Sept. 28, 1948. K. G. STRUNK ET AL 2,450,311

ADJUSTABLE CAM ACTUATOR

Filed Nov. 8, 1945

3 Sheets-Sheet 1

Fig. 1.

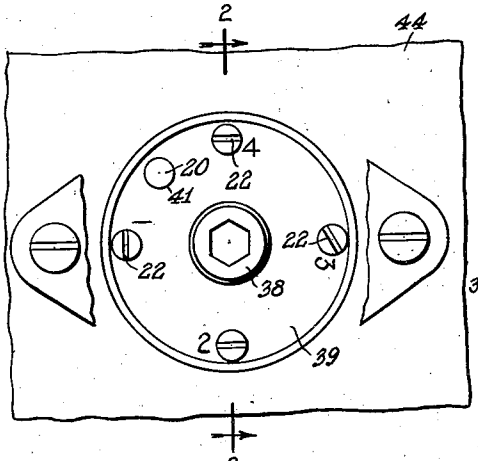


Fig. 2.

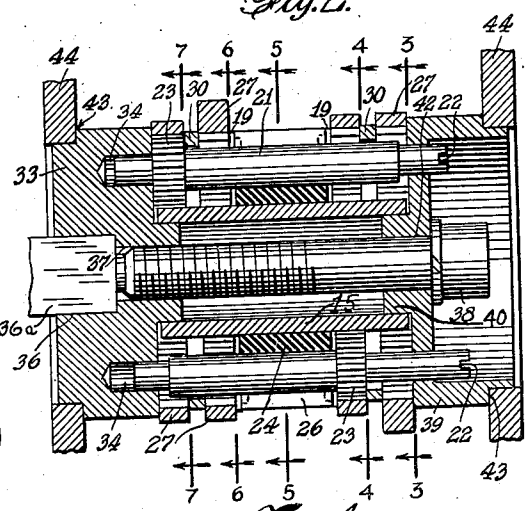


Fig. 3.

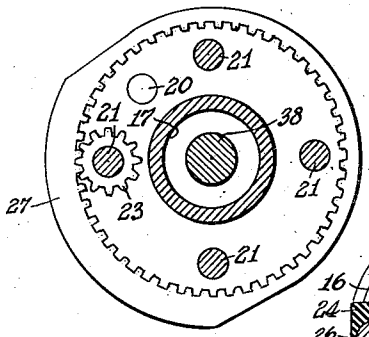


Fig. 4.

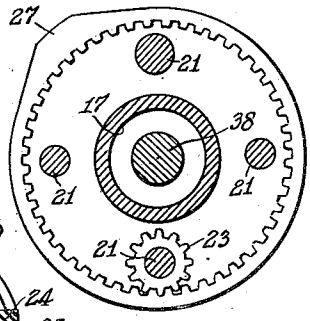


Fig. 5.

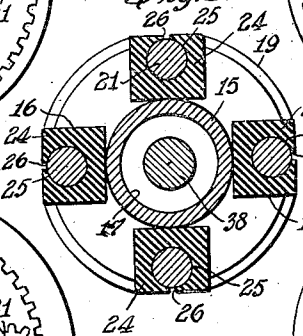


Fig. 6.

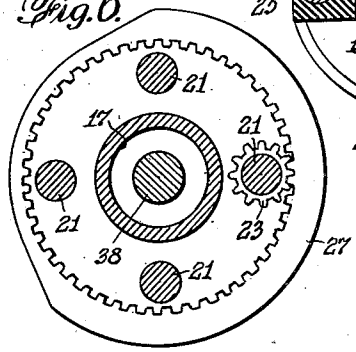
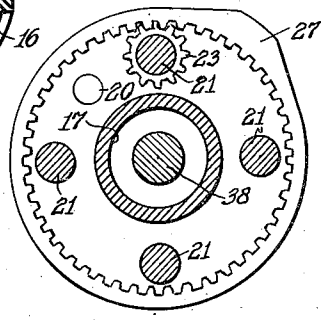


Fig. 7.



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Fig. 8.

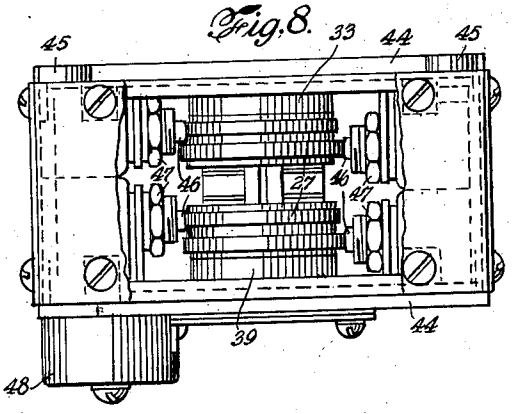


Fig. 9.

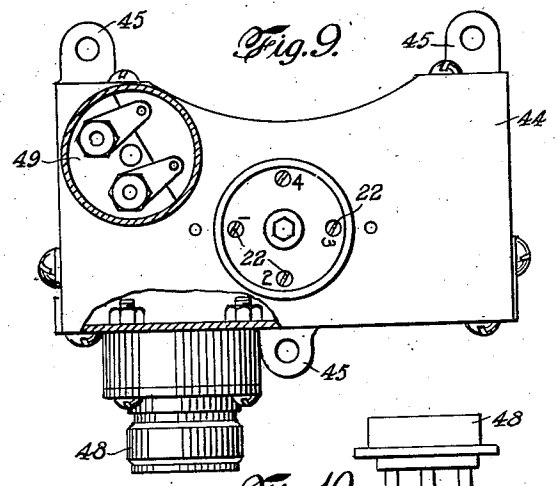
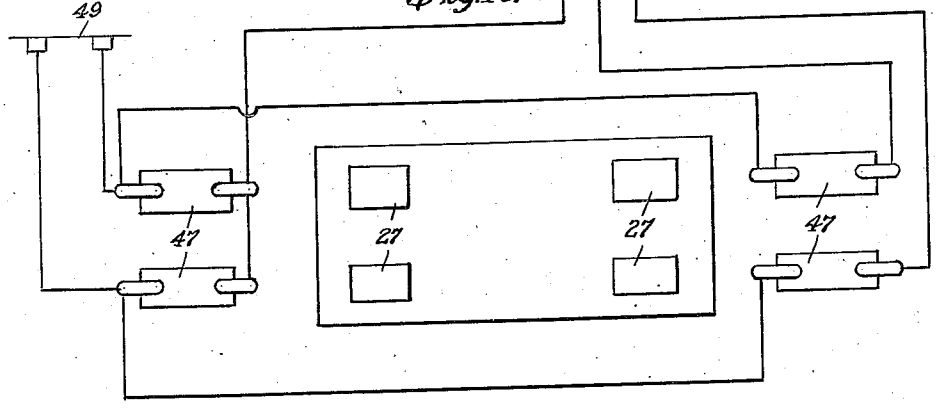


Fig. 10.



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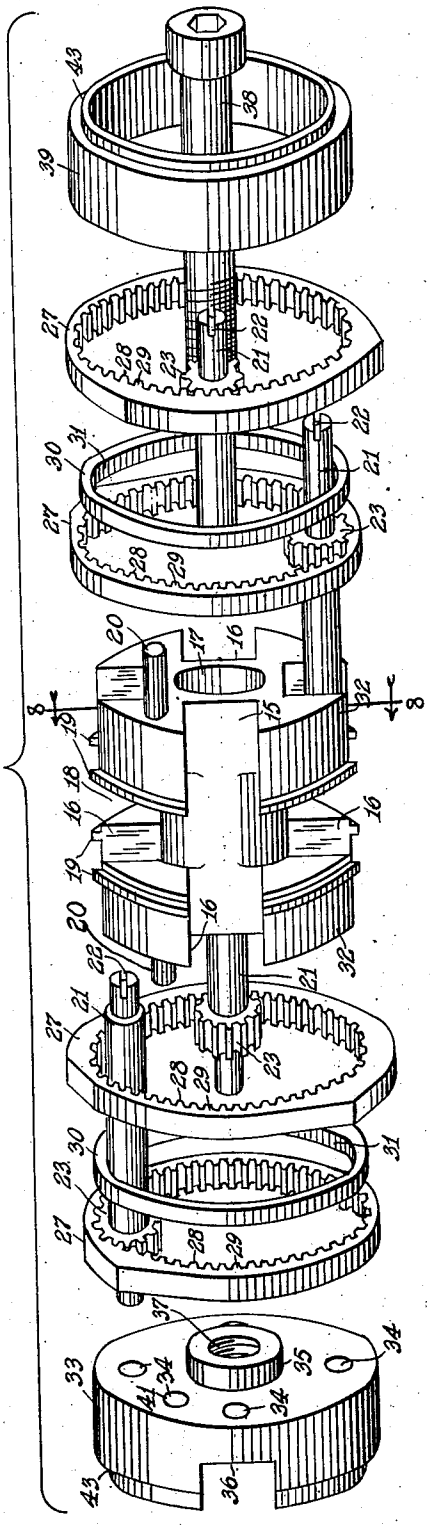


Fig. 11.

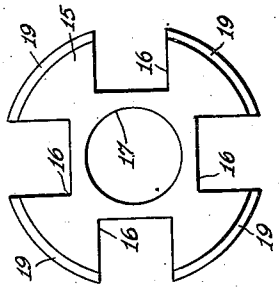


Fig. 12.

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UNITED STATES PATENT OFFICE

2,450,311

ADJUSTABLE CAM ACTUATOR

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Application November 8, 1945, Serial No. 627,442

8 Claims. (Cl. 74—568)

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This invention relates to mechanisms for adjustably actuating a plurality of driven members, particularly such as are employed for the transmission and control of power.

An object of the invention is to provide a device for operating a multiplicity of push rods by means of a series of cams supported upon a common hub, said push rods, in turn, activating electric snap switches.

A further object of the invention is to provide a means for actuating members which do not travel in a straight line as, for example, pivoted levers, gears, wheels or other driven members.

Another feature of the invention is the use of gear teeth to rotatably support one or more adjustable cams so that said cams may be individually and positively adjusted as required.

The invention consists of the construction, combination and arrangement of parts as herein illustrated, described and claimed.

In the accompanying drawings, forming part hereof, is illustrated one form of embodiment of the invention, in which drawings similar reference characters designate corresponding parts, and in which:

Figure 1 is a plan view of the adjustable cam actuator as it appears in the mechanism;

Figure 2 is a vertical section of the adjustable cam actuator, taken on line 2—2 of Figure 1, showing the assembly of the components parts;

Figure 3 is a transverse sectional view, taken on line 3—3 of Figure 2, showing the adjustable cam and the rotatable gear mechanism;

Figure 4 is a transverse sectional view, taken on line 4—4 of Figure 2, showing a second adjustable cam and its individual rotatable gear mechanism;

Figure 5 is a transverse sectional view, taken on line 5—5 of Figure 2, showing the relative position of the four control shafts which adjust the rotary motion of the cams, and also the blocks which operate as brakes to prevent slippage of the adjusted control shafts;

Figure 6 is a transverse sectional view, taken on line 6—6 of Figure 2, showing a third adjustable cam and its corresponding rotatable gear device;

Figure 7 is a transverse sectional view, taken on line 7—7 of Figure 2, showing a fourth adjustable cam and its rotatable gear mechanism;

Figure 8 is a side elevation of a complete embodiment of the apparatus with the shielding cover cut away to show the relative position of the member parts and the manner by which a

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series of snap switches may be actuated by the revolving cams;

Figure 9 is a plan view of the invention showing the opposed block assembly and electrical contact points.

Figure 10 is a wiring diagram of this embodiment of the adjustable cam actuator;

Figure 11 is an exploded view of the adjustable cam actuator, showing the relationship of the component parts; and,

Figure 12 is a transverse section of the cam actuator on the line 8—8 of Figure 11, showing the construction of the hub.

Referring to the drawings, and particularly Figure 11, 15 designates a hub provided with four longitudinal slots 16, a central bore 17, a transverse recess 18 passing around the middle of the hub 15 at a depth equal to that of the longitudinal slots 16 and flanked by two flanges 19.

Set into the hub 15 and extending in a direction parallel to the axis thereof are two pilot pins 20.

A control shaft 21 having a slot cut in one end 22, so that it may be readily adjusted by a screw driver and having a pinion 23 as an integral part thereof, is inserted into a small block 24 of laminated phenolic construction, as best shown in Figure 5. Said block 24 has bored therein a hole 25 of slightly smaller diameter than that of the control shaft 21, and is partially split at 26, so as to operate as a brake to any undesired rotation of the shaft 21.

Referring again to Figure 11, the combined control shaft 21 and braking block 24 are fitted into the longitudinal slots 16 of the hub 15 in such manner that the brake block is prevented from rotating. The control shaft 21 is aligned axially with the hub 15. This is repeated in the illustrated embodiment of the invention in each of the four longitudinal slots 16. All control shafts 21 are positioned in such manner that the control shaft slots 22 are all accessible by screw driver from the same end of the device.

Four cam members 27 having their inner bore 28 machined radially in the form of a gear 29 integral therewith, are slipped over the ends of the hub 15 in such manner that one pair of said cams 27 is positioned on each side of the transverse recess 18. The inner face of each pair of cam members 27 is placed flush with the flanges 19 on the hub 15. Each cam member 27 is positioned so that its gear-teeth 29 mesh with the pinion 23 on the control shaft 21, specifically provided for its individual adjustment. This is best illustrated by reference to Figures 3, 4, 6

and 7, in which the relative position of the four cam members 27 and the actuating pinions 23 thereof are clearly shown.

Referring further to Figure 11, the lineal position of the pinion 23 on each of the control shafts 21, differs in order to make contact with only one cam member 27, thereby permitting of individual cam adjustment. As a further safeguard against one cam member 27 imparting its motion to another cam member 27 while being adjusted, each pair of cams 27 is separated by a washer 30 freely rotatable upon its inner bore 31, supported by the outer surface 32 of the hub 15. Surface 32 also serves as a journal bearing for cams 27, the inner ends of their gear-teeth 29 resting on this surface.

A circular end block 33 with suitable bores 34 to accommodate and pivot the ends of the four control shafts 21 and pilot pin 20, is placed against one end of the hub 15. Said end block 33 engages the central bore 17 of the hub 15 by means of a collar 35. The end block 33 is provided with a drive slot 36 by which the adjustable cam actuator may be freely rotated by means of a drive shaft 36a.

A central threaded bore 37 completes the construction of the end block 33 and serves, when operated in conjunction with a clamping screw 38 and opposed block 39, to lock the adjusted cams 27 and prevent slippage.

The circular opposed block 39 engages the central bore 17 of the hub 15 by means of a collar 40, and is positioned by an appropriately placed bore 41 into which the pilot pin 20 is inserted. The opposed block 39 is drilled to accommodate the ends of the four control shafts 21 in such manner that the end slots 22 are easily accessible for adjustment by means of a screw driver. This is most clearly shown by reference to Figure 1, in which can be seen the control shaft slots 22 conveniently numbered to correspond with the four adjustable cams 27.

The opposed block 39 has a central bore 42 to allow insertion of the clamping screw 38.

Shoulders 43, machined into the outer face of the end block 33 and the opposed block 39, provide bearing surfaces upon which the adjustable cam actuator rotates within the bored holes provided therefor in the end plates 44, as best shown in Figure 2.

Adjustment of any single cam member 27 to a different angular setting with reference to the other cam members 27 and independently thereof, is accomplished by loosening the clamping screw 38, inserting a screw driver into the control shaft slot 22 and rotating the control shaft 21 in either direction and through any angle, thereby causing the pinion 23 to turn the cam member 27 to the desired angular location.

The remaining control shafts 21 are maintained in position by the brake blocks 24 on their control shafts 21.

After the cam 27 is adjusted to the desired setting, clamping screw 38 is tightened to draw end block 33 and opposed block 39 together, thereby securing the cams tightly against the flanges 19 on the hub 15.

By referring to Figure 8 it will be seen that in the actual operation of the adjustable cam actuator, the driven rod members 46, which in the present embodiment of the invention, actuate electrical snap switches 47, are brought into contact with the revolving cams 27 and are suitably controlled thereby.

Figure 9 serves to illustrate an assembled adjustable cam actuator with end plate 44 cut away to show the installation of a shielded electrical connection 48. A second electrical connection 49 is shown mounted upon the end plate 44. Ears 45, for ready mounting, are also shown.

Figure 10 illustrates diagrammatically one form of wiring diagram used with the present embodiment of the invention. It is within the concept of this disclosure that other wiring means may be used. It is also contemplated that this actuator may be used in other than electrical circuits. The relative location of the snap switches 47, and the electrical connectors 48, 49 are shown. The position of the individual actuating cams 27 is also indicated.

Having thus fully described the invention, what is claimed as new and desired to be secured by Letters Patent of the United States, is:

1. In a mechanism for actuating a plurality of driven members, a series of cams individually rotatable upon a common supporting member comprising a hub longitudinally slotted to correspond to the desired number of cams and to receive control shafts therefor, transversely recessed at its center to receive a brake block, having a pair of raised flanges integral therewith on opposite sides of said recess and having a central bore, a brake block associated with each control shaft, means to angularly and individually adjust said cams and means to positively lock the positioned cams.

2. In a mechanism for actuating a plurality of driven members, a series of cams individually rotatable upon a common supporting member comprising a hub longitudinally slotted to correspond with the desired number of cams, transversely recessed at its center, having a pair of raised flanges integral therewith on opposite sides of said recess, means to individually adjust said cams comprising an internal, radially cut, gear integral with each of said cams, a control shaft and pinion positioned within each of the longitudinal slots of the aforementioned hub, to engage said radial gears, means to prevent slippage of adjusted cams during rotation of individual cam members, comprising a brake block of laminated phenolic construction having a central bore slightly smaller than the diameter of the control shaft and partially split, the whole being slipped over the control shaft and disposed within the juncture of the longitudinal slot and transverse recess of the hub and means to positively lock the positioned cams.

3. In a mechanism for actuating a plurality of driven members, a series of cams individually rotatable upon a common supporting member, means to individually adjust said cams, means to prevent the transmission of motion laterally to adjusted cams during rotation of individual cam members comprising a series of freely turnable washers separating the said cams and means to positively lock the positioned cams.

4. In a mechanism for actuating a plurality of driven members, a series of cams individually rotatable upon a common support comprising a hub longitudinally slotted to correspond to the desired number of cams, transversely recessed at its center to receive a plurality of brake blocks, having a pair of raised flanges integral therewith on opposite sides of said recess, means to individually adjust said cams comprising an internal, radially cut, gear integral with said cam, a control shaft and pinion positioned within each of the longitudinal slots of the aforementioned hub, to engage said radial gears, means to prevent slip-

age of adjusted cams during rotation of individual cam members comprising, in combination, a brake block of laminated phenolic construction having a central bore slightly smaller than the diameter of the control shaft and partially split, the whole being slipped over the control shaft and disposed within the juncture of the longitudinal slot and transverse recess of the hub, and a series of freely turnable washers separating the said cams and means to positively lock the positioned cams.

5. In a mechanism or actuating a plurality of driven members, a series of cams individually rotatable upon a common supporting member comprising a hub transversely recessed at its center to receive a plurality of brake blocks, having a pair of raised flanges integral therewith on each side of said recess and having a central bore, means to individually adjust said cams including a plurality of brake blocks and means to positively lock the positioned cams comprising a centrally threaded end block, a centrally bored opposed block and a clamping screw, so arranged that tightening said clamping screw secures the cams between the end block and flange on one side of the transverse recess of the aforementioned hub and the opposed block and flange on the other side of the central recess.

6. In a mechanism for actuating a plurality of driven members, a series of cams individually rotatable upon a common supporting member, means to individually adjust said cams, comprising an internal, radially cut gear integral with each of said cams, a control shaft having a transverse slot at one end thereof and a pinion to engage each of said radial gears, control blocks associated with said shafts, said pinion and control

shaft being so disposed that the slotted end thereof projects through the adjacent face of an opposed block permitting of ready adjustment and means to lock the positioned cams.

7. In a mechanism for actuating a plurality of driven members, a series of cams individually rotatable upon a common supporting member, means comprising a pinion to individually adjust said cams, friction means engaging the shaft of the pinion to prevent slippage of adjusted cams during rotation of individual cam members and means to positively lock the positioned cams.

8. In a mechanism for actuating a plurality of driven members, a series of cams individually rotatable upon a common supporting member, means comprising a pinion to individually adjust said cams, friction means engaging the shaft of the pinion and freely turnable washers between adjacent cams to prevent slippage of adjusted cams during rotation of individual cam members and means to positively lock the positioned cams.

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