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2,493,420

CAM MECHANISM FOR VARIABLE LENGTH THROW

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2 Sheets-Sheet 1

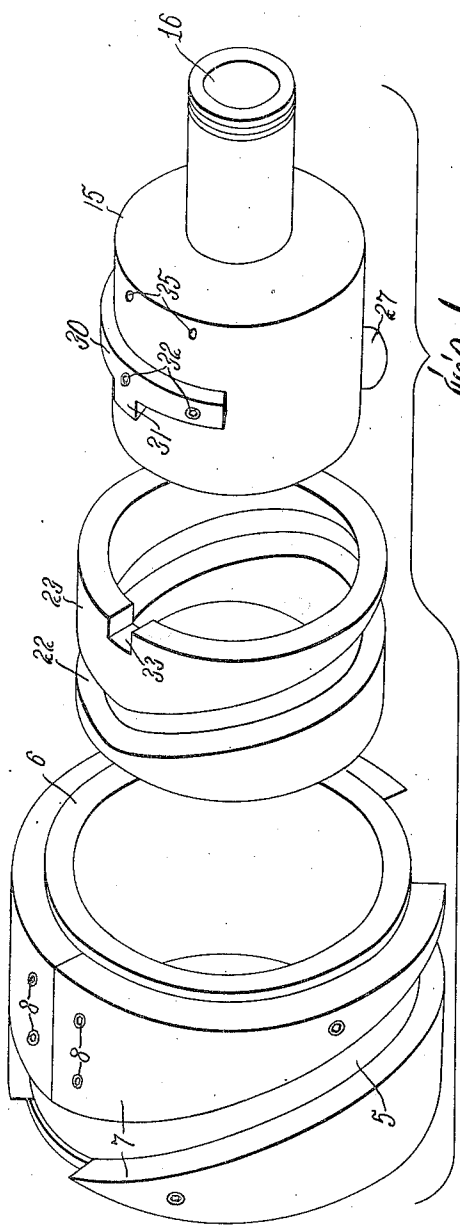


Fig. 3.

Fig. 1.

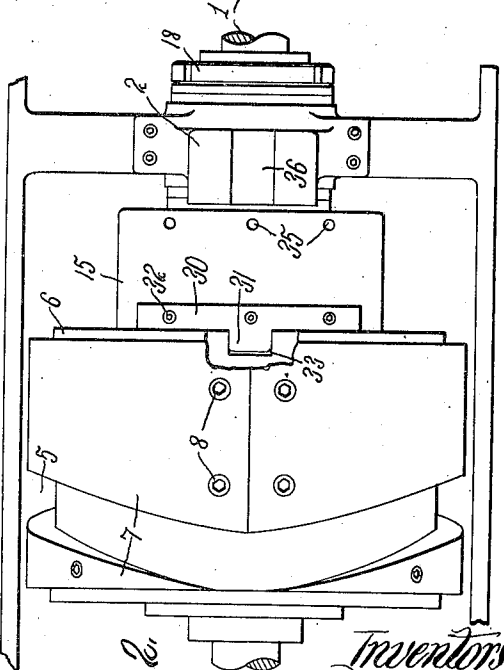
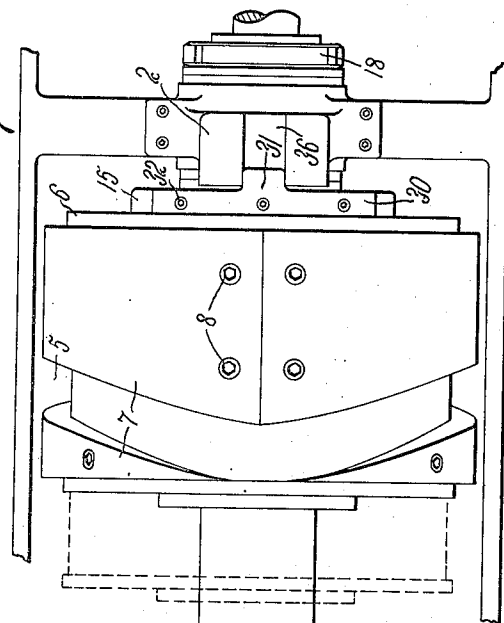


Fig. 2.

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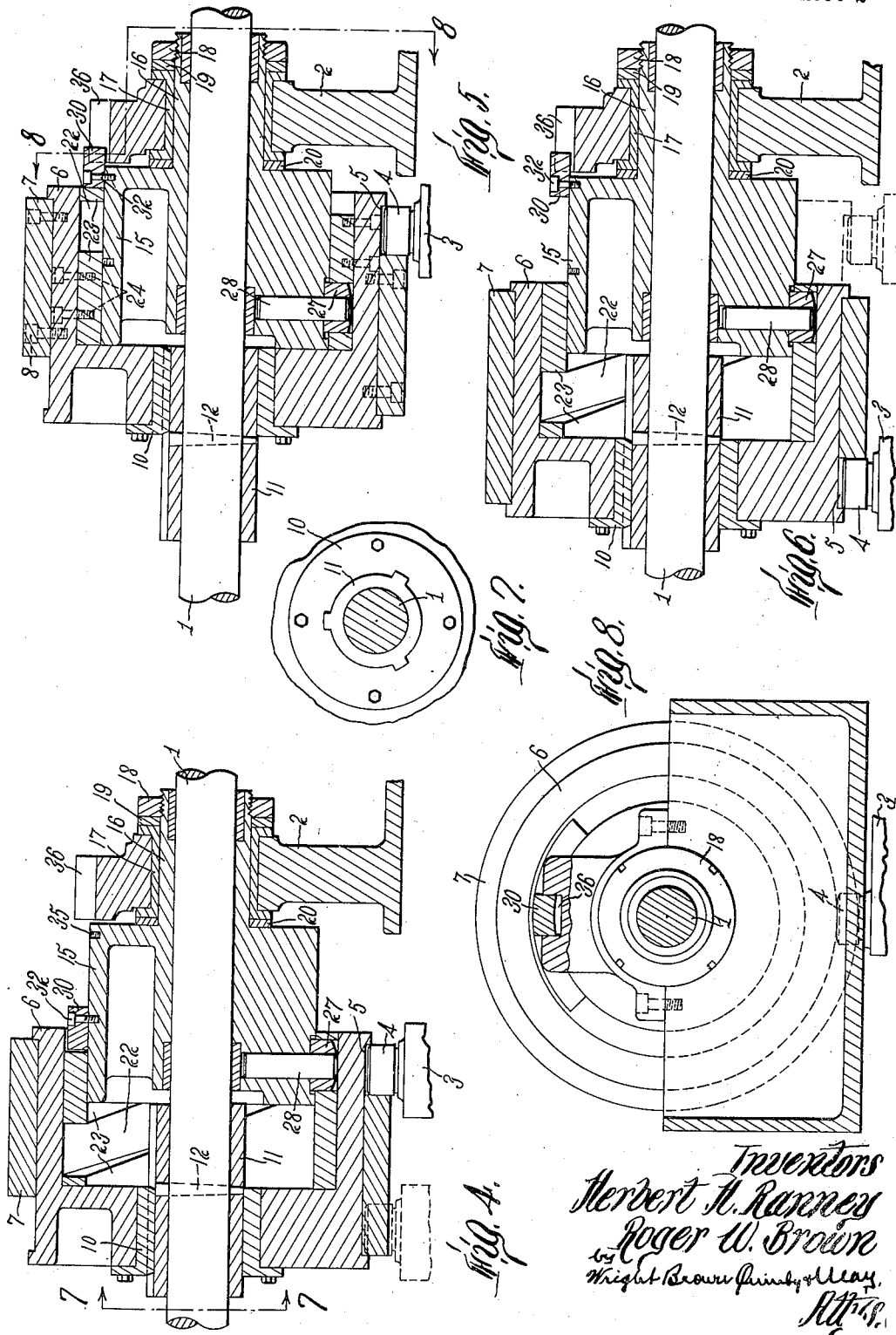
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2 Sheets-Sheet 2



UNITED STATES PATENT OFFICE

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CAM MECHANISM FOR VARIABLE LENGTH
THROW

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5 Claims. (Cl. 74-57)

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This invention relates to cam mechanism and more particularly to such mechanism particularly adapted to actuate a tool slide or carriage, and it has for an object to provide such a mechanism readily adjustable to produce selectively motion of either of a pair of amplitudes. This is particularly advantageous in the actuation of tool slides to provide for operation on work pieces which differ substantially in length as it makes possible the changing of the stroke without requiring removal and replacement of actuating cams.

With a single barrel type of cam acting upon a follower the motion obtainable for a small rotation of the cam is limited by the acceptable pressure angle of contact against the follower by the cam. This is a real and limiting factor in cam design when it is desirable to produce a multiplicity of actions in 360° of drum rotation.

This invention has for a further object, therefore, to provide mechanical means making possible a greater axial carriage movement from a small rotation of cam drums arranged in complementary action than would be possible with a single cam drum operating at an equal angle of pressure.

For a complete understanding of this invention, reference may be had to the accompanying drawings in which

Figure 1 is an exploded perspective view of certain of the cam mechanism parts.

Figures 2 and 3 are fragmentary top plan views showing the mechanism applied to the cam shaft of a multiple spindle lathe of well known type, the parts being arranged for short and long strokes of the tool carriage, respectively.

Figure 4 is a central longitudinal sectional view through the cam mechanism adjusted for short throw and with the follower carriage shown in full and dotted lines at its limits of throw.

Figure 5 is a view similar to Figure 4, but showing the follower carriage in full lines at the opposite limit of its throw.

Figure 6 is a view similar to Figure 4, but with the parts adjusted to produce a long throw, the extent of throw of the carriage being shown in full and dotted lines.

Figure 7 is a detail sectional view on line 7-7 of Figure 4.

Figure 8 is a detail sectional view on line 8-8 of Figure 5.

Referring to the drawings, at 1 is shown a rotary shaft mounted in suitable stationary bearings, one of which is indicated at 2. This shaft, as shown, is the cam shaft of a multiple

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spindle lathe of the well known Cone type, this cam shaft, as is well known in the art, carrying along its length various cam-carrying drums for actuating various parts of the machine and determining the cycle of operations. At 3 in Figures 4, 5, 6 and 8 is shown a portion of a tool slide or carriage arranged to be moved lengthwise of the axis of the cam shaft, this slide carrying various end working tools for operating on work carried by a plurality of rotary spindles arranged in circular array in an indexing carrier (not shown) arranged parallel to the axis of the cam shaft 1. This carriage 3 carries a cam follower 4 which rides in a cam path 5 on a drum 6. As shown one or both sides of the cam path may be formed by curved cam plates 7 which may be bolted to the periphery of the drum 6 as by the bolts 8 (see Figures 2 and 3). The cam drum 6 is fixed to a sleeve 10 keyed to a sleeve 11, which, in turn, is pinned to the shaft 1 as by the taper pin 12. The drum 6 is thus mounted for axial motion along the shaft 1, but is held against relative angular motion with respect thereto.

A second cam drum 15 is also carried by the shaft 1, but this cam drum 15 is journaled for rotation thereon but is held against axial motion. The means for retaining it in axially fixed position comprises a small diameter extension 16 which is journaled within a bushing 17 in the bearing 2, and which carries threaded on its outer end an adjusting nut 18 bearing against a washer 19 engaging the outer end of the bushing 17. A second washer 20 is interposed between the drum 15 and the bearing bushing 17. The drum 15 is thus held against axial motion relative to the shaft 1 by being so held with reference to the bearing 2.

The drums 6 and 15 have their adjacent ends in telescopic relation, the drum 15 being of smaller external diameter than the interior diameter of the drum 6, the adjacent end of which is formed tubular. The drums 6 and 15 are connected together by cam mechanism so that by relative rotation of these drums, the drum 6 may be given an axial motion relative to the shaft 1. As shown this cam mechanism comprises an internal cam path 22 on the inner face of the drum 6 and which may be formed by cam plates 23 on opposite sides secured to the inside face of the drum 6 as by the bolts 24. Riding in this cam path is a follower roll 27 journaled on a pin 28 fixed in the cam drum 15. With this construction it will be evident that relative rotation of the cam drums 6 and 15 will cause the cam drum 6

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to be moved forwardly and backwardly axially as the follower 27 rides in the cam groove 22.

Means are provided by which, at will, the cam drum 15 may be held stationary during the rotation of the shaft 1 so that as the shaft 1 is rotated, the cam drum 6 will be rotated relative to the cam drum 15 and thus be given in addition to its rotary motion, the axial motion produced by the traverse of the cam groove 22 by the follower 27, or if desired, the cam drums 15 and 6 may be locked together for simultaneous rotation, in which event there is no relative rotation between these two drums so that they rotate as a unit and there is no axial motion of the cam drum 6. This means comprises an arcuate key 30 having a key projection 31. This key 30 may be fixed in the position shown in Figure 2 to the cam drum 15, as by screws 32, with the key projection 31 engaging in a slot 33 in the adjacent end of the drum 6, as, for example, cut in the edge of one of the cam plates 23. The throw of the carriage is thus produced entirely by the throw of the external cam path 5, the total throw being then shown by the full and dotted line positions of the follower 5 shown in Figure 4. This key 30 may removed from this position, reversed end for end, and secured to the cam drum 15 adjacent to its outer end close to the fixed bearing 2, this position of the parts being shown in Figure 3, the screws 32 being then engaged in the holes 35 of the drum 15. In this position of the parts, the key projection 31 engages in a slot 36 in the upper face of the bearing 2. With this arrangement the drum 15 is held against rotation with the shaft 1, so that as the shaft 1 rotates and rotates the drum 6, the drum 6 is caused to move axially because of its cam connection with the drum 15, this cam connection now being operative. The result is that the throw of the carriage 3 is increased to the summation of the throw due to the shape of the external cam path 5 and the internal cam path 22, the extent of this throw being shown by the full and dotted line positions of the carriage 3 shown in Figure 6.

From the foregoing description of an embodiment of this invention it will be evident to those skilled in the art that various changes and modifications might be made without departing from the spirit or scope of this invention.

We claim:

1. In combination, a rotary shaft, a pair of cam elements arranged concentrically on said shaft, one of said elements having a cam path and the other of said elements having a follower riding in said path, a fixed member adjacent to one of said elements, means for selectively coupling said one element to said member or to said other element, said other element being keyed to rotate with said shaft and having a driving cam path, and a follower engaging in said driving cam path.

2. In combination, a rotary shaft, a carriage movable parallel to said shaft, a follower carried

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by said carriage, a pair of cam elements on said shaft one having a cam path for cooperation with said follower and being keyed for motion axially relative to said shaft, the other of said cam elements being journaled on said shaft and having cam and follower connection to said one cam element a fixed member and means for selectively coupling the other of said cam elements to said one element to rotate therewith or for securing said other cam element to said fixed member.

3. In combination with a rotary shaft, a pair of cam drums on said shaft, one of said drums being movable axially relative to said shaft and keyed against rotation with respect thereto, a carriage movable lengthwise of said shaft, a cam follower on said carriage, a cam path on said one drum cooperating with said follower whereby rotation of said one drum moves said carriage, said drums having cooperating cam and follower mechanism causing motion of said one drum axially of said shaft on relative rotation between said drums, a fixed member and means for selectively coupling said other drum to said one drum to rotate therewith or for securing said other drum to said fixed member.

4. In combination, a rotary shaft, a pair of drums mounted on said shaft one for axial and nonrotary motion relative to said shaft, and the other for relative rotation and axially fixed with reference to said shaft, one of said drums being telescopically related to the other of said drums and having cam and follower connections therewith causing a relative rotation of said drums to move said one drum axially, said one drum having a peripheral cam path, a movable carriage, a follower on said carriage engageable with said cam, a fixed member and means for selectively coupling said drums together for simultaneous rotation or for holding said rotarily mounted drum to said fixed member against rotation.

5. In combination, a rotary shaft, a pair of telescopically related drums carried by said shaft, one of said drums being keyed for rotation and axially movable on said shaft, the other of said drums being journaled on said shaft and retained against axial motion, the outer of said drums having an internal cam path and the inner of said drums having a follower engaging in said cam path, whereby relative rotation between said drums causes axial motion of said axially movable drum, said outer drum having an external cam path, a carriage movable lengthwise of the axis of said shaft and having a follower engageable in said external cam path, a fixed member adjacent to one end of said journaled drum, and key means for selectively connecting said drums together for simultaneous rotation or for coupling said journaled drum to said fixed member.

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No references cited.