

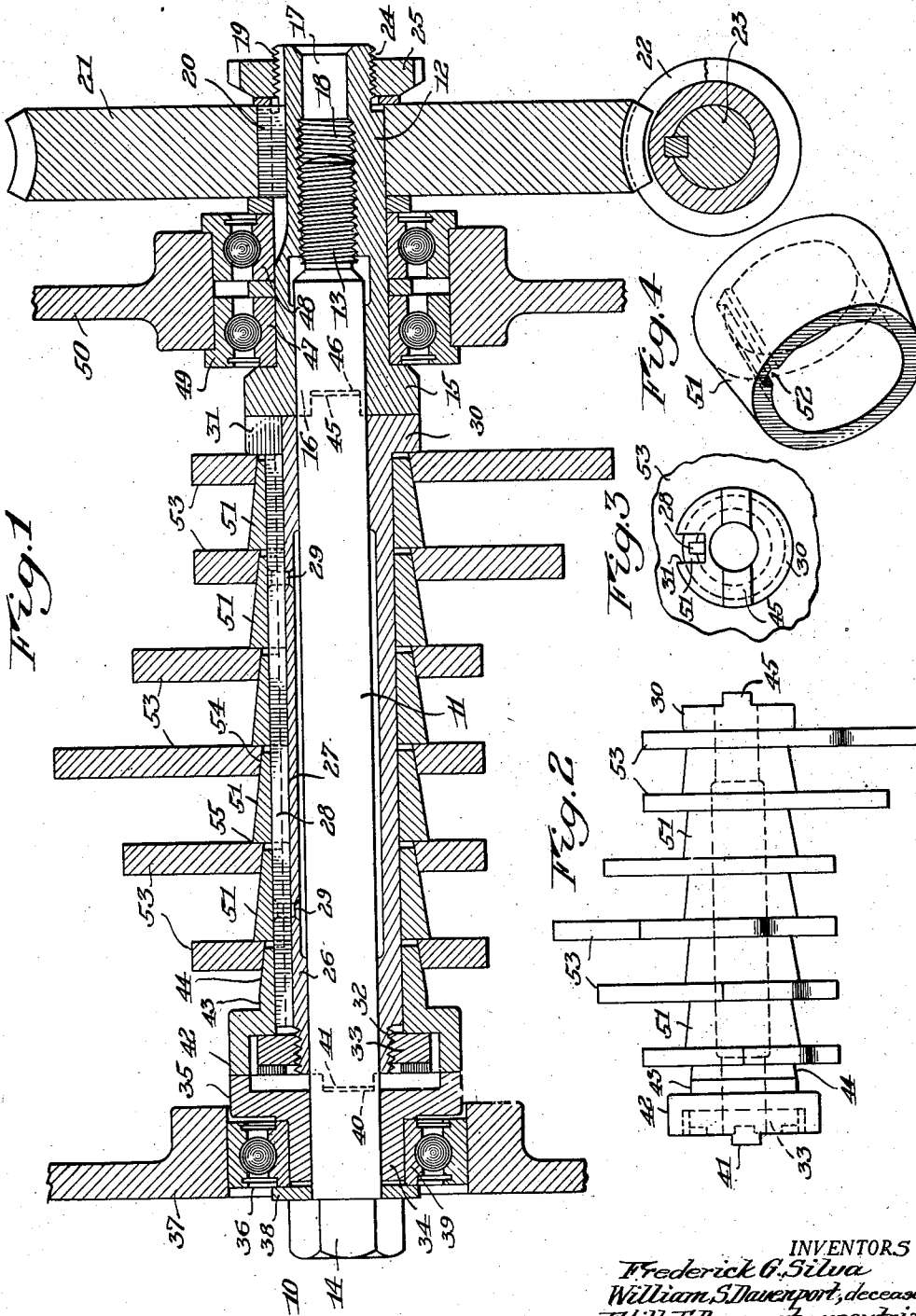
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CAM ASSEMBLY

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CAM ASSEMBLY

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14 Claims. (Cl. 74-568)

This invention relates to cam assemblies for producing successive movements of one or more parts of automatic forming machines, such, for example, as those employed on the lead and cross slide cam shafts of automatic turret lathes and the like, one object of the invention being to provide an improved assembly of the above character having a construction capable of being readily and conveniently assembled and disassembled, for including therein any desired selection of cams and for adjusting the angular position of any one or more of the cams relative to the other cams of the assembly.

Another object is to provide a device of the character described in which the individual cams may be readily secured in any desired angular relation to one another to vary the time of operation thereof with any desired degree of precision.

To these and other ends the invention resides in certain improvements and combinations of parts, all as will be hereinafter more fully described, the novel features being pointed out in the claims at the end of the specification.

In the drawing:

Fig. 1 is a longitudinal, sectional view of a cam assembly embodying the present invention;

Fig. 2 is a reduced side elevation of the cam and cam sleeve assembly detached;

Fig. 3 is a fragmentary end elevation of parts shown in Fig. 2, as viewed from the right hand end thereof, and

Fig. 4 is a perspective view of one of the collars shown in Figs. 1 and 2, detached.

The invention is embodied in the present instance, by way of illustration, in a cam assembly particularly adapted, for example, for use on the lead and cam shafts of an automatic forming machine, this application being a division of our copending parent application, Serial No. 386,130, Automatic forming machine, filed March 31, 1941.

Referring more particularly to the drawing, a lead cam shaft is indicated generally at 10, comprising at one end a shaft section 11 and, at its other end, a sleeve-like trunnion member or section 12. The shaft section 11 is generally cylindrical, having at one end a threaded portion 13 of reduced diameter, and at its other end, a head 14. The sleeve-like section 12 has a flange 15 and a central bore 16 which is reduced in diameter, at the end opposite the flange, as at 17, and formed with a threaded portion 18 for engagement with the reduced threaded end 13 of the shaft section 11, as shown.

The outer circumference of the sleeve-like section 12 of the shaft is preferably formed with a

longitudinally extending key slot 19, for the reception of a key 20 for fixing on the shaft a worm wheel 21 driven by an intermeshing worm gear 22 on a shaft 23, which latter parts form the means for rotating or driving the cam assembly. The outer end of the sleeve section 17 of the shaft is threaded, as at 24, for the reception of a nut 25 for locking gear 21 in position.

A sleeve for supporting the cams is shown at 26, loosely mounted on the shaft section 11, and formed with a longitudinally extending slot 27 for the reception of a key 28 which is rigidly held in its slot in the cam supporting sleeve 26, as by means of rivets 29. One end of the cam sleeve is preferably flanged, as at 30, and provided with a spanner wrench opening 31. The other end of the sleeve is preferably threaded, as at 32, for the reception of a nut 33. The cams are mounted on sleeve 26, as hereafter described, and wedged in adjusted position thereon between flange 30 at one end of the cam supporting sleeve 26 and the nut 33 at the other end of the sleeve.

Shaft section 11 is loosely inserted through and carried at one end by a trunnion member or sleeve 34 having a flanged part 35. Sleeve 34 is rotatably carried in a roller bearing assembly, indicated generally at 36, as mounted in a stationary machine frame part 37. A washer 38 is preferably interposed between the head 14 of the shaft and the rotary race 39 of the bearing, to position the parts as shown. Flange 35 of the sleeve is preferably provided, at diametrically opposite points, with rectangular notches 40, which are detachably engaged by projecting clutch lugs or teeth 41 on the enlarged flanged end 42 of a collar 43, the other end of which is smoothly tapered and reduced, as at 44. Collar 42 is slidably keyed on one end of sleeve 26, for a purpose to be presently described. Flange 30 at the opposite end of sleeve 26 is provided with similar diametrically arranged teeth 45, for engagement with notches 46, respectively, in the flange 15 of the sleeve member or section 12 of the shaft.

Sleeve section 12 of the shaft, which may be described as a trunnion sleeve for the opposite end of the shaft section 11, is carried in a pair of rotating races 47 and 48 of a bearing assembly, indicated generally at 49, which is supported in a stationary frame part 50 located in spaced relation with the frame part 37. It will be apparent from the above description that shaft section 12 has a driving connection with one end of cam sleeve 26, the other end of which has a driving connection, through toothed clutch parts 40 and

41, with trunnion sleeve 34 carrying the opposite end of the shaft, so that the shaft section or sleeve 12, sleeve 34, cam sleeve 26 and shaft section 11 all rotate together as a unit.

The tapered collar 43 is one of a series of tapered collars, the others of which, indicated at 51, are preferably of uniform construction and slidably keyed on sleeve 26 being each formed for that purpose with a key slot 52, as shown in Fig. 4. Each of collars 51 is tapered in diameter from end to end, as shown, and is located between a pair of adjacent cam disks 53, having its reduced end received in a smoothly tapered mounting bore 54 of one cam of the pair, and its opposite end in laterally abutting engagement, as at 55, with the opposite cam of the pair. Collar 43 has a similar tapered end 44 received in a tapered bore in the adjacent end cam, so that each cam is mounted on one of the tapered collars.

It will be seen from the above description that after loosely assembling a selected plurality of cams 53 on the intermediate tapered collars 51 on sleeve 26, each cam may be rotarily adjusted to any desired angle of rotation relative to the other cams and sleeve, and that by tightening nut 33, the collars and cams may then be moved longitudinally and pressed between the nut and the opposite end flange 30, so as to detachably lock and wedge each cam against rotation relative to the cam sleeve 26.

Since the contacting tapered surfaces between each cam and its collar are smooth surfaces, without lugs, teeth, or other projections requiring registration in predetermined relative positions, each cam may be freely adjusted on its collar to any desired angle of rotation with any desired degree of precision. It will also be seen that by unscrewing and withdrawing shaft section 11, the assembly, comprising the cam sleeve 26 and its cams and collars, may be demounted as a unit, by sliding the lugs 31 and 45 out of the corresponding notches 40 and 46 in the bearing sleeves. The assembly, when thus detached, as shown in Fig. 2, is made readily accessible for adjusting or replacing any one or more of the cams.

After selecting the cams suitable for the particular work to be accomplished, the cams and collars are loosely assembled in the sleeve 26 which is placed in any known or suitable jig, or fixture, comprising a fixed part and a rotatable part, one of which is provided with graduations and the other with an index. The sleeve is located with its lugs 45 in predetermined relation to the fixed part, and the rotating part and graduations of the fixture are employed to locate the high point of each cam in desired angular relation with the sleeve, as well understood in the art. When properly adjusted, nut 33 is tightened and the cams are thus wedged and locked in place.

When thus locked together, the assembly is inserted in line between the trunnion sleeves 12 and 34, with the projections or teeth 41 and 45 registering with the notches 40 and 46, respectively, these projections and notches being preferably offset so that the assembly cannot be improperly inserted. The shaft section 11 is then inserted through sleeve 34 and sleeve 26 and threaded into its sleeve section 12.

It is apparent that, by means of the above described construction, the assembly may be detached at any time and any one or more of the cams may be readily and conveniently adjusted or replaced by a different cam or cams, as desired. This provision is particularly useful, for example, whenever it is discovered, in the use of

the machine, that any operation may be speeded up by changing the length or duration of cut of a given tool, by changing the position of its cam on sleeve 26, as well as in changing the setup of cams when changing from one job to another. Such a cam assembly contributes to the flexibility of the machine by which it is controlled and may be adapted to substantially any set of conditions, without appreciable delay or expense.

It will thus be seen that the invention accomplishes its objects, and while it has been herein disclosed by detailed reference to the parts of a preferred embodiment, it will be understood that such disclosure is intended by way of illustration, rather than by way of limitation, as it is contemplated that various changes in the construction and arrangement of the parts will occur to those skilled in the art within the spirit of the invention and the scope of the appended claims.

We claim:

1. A cam assembly comprising a support, a plurality of cams adjustably mounted on said support, a rotatable member, a rotary shaft detachably secured to said member and on which said support is detachably mounted, said shaft being detachable from said member and said support from said shaft for adjusting said cams on said support, spaced bearings for said member and shaft, means for rotating said member, and driving connections from said member to said support and shaft for rotating said shaft, support and cams.

2. A cam assembly comprising a support, a plurality of cams adjustably mounted on said support, a pair of spaced members, a rotary shaft detachably secured at its opposite ends in said members and on which said support is detachably mounted between said members, rendered operative by detachment of said support for locking and unlocking said cams for adjustment thereon, means for rotating one of said members, and a detachable driving connection between said rotated member and said support said shaft for rotating said shaft, support and cams.

3. A cam assembly comprising a supporting sleeve having a flanged end and a threaded end, a nut on said threaded end, a plurality of cams adjustably mounted and locked on said sleeve as a unit between said flanged end and nut thereof, a rotatable member, a rotary shaft detachably secured to said member and on which said support is detachably mounted, means for rotating said member and driving connections from said member to said support for rotating said shaft, support and cams.

4. A cam assembly comprising a supporting sleeve having a flanged end and a threaded end, a nut on said threaded end, a plurality of cams adjustably mounted and locked on said support as a unit between said flanged end and nut thereof, a pair of spaced rotary members, a rotary shaft detachably secured at its opposite ends in said members and on which said support is detachably mounted between said members, means for rotating one of said members, and a detachable driving connection between said rotary member and said support and shaft for rotating said shaft, support and cams.

5. A cam assembly comprising a sleeve, a plurality of cams on said sleeve, a pair of spaced bearing members, a shaft carried at its opposite ends in said members and provided with means for detachably securing the same therein, said sleeve being detachably mounted on said shaft between said members, means for rotating one of

said members, and a driving connection between said rotated member and said sleeve for rotating said sleeve and cams.

6. A cam assembly comprising a sleeve, a plurality of cams on said sleeve, a pair of spaced rotary members, a shaft detachably inserted through one of said members and having threaded means for connecting it with the other thereof, said sleeve being detachably mounted on said shaft between said members, means for rotating one of said members, and a driving connection between said rotated member and said sleeve for rotating said sleeve and cams.

7. A cam assembly comprising a sleeve, a plurality of cams on said sleeve, a pair of spaced rotary members, a shaft detachably inserted through one of said members and threadedly attached to the other thereof, said sleeve being loosely and detachably mounted on said shaft between said members, means for rotating one of said members, and detachable clutch connections between said rotated member and said sleeve and between said sleeve and the other of said members for rotating said sleeve and said cams.

8. A cam assembly comprising a supporting sleeve, a plurality of cams adjustably and detachably secured on said sleeve, a pair of spaced rotary trunnion sleeves, a shaft detachably inserted through one of said trunnion sleeves and threadedly attached to the other thereof, said cam sleeve being loosely and detachably mounted on said shaft between said trunnion sleeves, means for rotating one of said trunnion sleeves, and detachable clutch connections between said rotated trunnion sleeve and said supporting sleeve and between said supporting sleeve and the other of said trunnion sleeves for rotating said supporting sleeve and said cams.

9. A cam assembly comprising a supporting sleeve, a plurality of cams each having therein a tapered mounting opening, a plurality of tapered collars mounted on and keyed to said sleeve and each located between a pair of said cams and having an end thereof received in the mounting opening of one of said pair, a pair of spaced rotary trunnion sleeves, a shaft detachably inserted through one of said trunnion sleeves and threadedly attached to the other thereof, said supporting sleeve being loosely and detachably mounted on said shaft between said trunnion sleeves, means for rotating one of said trunnion sleeves, and driving connections between said rotated trunnion sleeve and said supporting sleeve and between said supporting sleeve and the other of said trunnion sleeves for rotating said shaft, cam sleeve and cams.

10. In an automatic forming machine, a cam assembly comprising a rotatable support, a plurality of cams mounted on said support, and a plurality of spacing collars, said collars having tapered outer surfaces and said cams having correspondingly tapered bores for reception on the collars, said collars being arranged on the support one between each pair of adjacent cams.

11. A cam assembly comprising a rotatable support, a plurality of cams each having a smoothly tapered mounting bore therein, a plurality of spacing collars secured to said support

for rotation therewith, each of said collars having a smoothly tapered end received in the bore of one of said cams and mounting the same for adjustment through any desired angle of rotation, means for pressing said collars and cams together to wedge and secure said cams against rotation relative to said support, and means for rotating said support.

12. A cam assembly comprising a rotatable supporting sleeve, a plurality of cams each having a smoothly tapered mounting bore therein, a plurality of smoothly tapered collars secured to said sleeve for rotation therewith and each positioned between a pair of said cams with its tapered surface received in said bore of one of said cams and mounting the same for adjustment thereon to any desired angle of rotation, means for pressing said collars and cams together to detachably wedge and secure said cams against rotation relative to said supporting sleeve, a pair of spaced trunnion sleeves, a shaft detachably inserted through said supporting and trunnion sleeves for demountably supporting said supporting sleeve, and means for rotating said shaft, supporting sleeve and cams.

13. A cam assembly comprising a rotatable supporting sleeve, a plurality of cams each having therein a smoothly tapered mounting bore, a plurality of smoothly tapered collars keyed to said sleeve and each located between a pair of said cams with one end received in said bore of one of said pair and the other end in laterally abutting engagement with the other cam of said pair, a nut threadedly engaged with said sleeve for pressing said collars and cams together longitudinally thereof to detachably wedge and secure said cams against rotation relative to said sleeve, a spaced pair of trunnion sleeves, a shaft detachably inserted in said trunnion and supporting sleeves for detachably mounting said supporting sleeve, and means for rotating said shaft, supporting sleeve and cams.

14. A cam assembly comprising a supporting sleeve having a flange at one end thereof, a plurality of cams each having a smoothly tapered bore therein, a plurality of smoothly tapered collars keyed on said sleeve to slide longitudinally thereof and each positioned between a pair of said cams with one end received in said bore of one of said pair and the other end in laterally abutting engagement with the other of said pair, a nut threadedly engaged with the end of said sleeve opposite said flange for detachably pressing said collars and cams together between said nut and sleeve to wedge and secure said cams against rotation relative to said sleeve, a pair of spaced trunnion sleeves, a shaft detachably inserted through one of said trunnion sleeves and said supporting sleeve and detachably threaded in the other of said trunnion sleeves for detachably mounting said supporting sleeve and cams, means for driving one of said trunnion sleeves, and driving connections between said trunnion sleeves and cam sleeve for rotating said shaft, cam sleeve and cams.

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