July 3, 1945. C. WEIDAUER ET AL 2,379,771

CAM ASSEMBLY

Filed Nov. 13, 1942 3 Sheets-Sheet 1

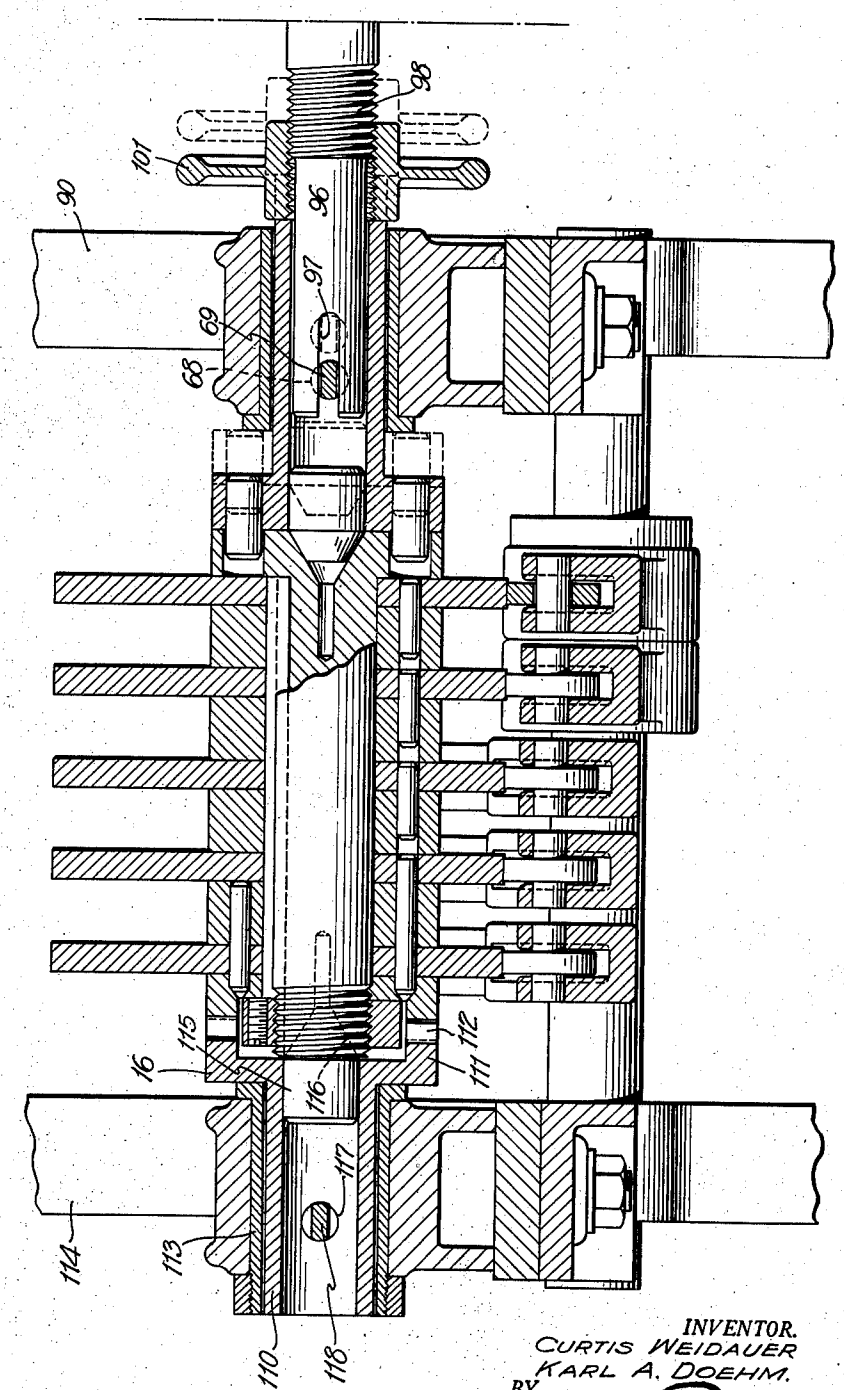


FIG. 1.

INVENTOR.
CURTIS WEIDAUER
KARL A. DOEHM.
BY
Ely & Pattison
ATTORNEYS.

WITNESS:

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CAM ASSEMBLY

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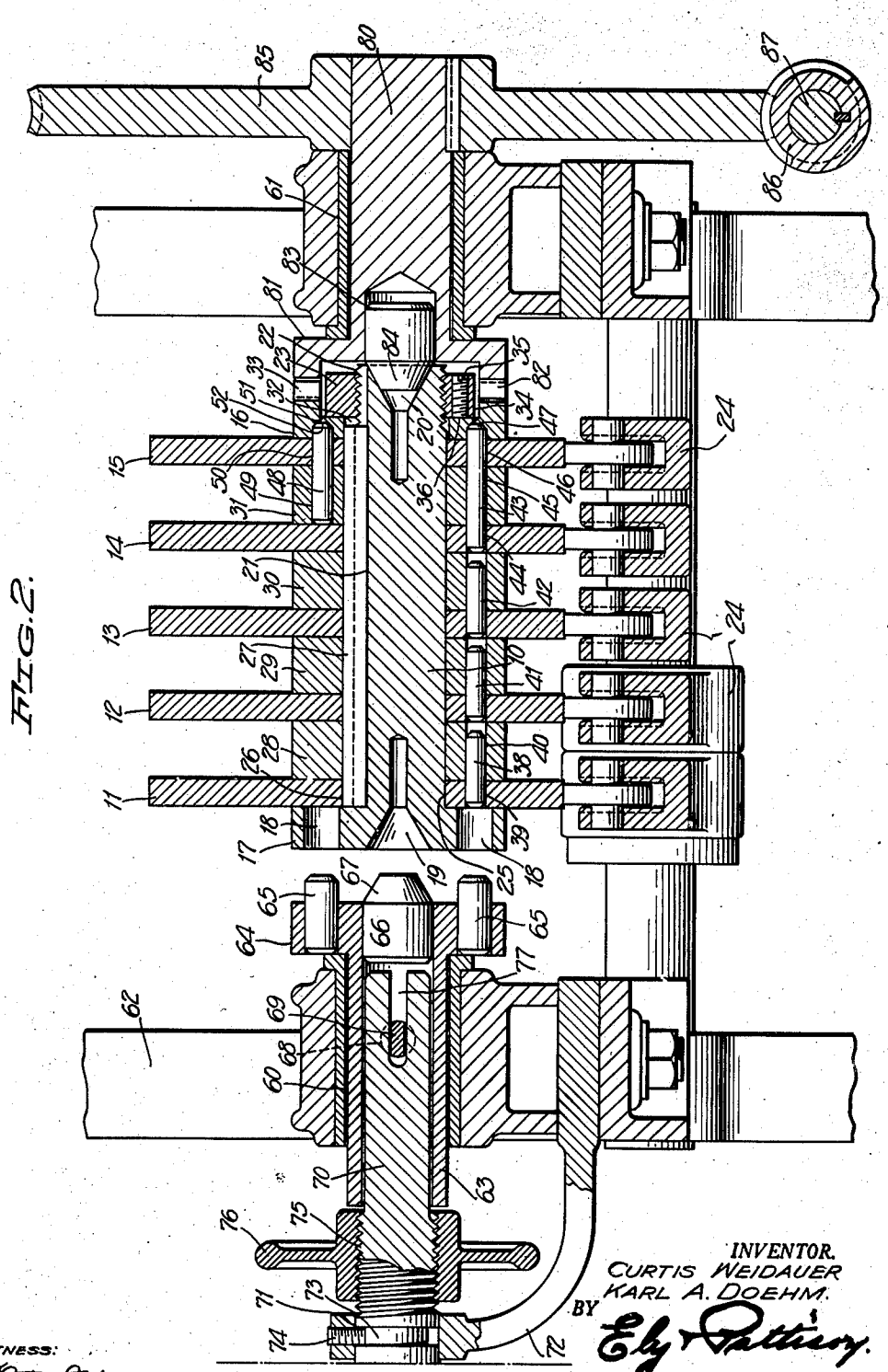


FIG. 2.

WITNESS:

INVENTOR.
CURTIS WEIDAUER
KARL A. DOEHM.
BY Ely & Pattison.
ATTORNEYS.

July 3, 1945. C. WEIDAUER ET AL 2,379,771

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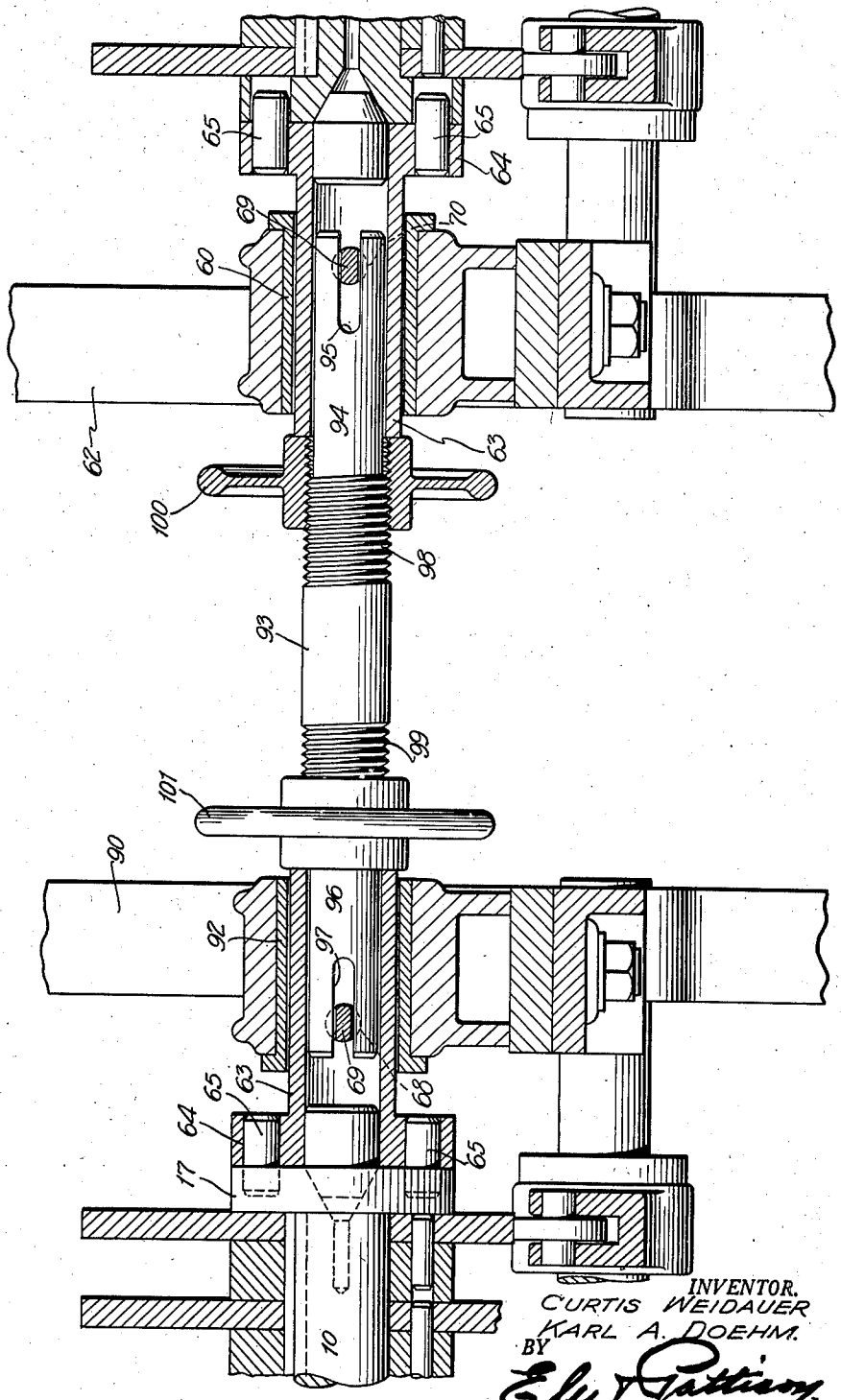


FIG. 3.

WITNESS:

INVENTOR.
CURTIS WEIDAUER
KARL A. DOEHM.
BY
Ely & Pattison
ATTORNEYS.

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UNITED STATES PATENT OFFICE

2,379,771

CAM ASSEMBLY

Curtis Weidauer, Manhasset, N. Y., and Karl A. Doehm, West New York, N. J., assignors to Samuel Briskman, New York, N. Y.

Application November 13, 1942, Serial No. 465,478

2 Claims. (Cl. 74—567)

The present invention relates to new and useful improvements in cam mechanisms and more particularly it pertains to a new and novel cam assembly.

The invention provides a novel construction whereby a plurality of cams may be removably mounted upon a shaft thus, rendering any one cam, or any set of cams readily replaceable by other cams or sets of cams as desired.

The invention also provides a construction by means of which a set of cams, including the shaft upon which they are mounted, may be so mounted in a machine as to be bodily removable therefrom, as a unit, without disturbing any of the elements of the cam unit.

The invention also provides a novel construction whereby two or more cam units may be operatively connected together and simultaneously driven merely by driving one of the cam units.

The construction has particular advantage for use in connection with automatic machines of the type illustrated in our co-pending application, filed November 27, 1941, for Automatic machine, Serial No. 420,660, in which a plurality of tools are moved into engagement with the work operated upon by a mechanism controlled by cams, there being a control cam for each of the tools.

In such a machine, as the type of work to be accomplished thereby, varies, the operation of the tools varies and obviously the control cams of the tools will also vary.

The present invention provides control cams in the form of cam units which may be removed as such and stored for future use.

Furthermore, the invention provides a novel construction whereby individual cams of a cam unit may be removed and replaced at will, by other cams.

Throughout the following specification and claims, the terms cam assembly and cam units have been employed and it is to be understood that the former, has been used to describe two or more cam units, while the latter term has been applied to several cams and the component parts which are collectively united to form the cam unit.

In the accompanying drawings, there is illustrated a cam assembly of the type illustrated in our co-pending application, above mentioned, no illustration, however, being given of any type of mechanism to be operated by the cams.

In said drawings,

Figure 1 is a longitudinal sectional view partly in elevation illustrating the construction of one of the cam units constructed in accordance with the present invention,

Figure 2 is a longitudinal sectional view illustrating a cam unit similar to the one illustrated in Figure 1, and;

Figure 3 is a fragmentary view partly in section and partly in elevation illustrating a driving coupling member by means of which two cam units of the type illustrated in Figures 1 and 2 may be operatively connected together to drive one from the other.

Since the cam units illustrated in Figures 1 and 2 are of substantially the same construction, differing only in the manner in which they are driven and the positions in which they are mounted, it is believed tha a specific description of one will suffice.

Referring particularly to Figure 2 of the drawings, a cam unit constructed in accordance with the present invention comprises a shaft 10, a plurality of cams 11, 12, 13, 14 and 15, and a driving ring 16 by means of which the cam unit may be operatively connected to a suitable driving element.

The shaft 10 has a shoulder at one end thereof which shoulder is preferably formed by a flange 17 which has a plurality of openings 18 therein, the purpose of which will be hereinafter described.

In that end of the shaft 10 upon which the flange 17 is formed, there is an axially disposed tapered recess 19 and upon its opposite end, the shaft 10 has a similar recess 20. The shaft 10 is also provided with a key way 21 and an externally threaded end portion 22 for the reception of a nut 23.

The several cams may have any desired contour depending upon the mechanisms to be operated thereby and the operation which said mechanisms are designed to perform.

In the present embodiment of the invention, the several cams are illustrated as operating pivotal levers 24 in the same manner as in our application heretofore referred to.

Each of the cams is provided with an opening 25 for reception of the shaft 10, thereby to provide for mounting the cams upon the shaft and each cam is also provided with a key receiving notch or opening 26 for reception of the key 27 mounted in the key way 21 of the shaft 10 which construction provides an operative connection between each of the cams and said shaft.

The cam 11 is herein illustrated as abutting the shoulder formed by the flange 17 and inter-

posed between the cam 11 and the cam 12, there is a spacing ring 28, which, preferably is also operatively connected to the shaft 10 by the key 27.

Interposed between the cam 12 and the cam 13, there is a spacing ring 29 and similar spacing rings 30 and 31 are interposed respectively between the cams 13 and 14 and the cams 14 and 15, and each of said spacing rings is operatively connected to the shaft 10 by the key 27.

The driving ring 16 abuts the outer face of the cam 15 and it is provided with a notch or recess 32 for the reception of the end portion of the key 27 to provide an operative driving connection between the driving ring and the shaft 10.

Upon its outer face, the driving ring is provided with a plurality of spaced clutch teeth or the like 33, by means of which it may be operatively connected to a driving element in a manner to be hereinafter specifically described.

The nut 23, heretofore mentioned, when threaded upon the threaded portion 22 of the shaft 10, is received within a recess 34 in the driving ring 16 and when turned home, serves to clamp the several cams, spacing rings and the driving ring between itself and the shoulder formed by the flange 17, thus providing the unitary structure hereinafter referred to as the cam unit.

A screw 35 is threaded through the nut 23 and its inner end engages the driving ring 16 as at 36 thus serving to prevent accidental loosening of the said nut 23.

The cam 11 and the spacing ring 28 are interconnected by means of a pin 38, one end of which is received in an opening 39 in the cam, while the other end of the pin 38 extends into an opening 40 in the spacing ring 28. Similarly, the cams 12 and 13, are interconnected respectively with the spacing rings 29 and 30 by pins 41 and 42.

The cam 14 is interconnected with the spacing ring 31, the cam 15 and the driving ring 16, by means of a pin 43. This pin 43 has one of its ends positioned in an opening 44 in the cam 14, its opposite end, which is tapered being received in a tapered recess 47 in the driving ring 16, with its intermediate body portion occupying positions in openings 45 and 46 respectively in the spacing ring 31 and the cam 15.

The spacing ring 31, the cam 15 and the driving ring 16 are also interconnected by a pin 48, one end of which is received in an opening 49 in the spacing ring 31. This pin extends through an opening 50 in the cam 15 and has a tapered end 52 which is received in a tapered recess 51 in the driving ring 16.

From the foregoing, it will be apparent that the invention as thus far described provides a cam assembly which in itself comprises a rigid unit in which a plurality of cams may be so associated with one another as to permit of their being removed either for rearrangement or replacement by other cams as desired. Furthermore, the construction provides a cam assembly which may be maintained as a unit if desired.

Having thus described the construction of the cam unit, one manner in which it may be mounted for operation will now be described.

The reference characters 60 and 61 designate two bearings in which the cam unit is supported in operative position. These bearings may be carried by standards, hangers such as designated 62 in the drawings, or any other suitable bearing supports.

Mounted in the bearing 60, there is a hollow shaft 63 which has upon one end a head 64. Projecting from the head 64, there are pins 65 which are adapted to be received in the openings 18 of the flange 17. This hollow shaft is also provided with a tapered plug-like member 66 the tapered portion 67 of which is adapted for reception in the tapered end recess 19 of the shaft 10.

Extending radially through the hollow shaft 63 there is a cross pin 68 which has a flattened intermediate portion 69, the purpose of which will hereinafter appear.

The reference character 70 designates a shaft which is adapted to extend into the hollow shaft 63, the outer end of this shaft being supported in a bearing 71 in a bracket or arm 72, fixed with respect to the bearing support 62. Near its outer end, this shaft 70 has an annular groove 73 for the reception of the inner end of a screw 74, thus to prevent longitudinal movement of the shaft 70. Also adjacent to its outer end, the shaft 70 is provided with a threaded portion 75 and threaded thereon, there is a hand wheel 76. A slot 77 is formed in the inner end of the shaft 70 which slot receives the flattened portion 69 of the cross pin 68 thereby to provide an operative driving connection between the hollow shaft 63 and the shaft 70.

In Figure 2 of the drawings, the pins 65 are shown as being withdrawn with respect to the openings 18. It will be obvious, however, that upon turning the hand wheel 76 in the proper direction to move it towards the right in said figure, in such movement, the hand wheel will engage the outer end of the hollow shaft 63 and move said shaft towards the right in said figure, thus moving the pins 65 into the openings 18 of the flange 17 of the shaft 10 and the tapered end 67 of the plug-like member 66 into the end recess 19 of the shaft 10.

The reference character 80 designates a shaft which has a hollow head portion 81, which latter has a plurality of clutch teeth 82 adapted for interlocking engagement with the clutch teeth 33 of the driving ring 16.

This shaft constitutes the driving element heretofore referred to and is rotatably mounted in the bearing 61.

Upon its inner end, it carries a plug-like member 83 which has a protruding tapered end portion 84 for reception in the end recess 20 of the shaft 10. Upon its outer end, this shaft has a worm gear 85 keyed thereto and which is adapted to be driven by a worm 86 keyed to a shaft 87 which may be driven in any desired manner.

From the foregoing, it will be apparent that the cam unit is supported in operative position by the plug-like members 66 and 83 of the shafts 63 and 80 respectively, when the several parts are in the positions in which they are illustrated in full lines in Figure 1 and that the cam unit may be bodily removed as such from its supports when the several parts are in the positions in which they are illustrated in Figure 2.

It will also be obvious that when the cam unit is mounted in its operative position, operation of the driving member will, through the medium of the interengaged clutch teeth 33 and 82, effect a rotation of the entire unit in the bearings 60 and 61.

In Figure 3 there is illustrated a modified form of the invention in which two cam units are

mounted in alinement with each other and operatively connected together in such a manner that one of the cam units is driven by the other.

Referring to said Figure 3, it will be noted that the cam unit at the left of said figure, has been turned end for end, as compared to its position in Figure 2, the flange 17 of the shaft 10, and the head 64 of the hollow shaft 63 being positioned to the right.

In said Figure 3, the reference character 90 designates a bearing support in which is mounted a bearing 92.

In this form of the invention, the arm or bracket 72 is dispensed with and in lieu of the shaft 70 illustrated in Figure 2, a shaft 93 is employed, said shaft being mounted in the bearings 60 and 92.

The shaft 93 has an extension 94, slotted as at 95 to receive the flattened portion 69 of the cross pin 68 of the hollow shaft 63 of the right hand cam unit. It also has an extension 96, slotted as at 97, to receive the flattened portion 69 of the cross pin 68 of the left hand cam unit, it being remembered that this cam unit has been turned end for end.

This shaft 93 also has two threaded portions 98 and 99 and threaded respectively thereon, there are hand wheels 100 and 101.

The hand wheels 100 and 101 are adapted to engage the outer ends of their respective hollow shafts 63 to move said shafts to position, to cause the pins 65 carried by their heads 64 to engage in the openings 18 in the flanges 17 of their respective shafts 10.

By reference to Figure 1, it will be noted that in lieu of the shaft 80 illustrated in Figure 2, a hollow shaft 110 has been substituted. This shaft has a recessed head portion 111 which is provided with clutch teeth 112 for engagement with the clutch teeth 33 of the driving ring 16, which, however, in this position, does not function as a driving ring.

The hollow shaft 110 is mounted in a bearing 113 mounted in a suitable bearing support 114, and it also has a plug-like member 115 having a tapered portion 116 for reception in the end recess 20 of the shaft 10. This hollow shaft 110 is also provided with a cross pin 117 which has a flattened portion 118 by which it could, if so desired, be operatively connected with a third cam unit, not, however, herein illustrated.

From the foregoing, it will be apparent that the present invention provides a construction by means of which the several cam elements of a cam unit may be individually removed and others substituted, or in which the several cams may be transposed as to position.

The present invention also provides a construction by means of which a cam assembly may be bodily removed, as a complete unit, from its operative position in a machine and it further provides constructions by which two or more cam units may be operatively connected together for operation by a single driving element.

The invention has been herein illustrated and described in its preferred forms but it is to be understood that it is not to be limited to the specific constructions herein set forth and that it may be embodied in other forms within the scope of the appended claims.

Having thus described the invention, what is claimed as new is:

1. A cam unit comprising in combination, a shaft having a flange at one end, a plurality of cams removably mounted upon the shaft in spaced relation to one another, spacing rings removably mounted upon the shaft in interposed relation to the cams to maintain the spaced relation thereof, a driving ring mounted upon the shaft between one of the cams and the end of the shaft opposite to the end which has the flange, means for operatively connecting the cams, the spacing rings, and the driving ring to the shaft, means for operatively connecting the driving ring to the two cams next adjacent thereto and to the spacing ring interposed between said cams, separate means for operatively connecting the driving ring with the cam next adjacent thereto and said last mentioned spacing ring, and means cooperating with said flange for securing the cams, spacing rings and driving ring in position upon the shaft.

2. A cam unit comprising in combination, a shaft having a rigid abutment shoulder at one end, a threaded section at the opposite end of the shaft, a plurality of cams removably mounted upon the shaft in spaced relation to one another, spacing rings removably mounted upon the shaft in interposed relation with the cams to maintain the spaced relation thereof, a driving ring removably mounted upon the shaft between one of the cams and the threaded section of the shaft, means for operatively connecting the cams, the spacing rings and the driving ring to the shaft, means for operatively connecting together the cams, the spacing rings and the driving ring, and a nut threaded upon the threaded section of the shaft for clamping the cams, spacing ring and driving ring against the rigid abutment shoulder at the opposite end of the shaft to form a unitary structure and maintain the operative connection between the cams, the spacing rings and the driving ring.

CURTIS WEIDAUER.
KARL DOEHM.