rod member for shifting said rod member to and fro upon rotation of said cam, each of said cams being drum cams.

10. A motion transmitting device comprising a mounting frame, at least one longitudinally extending rod mounted on said frame, a bearing block having first bearing means around said rod member and being movable along said rod member, said bearing block having a second bearing means defining a guide path extending at an angle to said rod member, at least one second rod member carried in said second bearing means and being movable to and fro in directions at an angle to said rod member, at least one member carried by said rod member and adapted to carry a movable machine part, a rotatable shaft mounted in said frame adjacent said block, first and second cams carried on said shaft for rotation therewith each having a groove defined therein, said block having a first follower engaged in the groove of said first cam, a crank arm pivotally mounted adjacent said second cam and having a first arm with a follower therein engaged in the groove of said second cam and having a second arm portion connected to said second rod member for shifting said rod member to and fro upon rotation of said cam, at least two transversely spaced parallel first rod members and at least longitudinally spaced and parallel second rod members, said block having a first set of first and second bearings arranged in parallel for engagement with said first rod members, and a second set of first and second bearings longitudinally spaced apart and transversely parallel for said second rod members.

11. A motion transmitting device, comprising a first guide bar, a first member mounted on said guide bar for movement backwardly and forwardly therealong, a second guide bar mounted on said first member and being movable backwardly and forwardly relative to said first member at an angle to said first guide bar, a first cam connected to said first member and being movable to move said first member along said first guide bar, and a second cam connected to said second guide bar and being movable to move said second guide bar relative to said first member.

12. A motion transmitting device, according to claim 11, particularly for positioning one machine part in relation to another, said second guide bar having a second member adapted to carry a movable machine part adjacent one end thereof and having a slideway adjacent the opposite end, a rocker arm pivotally mounted adjacent said second cam and having a first arm portion with a follower guided by said second cam and a second arm portion engageable in said slideway and adapted to move said slideway to move said second rod relative to said first member.

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