

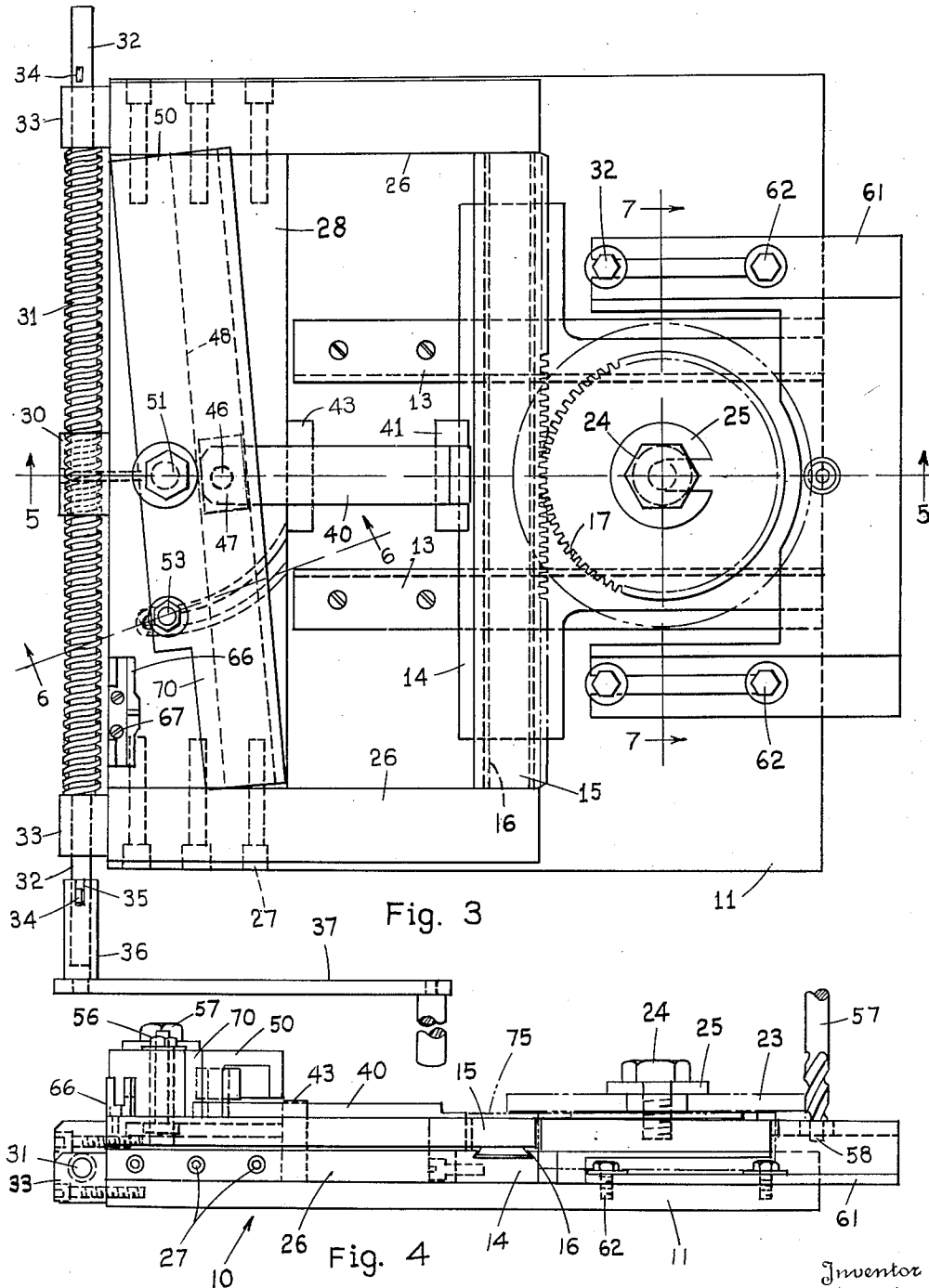
May 16, 1950

J. A. SHEPHARD
CAM FORMING ATTACHMENT

2,507,547

Filed Sept. 16, 1946

3 Sheets-Sheet 2



Inventor
James A. Shephard

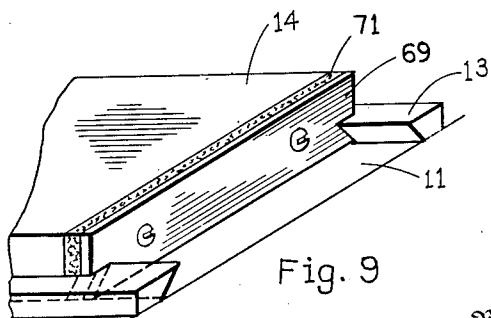
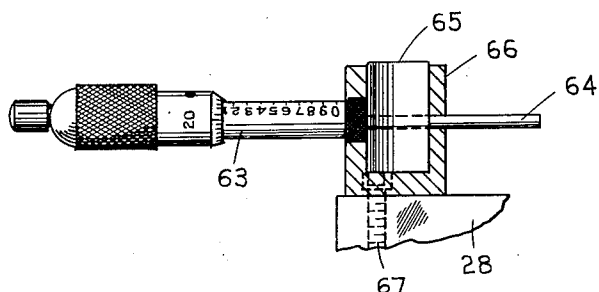
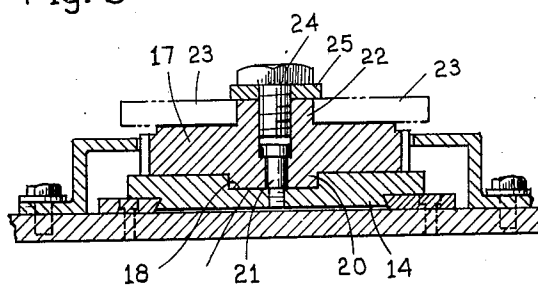
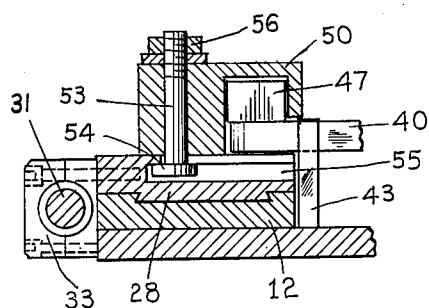
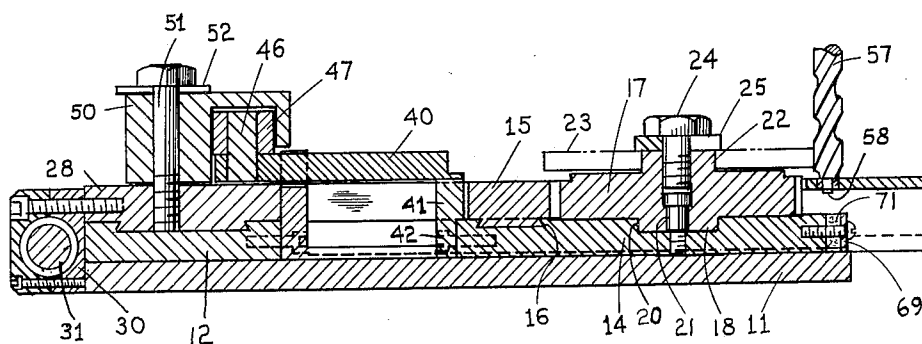
McAfee

Attorney

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M. Hayes

Attorney

UNITED STATES PATENT OFFICE

2,507,547

CAM FORMING ATTACHMENT

James A. Shephard, Wickford, R. I.

Application September 16, 1946, Serial No. 697,168

2 Claims. (Cl. 90—13.9)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

1

This invention relates to a cam forming attachment and has for an object to provide a cam forming attachment which may be used for making cams of any nature.

The reason for creating this device is to have an economical cam forming attachment to use on a drill press or similar usually available machine. This would require less time and skill to set up and operate than a milling machine, with an offset vertical milling attachment and a geared index head, in milling cams for Brown & Sharpe automatic screw machines. Ordinarily, there is but one such milling machine and attachments to a shop because of their cost. Since they are used on other work, they are not always available for milling cams.

The attachment of this invention can be easily carried about and stored when not in use. It can also be used on a grinding machine to grind cams after being hardened. It can be adapted to any use where an infinitely selectable lead is required, such as in drafting instruments, thread or spiral cutting machines and machines transforming straight forms to circular.

With the foregoing and other objects in view, the invention consists in the construction, combination and arrangement of parts hereinafter described and illustrated in the drawings:

Fig. 1 is a perspective view of the cam forming attachment of this invention, partly broken away.

Fig. 2 is a perspective view from the opposite edge of Fig. 1, of the device mounted on a drill press bed with a piece of work in position thereon.

Fig. 3 is a top plan view, partly X-rayed.

Fig. 4 is a side edge view of Fig. 3.

Figs. 5, 6 and 7 are sectional views on lines 5—5, 6—6, 7—7 of Fig. 3.

Fig. 8 is a fragmentary view showing the micrometer and its supporting bracket and

Fig. 9 is fragmentary perspective view of the oiler and chip guard for the slideway.

There is shown at 10 the cam forming attachment of this invention. This attachment cam-forming device includes a base plate 11 on which are secured slideways 12 and 13, the slideway 12 being in one piece and extending across the back while the slideway 13 consists of two separate under-cut trackways extending at right angles forwardly from adjacent the center of slideway 12 and to the front edge of the base plate 11. Mounted on these slideways 12 and 13 are the carriers 28 and 14.

The carrier 14 contains a gear rack 15 in a slideway 16 formed in the carrier 14 and a ro-

2

table gear 17 meshed with the rack 15. Gear 17 has a depending annulus 18 rotatable in a journal 29 formed in the carrier 14 to which it is pivotally secured by a counter-sunk screw 21 extending through the center thereof.

The upper side of the gear 17 is provided with a raised annulus 22 of a diameter to cooperate with an opening through a work piece 23 securable thereto by a stud screw 24 and U-washer 25 by means of which the work piece 23 may be detachably secured to the gear 17 so as to partake of the rotation thereof. The rack 15 is given transverse motion in its slideway 16 by two extending arms 26 slidably abutting each end thereof. The arms 26 are secured by stud screws 27 to the ends of the carrier 28 which is mounted in the first mentioned slideway 12.

The carrier 28 is movable along its slideway 12 by means of a nut 30 secured thereto and screw 31 extending through this nut 30 and having a bearing neck 32 at each end thereof extending through journals 33 secured to the ends of the back of the base plates 11. Each bearing neck 32 is provided with an upstanding pin 34 for co-operation with counter-sunk slots 35 of a sleeve 36 forming part of a hand crank 37. Hand crank 37 can thus be placed in operative position on either end of the screw 31. As will be apparent, rotation of the hand crank 37 through the screw 31, the carrier 28 and its arms 26 will cause movement of the rack 15 in its slideway 16 on the carrier 14, thus rotating gear 17 and workpiece 23.

The rack and gear carrier 14 is mounted in the slideway 13 for motion over the base 11 at right angles to the motion of the carrier 28. To control this motion of the carrier 14, there is provided a bridge piece 40 extending from a block 41 secured to the carrier 14 by means of the screws 42.

The bridge piece 40 extends through the upstanding fingers 43 of a guide block 44, the guide block 44 being secured by screws 45 to the slideway 12 and thus to the base plate 11. The bridge piece ends in an upstanding bearing finger 46 on which is journaled a shoe 47. This shoe 47 travels in an inverted trackway 48 formed in a lead bar 50 pivotally secured by means of the stud bolt 51 and washer 52 to the carrier 28.

A second bolt 53 extends through a second opening bolt aperture through the lead bar 50 and has a head 54 movable in an arcuate countersunk slot 55 formed in carrier 28, the arcuate slot 55 being an arc about the center of the first bolt 51. A nut 56 provides means for tight-

ening the lead bar 50 at any adjusted angle to its carrier 28. The arcuate slot 55 is such as to permit the lead bar 50 to be fixed in a position parallel to the slideway 12 to its carrier 28 or at a desired limited angle thereto. When the lead bar is at any angle to slideway 12, it will be apparent that rotation of the hand crank 37 will cause this lead bar 50 to ride over the shoe 47 and cause the bridge piece 40 to move the carrier 14 and its parts along the slideway 13 at right angles to the movement of the carrier 28. It will, hence, be apparent that rotation of the screw 31 will rotate the gear 17 through its rack 15, and when the lead bar 50 is at any angle, its slideway 12 will also cause the gear 17 to be moved along the slideway 13 and at right angles through the slideway 12, thus causing the work piece 23 mounted thereon to be given a controlled rotary as well as translatory motion against a milling cutter 57 having a projecting finger 58 receivable in a guide race 60 journaled in a bracket 61 adjustably mounted by means of screws 62 on the base plate 11. By appropriately fixing the angle of the lead bar 50, a desired spiral can thus be cut into the edge of the work piece 23.

In order to accurately set the angle of the lead bar 50 so as to accurately provide the desired cut in the work piece, there is provided a micrometer 63 having a measuring finger 64 extending through a cross block 65. A micrometer bracket 66 is secured to the carrier 28 by screws 67. This bracket 66 has upstanding walls between which the micrometer block 65 may be inserted with the micrometer 63 extending to one side thereof and the micrometer measuring finger 64 extending to the other side to contact the recessed wall 70 of the lead bar 50. When the micrometer has been appropriately set, the lead bar 50 is rotated about its pivot bolt 53 until its recessed wall 70 contacts the end of the micrometer measuring finger 64 and then the nut 56 is tightened to lock it in place. The micrometer may be appropriately graduated so as to give a direct reading. However, conventional graduation of a micrometer may be used. The following formula should be used when setting the micrometer having the conventional graduations:

$$\frac{\text{Rise} \times 100}{\text{No. spaces} \times 2} = \text{Micrometer reading}$$

The rise is the difference in measurement from the center of the cam to its circumference at the beginning and ending of any lobe. In order to coincide with the markings on the dog carriers of B. & S. machines, cams are divided into 100 parts or spaces. If instead one were to use degrees, the formula would read as follows:

$$\frac{\text{Rise} \times 360}{\text{No. degrees} \times 2} = \text{Mic. reading}$$

The entire formula is based on the relation between one complete turn of the cam 23 being cut, and the distance the inclined guide bar 50 (or any other means of moving the cam into or away from the cutter) travels, during that one complete turn of the cam 23, and the proportion of that travel of the guide bar 50 (or other means) at which the micrometer finger 64 is located from the point of pivot 51 of the guide bar 50.

In this construction of attachment the formula is based on the relation of the length of the pitch circle of the gear 17 moved by the rack 15 (the pitch circle being the same length as the travel of the guide bar), and the distance, in a parallel

line, to the rack 15, from the point of pivot 51 of the guide bar 50 to the point of contact of the micrometer finger 64 and guide bar 50, that point of contact being made by the micrometer 63 mounted at right angle to a parallel line to the rack 15, and a line running through the center of point of pivot 51 and parallel to the guide way of the guide bar. In this attachment it is $\frac{1}{2}$ the circular pitch, so, therefore, the formula reads:

$$\frac{\text{Rise} \times 100}{\text{No. spaces} \times 2} = \text{Mic. reading}$$

Example: A lobe with $\frac{1}{2}$ inch rise in 25 spaces.

$$\frac{.500 \times 100}{25 \times 2} = 1.000 \text{ Mic. reading}$$

The micrometer 63 is a standard type graduated in .001 of an inch.

A lip guard 69 and an oiler pad 71 appropriately shaped is attached to the end of the carrier 14 to protect the slideway 13 from the milling cuttings, while a sheet metal guard 75, shown in dot-dash in Fig. 1, protects the teeth of gear 17 and rack 15 from the cuttings.

In operation, the cam forming attachment 10 of this invention may be attached to the bed 72 of a drill press or similar available machine by the usual attaching bolts 73 and fingers 74. Before fastening the nut 73, however, the lead bar 50 will be set at the appropriate angle by means of the micrometer 63, as above described, and the milling cutter 57 will be mounted for rotation by the drill press and will have its finger 58 in the guide race 60. The work piece 23 previously roughed out as much as desirable in any conventional manner, is fastened in position by the stud 24 and U washer 25. Then with the milling cutter being rotated by the drill press the hand crank 37 will be slowly rotated, and through actuation of the nut 30, the carrier 28, the rack 15 and the gear 17, the work piece 23 will be caused to rotate simultaneously as it moves against the rotating milling cutter 57 thus forming the desired cam lobe in the work piece. By appropriate setting of the lead bar any desired cams or lobes may be formed, reverse lobes, of course, being formed by merely turning the work piece upside down. After the cam has been cut, it will be finished or hardened in the usual manner.

Other modifications and changes in the number and arrangement of the parts may be made by those skilled in the art without departing from the nature of this invention within the scope of what is hereinafter claimed.

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

What is claimed is:

1. A cam forming device comprising a work piece mounting apparatus comprising means for rotating the work piece and for translating the work piece simultaneously, said means including a base plate, a pair of slideways on said base plate at right angles to each other, a carrier slidably supported in each slideway, a work piece carrying gear journaled on one carrier, a rack meshed with said gear, a third slideway slidably supporting said rack on said gear carrier, means extending from the other carrier and slidably engaging said rack, an angularly adjustable lead bar pivotally secured on said other carrier, a bridge piece extending from said gear and rack carrier, a trackway in said lead bar cooperating with said

5

bridge piece, and means for translating said lead bar carrier.

2. A cam forming device comprising a work piece mounting apparatus comprising means for rotating the work piece and for translating the work piece simultaneously, said means including a base, a pair of tracks on said base forming a T to each other, a carrier slidably supported in each track, a work piece carrying gear journaled on one carrier, a rack meshed with said gear, a slideway on said gear carrier, said rack being mounted in said slideway, arms extending from the other carrier and slidably abutting both ends of said rack, an angularly adjustable lead bar on said other carrier, a bridge piece extending from said gear and rack carrier, an inverted trackway

6

in said lead bar cooperating with said bridge piece, and means for translating said lead bar carrier over said bridge piece.

JAMES A. SHEPHARD.

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