June 24, 1958 W. P. WEGLARZ 2,840,651

ROTARY DRUM LIMIT SWITCH OPERATING MECHANISM

Filed Feb. 25, 1957 2 Sheets-Sheet 1

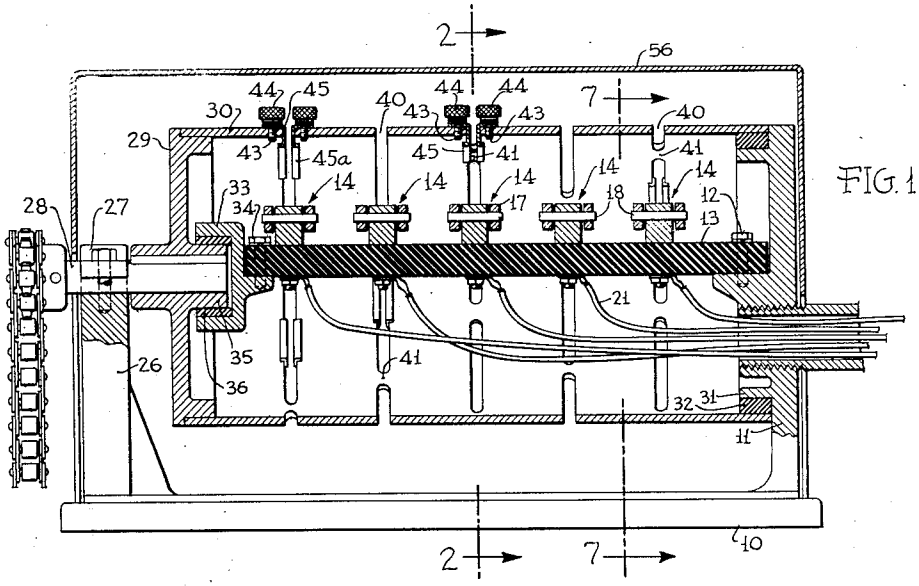


FIG. 1

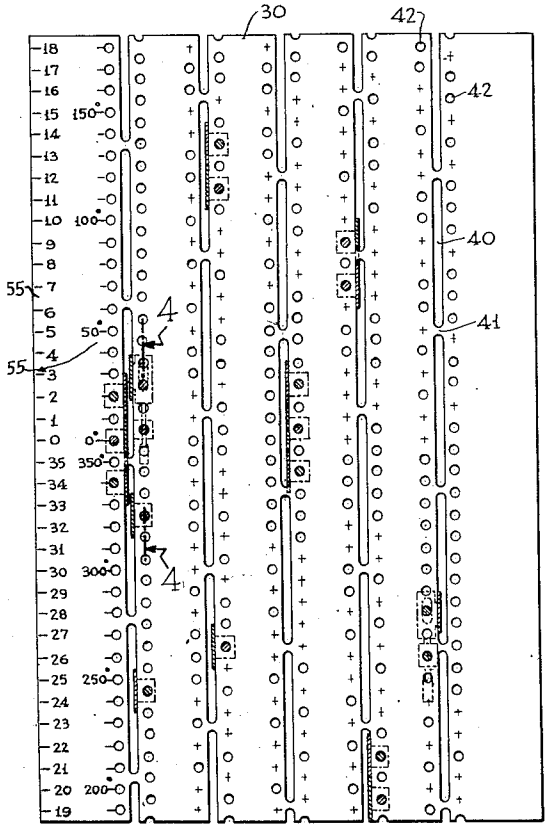


FIG. 3

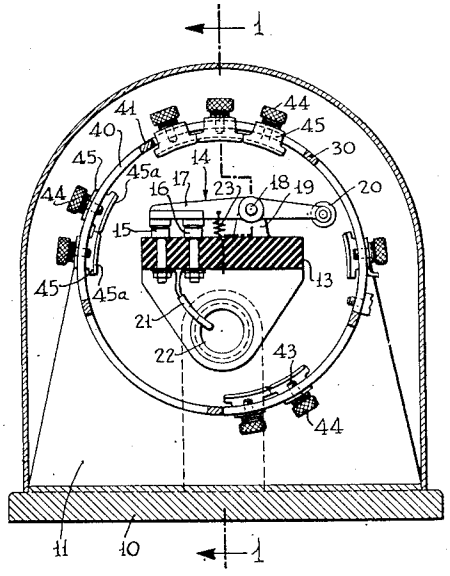


FIG. 2

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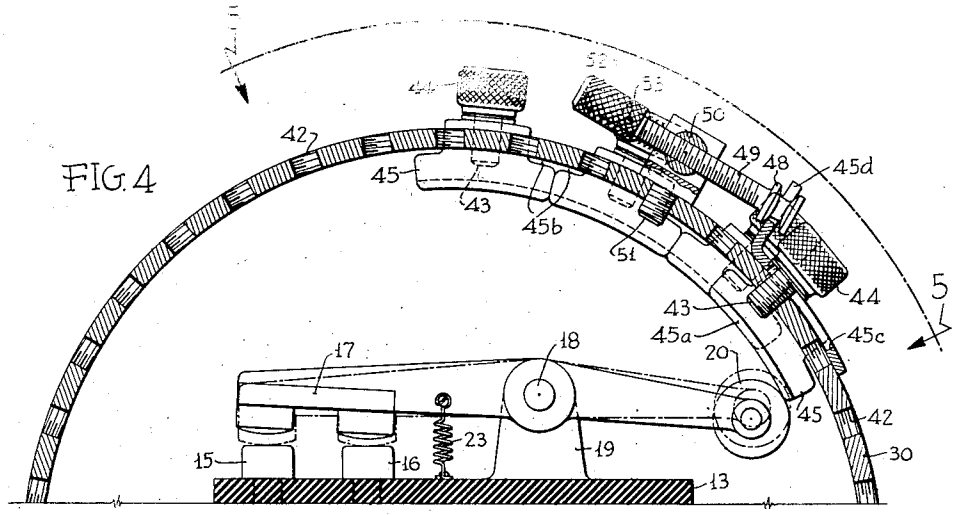
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ROTARY DRUM LIMIT SWITCH OPERATING MECHANISM

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FIG. 4



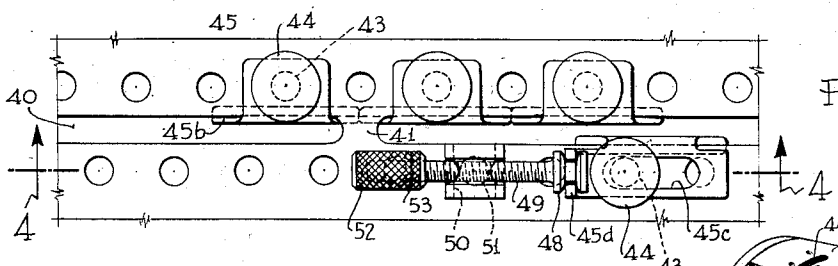
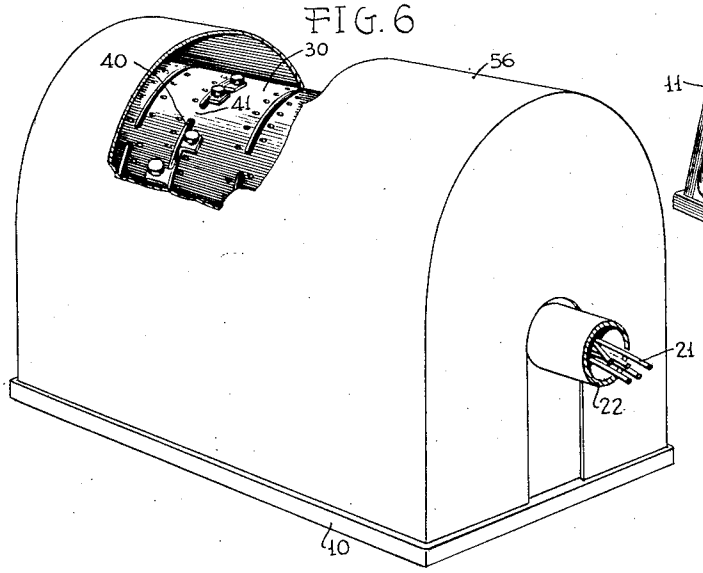


FIG. 5

FIG. 6



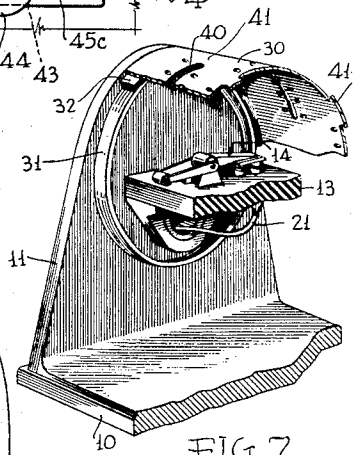


FIG. 7

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ROTARY DRUM LIMIT SWITCH OPERATING MECHANISM

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Application February 25, 1957, Serial No. 642,214

8 Claims. (Cl. 200—38)

This invention relates to rotary drum limit switch operating mechanism and has for an object the provision of improvements in this art.

The invention has been developed in connection with limit switch operating mechanism for metal forming presses and will be discussed in this connection though without intention of limiting the field of use of the invention in any way.

As is well known, forming presses of the rotary shaft type have associated with them a limit switch control mechanism for accurately controlling the actions of various parts of the press as well as various related devices such as feeders and ejectors (broadly referred to as servers) which must operate in accurately timed relationship with the press. These limit switch control mechanisms generally comprise a group of adjustable cams carried on a rotary cam shaft and a corresponding group of limit switches carried by a casing or shell surrounding the cams and operated by the cams.

It can be seen that it is difficult to gain access to the cams for adjustment and this is a great disadvantage, for in many types of operations, as when changing from the stamping of one part to another, frequent resetting of the cams is necessary.

Another difficulty encountered with the usual limit switch operating mechanisms is that there is exposure to live contacts in making adjustments so that an electrician as well as a press setter is required to make adjustments.

According to the present invention the limit switches are mounted at an interior location and an outside rotary drum carries all of the cams for operating the limit switches. The mechanism is so designed that all cam setings and adjustments can be made from the outside of the drum and consequently there is no danger of exposure to live contacts. Neither is there any need to manipulate any parts related to an electrical circuit. Therefore there is no need to have an electrician on the job when setting up operations. Another benefit of the arrangement is that the enclosed mechanism permits with safety the use of switches of heavy current capacity so that it is not necessary to use low current limit switches which act through high current relays, as is required when contacts are exposed during adjustment.

The apparatus includes means for installing parts to give an unlimited selection of cam action by inserting or rearranging or removing standard parts.

The apparatus also includes means for obtaining a vernier or micrometer adjustment of the end of the cam and this independently for either end.

The apparatus also provides clearly visible scales which indicate the selected cam arrangement so this can be noted and recorded for future reference, as for example for a later rapid resetting to perform the same operations.

The apparatus also provides means for making all cam settings and adjustments wholly by manipulation of parts which are provided and without the use of any tools whatever.

The objects and advantages of the invention will be

apparent from the following description of an exemplary embodiment, reference being made to the accompanying drawings thereof, wherein:

Fig. 1 is a vertical axial section through one form of apparatus embodying the invention;

Fig. 2 is a vertical transverse section taken on the line 2—2 of Fig. 1;

Fig. 3 is a flat developed plan view of the outer surface of the rotary drum, some of the cam element units being shown in section, to show what the action will be in one complete rotation of the drum;

Fig. 4 is an enlarged partial transverse vertical section showing a cam having a vernier adjustment at one end, the view being taken on the line 4—4 of Fig. 5;

Fig. 5 is a partial flat projection of the parts shown in Fig. 4 as seen from the line 5—5 on Fig. 4;

Fig. 6 is a perspective view of the apparatus with a protective outer cover in place, parts of the outer cover being cut away to show the rotary drum within; and

Fig. 7 is a transverse section in perspective, the section being indicated by the line 7—7 in Fig. 1.

As shown in the drawings, the apparatus comprises a base 10 which is adapted to be mounted in any convenient position, as on a press for example. At one end the base carries a pedestal support 11 on which there is secured, as by cap bolts 12, an insulating support bar 13 on which there are mounted a plurality of limit switch units 14. As shown in Figs. 2 and 4, each limit switch comprises a pair of fixed contacts 15 and 16 and a closure member 17 which is pivotally mounted on a shaft 18 carried by a support 19 on the insulating support bar 13. The pivoted closure member has an extension carrying an operating roller 20 adapted to be operated by a rotary cam. Conductor leads 21 extend from the contacts 15, 16 into a conduit 22 secured in the pedestal support 11 whence they run to their appropriate connections. The closure member 17 is urged toward contact engaging or circuit closing position by a spring 23.

At the outer end of the base 10 there is carried another pedestal support 26 which carries a bearing 27 in which a driven drum shaft 28 is rotatably mounted. The shaft carries a head 29 which comprises part of a rotary cam drum 30. For rigidity the end of the drum is rotatably supported on an annular bearing flange 31 carried by the pedestal support 11, a sealing and friction-reducing ring 32, as of "nylon" or "Teflon" being interposed between the flange 31 and the inner surface of the drum. At the other end the insulating bar 13 has a bearing cup 33 secured thereon, as by cap bolts 34, and within this bearing cup there is rotatably mounted a hub 35 of the head 29, a sealing and friction reducing ring 36 as of "nylon" or "Teflon" being interposed.

The drum 30 in a plurality of axial positions corresponding to the limit switch positions is provided with a plurality of circumferential slots 40 separated by bars 41 of the drum providing for the arrangement of operating cams over any part or all of the complete circumference. On each side of each slot zone there is provided a circumferential line of tapped holes 42 to receive screws 43 provided with knurled heads 44 for manual manipulation. The screws are adapted to secure L-shaped cam sector units 45 to the drum. The lower portion of a cam sector unit is bent, as at 45*a*, to present a widened surface to the switch cam roller 20 but there is sufficient width in the slot for two of the bent portions 45*a* to enter side by side. The cam roller is made of dielectric material or is insulated.

The screw holes 42 on opposite sides of a slot are staggered relative to each other so that the cam units can have an overlap to obtain a total length of cam operating surface which is other than a multiple of the cam sector units. As shown, the screw holes 42 are placed 10 de-

grees apart so that the full circumference is divided into 36 equal spaces and there is a 5 degree offset between the holes of adjacent rows. The cam segments shown herein have an extent of 20 degrees and by an end overlap a length range from 15 degrees down to 5 degrees can be obtained. It will be observed that the cam units are cut away on the ends, as at 45*b*, so as to meet at the connecting bars 41. While the cam units selected for illustration herein have a circumferential length of 20 degrees, they could be either longer or shorter but preferably are some multiple of the screw hole spacing.

At either end where there is need for a more precise length adjustment means are hereby provided for moving the end cam sector unit with a micrometer or vernier control. This arrangement is shown in Figs. 4 and 5. Here the sector in the top arm which is clamped to the drum is provided with a circumferential slot 45*c* to receive the clamp screw 42. At one end an upturned projection 45*d* is apertured or slotted from the end to receive a grooved head 48 of a vernier adjusting screw 49 threaded in a short shaft 50 turnably carried in the upturned ears of an anchor screw 51 threaded in one of the holes 42. A knurled head 52 is threaded on the adjusting screw 49 after it has been screwed in the short shaft 50 and is secured thereon by a drive pin 53. It will be seen that the grooved head can be entered in the slot of the upturned portion 45*d* after the anchor screw has been screwed into the drum. If the vernier arrangement is not desired the slotted cam segment can be moved by hand and clamped by the screw 43.

The drum 30 is provided with a marked scale 55 at one or more points as desired to provide a reading of the cam arrangements. This may be read and recorded for future reference.

The entire apparatus is enclosed by a dust proof cover 56 which is removed while making adjustments and replaced to protect the operating apparatus after the adjustments have been made.

The operation and adjustment of the apparatus will be apparent from the above description. By providing an ample supply of the standard cam segment units and clamp screws and the vernier segment units and vernier adjustment units it will be a simple matter for a mechanic to arrange cams of any length and number desired for each limit switch and thus provide any type of interrelated control which may be desired.

While one embodiment has been described in detail for purposes of illustration it is to be understood that there may be various embodiments and modifications within the general scope of the invention.

What is claimed is:

1. Rotary limit switch operating apparatus, comprising in combination, a fixed inner support, a limit switch mounted on said support and provided with a cam follower adapted to be operated by a circumferentially moving cam, a cam drum mounted for rotation around said switch and its cam follower, said drum being provided with circumferentially elongated slots separated by short connecting elements, a plurality of cam units, each having a circumferentially extending cam segment disposed in a circumferential slot and a part lying outside the drum, a plurality of circumferential cam segments together forming a circumferential composite cam for actuating said cam follower, and means securing the cam units by their outside elements to the drum.

2. Rotary limit switch operating apparatus, comprising in combination, a fixed inner support, a limit switch mounted on said support and provided with a cam follower adapted to be operated by a circumferentially moving cam, a cam drum mounted for rotation around said switch and its cam follower, said drum being provided with circumferentially elongated slots separated by short connecting elements, a plurality of cam units, each having a circumferentially extending cam segment disposed in a circumferential slot and a part lying outside the drum, a plurality of circumferential cam segments together forming a circumferential composite cam for actuating said cam follower, and means securing the cam units by their outside elements to the drum, said composite cam comprising some segments which overlap each other circumferentially to provide a total circumferential cam length which is other than a multiple of the total lengths of the cam segments of which it is composed.

3. Rotary limit switch operating apparatus, comprising in combination, a fixed inner support, a limit switch mounted on said support and provided with a cam follower adapted to be operated by a circumferentially moving cam, a cam drum mounted for rotation around said switch and its cam follower, said drum being provided with circumferentially elongated slots separated by short connecting elements, a plurality of cam units, each having a circumferentially extending cam segment disposed in a circumferential slot and a part lying outside the drum, a plurality of circumferential cam segments together forming a circumferential composite cam for actuating said cam follower, and means securing the cam units by their outside elements to the drum, said cam units being L-shaped with a first arm of the L being blade-shaped to enter a slot from outside and with the second arm lying over the outer surface of the drum alongside the slot, and means for securing said second arms of said cam units to the drum.

4. Rotary limit switch operating apparatus, comprising in combination, a fixed inner support, a limit switch mounted on said support and provided with a cam follower adapted to be operated by a circumferentially moving cam, a cam drum mounted for rotation around said switch and its cam follower, said drum being provided with circumferentially elongated slots separated by short connecting elements, a plurality of cam units, each having a circumferentially extending cam segment disposed in a circumferential slot and a part lying outside the drum, a plurality of circumferential cam segments together forming a circumferential composite cam for actuating said cam follower, and means securing the cam units by their outside elements to the drum, said cam units being L-shaped with a first arm of the L being blade-shaped to enter a slot from outside and with the second arm lying over the outer surface of the drum alongside the slot, and means for securing said second arms of said cam units to the drum, the means for securing said second arms of the cam units to the drum comprising screws threaded into holes in the drum, the screw holes being located on both axial sides of a slot and being arranged in circumferentially staggered relationship on opposite sides of the slot.

5. Rotary limit switch operating apparatus, comprising in combination, a fixed inner support, a limit switch mounted on said support and provided with a cam follower adapted to be operated by a circumferentially moving cam, a cam drum mounted for rotation around said switch and its cam follower, said drum being provided with circumferentially elongated slots separated by short connecting elements, a plurality of cam units, each having a circumferentially extending cam segment disposed in a circumferential slot and a part lying outside the drum, a plurality of circumferential cam segments together forming a circumferential composite cam for actuating said cam follower, and means securing the cam units by their outside elements to the drum, said cam units being L-shaped with a first arm of the L being blade-shaped to enter a slot from outside and with the second arm lying over the outer surface of the drum alongside the slot, and means for securing said second arms of said cam units to the drum, at least some of the cam units being provided with circumferentially elongated slots in their second arms which lie on the outside of the drum, and screws entering holes and slots in said second arms and being threaded in holes of the drum for securing the cam units to the drum.

6. Apparatus as set forth in claim 5, which further includes vernier adjusting means for an end cam segment unit, the said end cam segment unit having a circumferential slot, a clamp screw threaded in the drum through the unit slot for securing the unit to the drum, an upstanding slotted member on said end unit, a vernier screw carried by a shaft on a stud screw threaded in another hole in said drum, a grooved head on said vernier screw embracing said upstanding slotted member, and a removable knurled operating thumb head secured as by a drive pin on the other end of the vernier screw.

7. Rotary drum limit switch operating apparatus, comprising in combination, a pedestal support, a support bar carrying a limit switch carried by said pedestal support, a second pedestal support spaced axially from the first said pedestal support, a rotary drum having a shaft rotatably carried by said second support, adjustable cam operators carried by said drum which are insertable and adjustable from the outside, and rotary bearings between the outer end of the drum and the first pedestal support and between the outer end of the support bar and the second pedestal support.

8. Apparatus as set forth in claim 1, wherein a plurality of switches are mounted in axially spaced relationship within said drum and wherein said drum is provided with a plurality of axially spaced slots and a plurality of composite cams for operating said plurality of switches.

References Cited in the file of this patent

UNITED STATES PATENTS

2,692,534 Pluess ---------- Oct. 26, 1954