April 19, 1966 J. SEBRING 3,247,334

ROTARY SWITCH WITH IMPROVED ADJUSTER APPARATUS FOR MULTIPLE BRUSH AND DISC CONTACTS

Filed Nov. 20, 1963 2 Sheets-Sheet 1

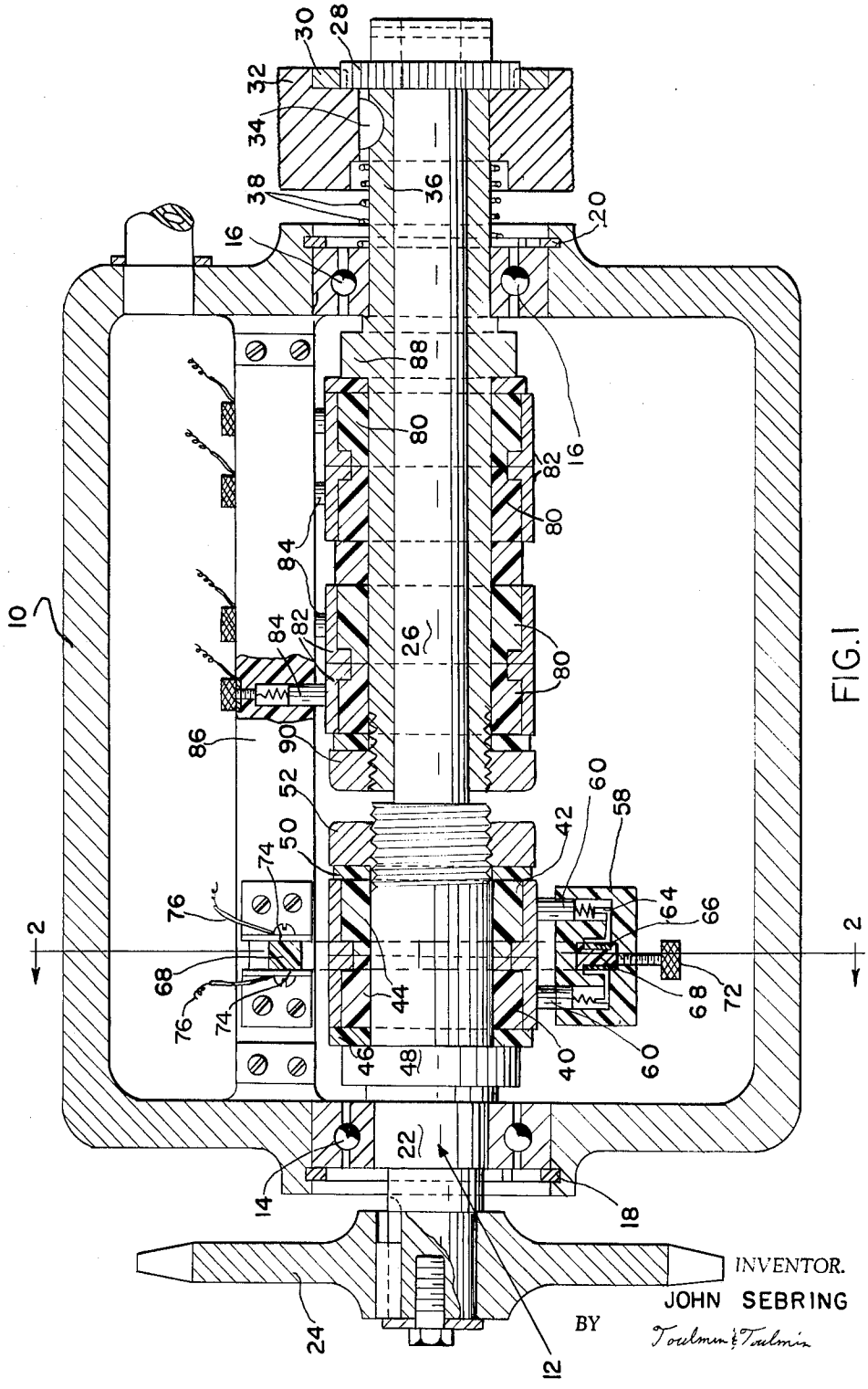

FIG. 1

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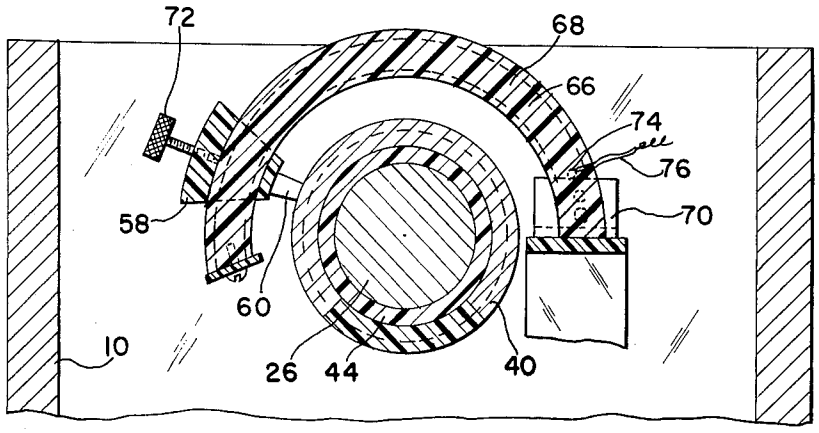

FIG. 2

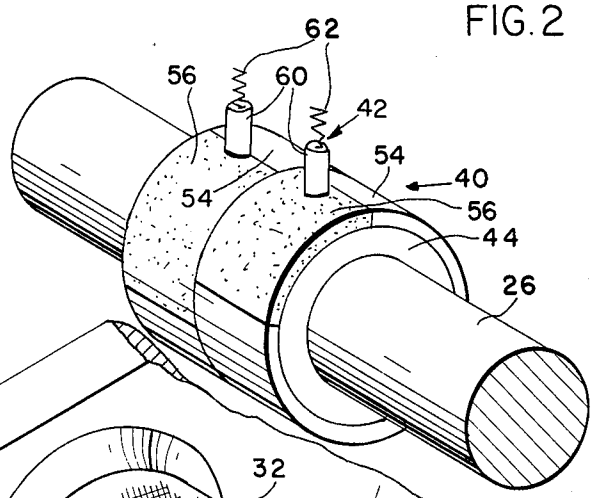

FIG. 3

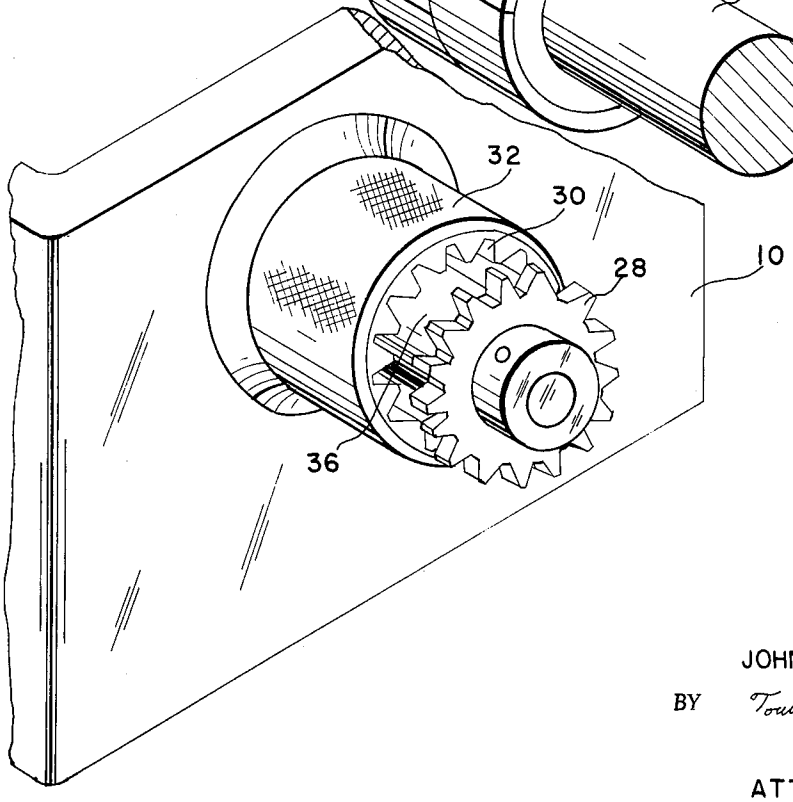

FIG. 4

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3,247,334

ROTARY SWITCH WITH IMPROVED ADJUSTER APPARATUS FOR MULTIPLE BRUSH AND DISC CONTACTS

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5 Claims. (Cl. 200—14)

This invention relates to rotary eleectric switches and is particularly concerned with an improved rotary electric switch in which multiple adjustments can be made to determine the time of opening and closing of the switch contacts. The present invention is a further improvement and development in connection with electric switches of the nature shown in United States Patent Nos. 2,635,727, 2,723,319 and 2,756,293, assigned to the same assignee as the instant application.

Electrical switches of the nature with which the present invention is concerned are used in connection with presses and the like and are employed for controlling various electrical circuits pertaining to auxiliaries associated with the press such as the clutch and brake or feed mechanisms or the like which must be operated in synchronism with the press.

In the patents referred to above, electrical switches are shown arranged for being driven by the press so as to operate in synchronism therewith and include in the switch structure, means for angularly adjusting the switch mechanism to obtain the desired coincidence between the switch and the press. Also shown in these patents is an arrangement for adjusting at least one portion of the switch angularly during operation of the press so that fine adjustments of at least those auxiliaries requiring such adjustments can be had.

In the switches of the prior patents, however, the first adjustment referred to adjusts the entire switch structure and this then requires further adjustment of some of the switch elements in order to provide for complete synchronization of the press and all of its auxiliaries.

The switch arrangement according to the present invention is an improvement on the switches referred to above in that the angular adjustment of one portion of the switch can be carried out entirely independently of the angular adjustment of another portion while the said other portion is capable of adjustment while the switch is in motion.

The provision of dual adjustments of this nature greatly enhances the utility of the switch arrangement without materially increasing the cost thereof and makes it possible to effect adjustment, for example of the clutch opening and closing circuit, without interfering with the adjustment of the switch mechanism for controlling the feed or the like.

With the foregoing in mind, it will be evident that a primary object of the present invention is the provision of an improved rotary electrical switch having multiple independent adjustments associated therewith.

Another object of the present invention is the provision of a rotary electrical switch having two groups of switch elements which can be adjusted independently of each other.

Still another object of this invention is the provision of a rotary electrical switch relatively simple in construction, but embodying multiple adjustment means whereby the switch can quickly be adjusted to control the opening and closing of circuits in which the switch is connected.

These and other objects and advantages of this invention will become more apparent upon reference to the following specification taken in connection with the accompanying drawings, in which:

FIGURE 1 is a plan sectional view of a switch constructed according to my invention;

FIGURE 2 is a transverse sectional view indicated by line 2—2 on FIGURE 1 showing an adjustable element of the switch;

FIGURE 3 is a fragmentary perspective view showing a pair of the annular members forming a part of each switch structure; and,

FIGURE 4 is a perspective view showing an adjustment associated with the switch.

Referring to the drawings somewhat more in detail, the switch will be seen to comprise a housing or casing 10 having shaft means 12 extending therethrough and rotatably supported on the anti-friction bearings 14 and 16 which are held in place in the casing as by snap rings 18 and 20.

The shaft means comprises a first shaft portion 22 supported in bearing 14 and having a projecting end part to which a sprocket 24 is keyed. Shaft portion 22 extends a short distance into housing 10 and is then reduced in diameter and continues on through the housing at the smaller diameter which is indicated at 26. At the extreme end of portion 26 is a gear or splined element 28 fixedly connected thereto. This element is adapted for engagement by an internally toothed or splined ring 30 fixed to knurled knob 32. Knob 32 is slidably keyed by key 34 to a shaft portion 36 which is in the form of a sleeve and which is rotatable on the reduced diameter portion 26. Knob 32 is urged toward the right by spring 38 to place ring 30 in driving engagement with member 28, but the knob can be pressed leftwardly against the bias of the spring to disengage ring 30 from member 28 at which time the knob can be availed of to rotate sleeve like shaft portion 36 about reduced diameter portion 26.

Mounted on the first mentioned shaft portion 22 is a pair of rings 40 and 42 which consist of insulating annular body portions 44 abutting insulating ring 46 on one side which engages flange 48 on shaft portion 22 and being abutted on the other side by insulating ring 50 which is held in place by nut 52 threaded on shaft 22. Nut 52 ordinarily holds the pair of rings fixedly to shaft 22, but it can be loosened to permit angular adjustment of the rings relative to each other.

Each of the pair of rings 40, 42 in addition to the inner insulating body parts 44 comprises peripheral segments 54 and 56 which make up the periphery of the rings and of which one is of conductive material and the other is insulating material. As will be seen in FIGURE 3, the conductive segments are indicated at 54 and may comprise from about 90° up to 220° of the periphery of the respective rings and these conductive segments furthermore are in abutting contact with each other. Angular adjustments of the rings to each other with the segments 54 in contact with each other is possible by loosening clamp nut 52.

Cooperating with the rings to form a switch is a movable brush holder 58 which will be seen in FIGURES 1 and 2. This brush holder has brackets therein receiving brushes 60 which bear on the peripheries of the two rings. Each brush 60 is connected by spring 62 and angular wiper element 64 with a conductive bar 66 on the respective side of a curved insulating support bar 68. This insulating support bar as will best be seen in FIGURE 2 is fixedly carried in the switch housing by bracket means 70 and extends arcuately about rings 40, 42 and slidably supports brush holder 58. The brush holder 58 can be attached along the bar and clamped thereto in adjusted position by clamp screw 72.

The two conductive bars 66 have terminal portions 74 to which wires 76 are connected. It will be evident that whenever both brushes 60 are in engagement with con-

ductive segments 54 the wires 76 will be interconnected whereas when either brush runs off its pertaining conductive segment, the wires 76 will be disconnected. The exact duration of the period that the wires 76 are thus interconnected is determined by relative angular adjustment of the rings 40, 42 whereas the timing of the interconnection of the wires 76 with respect to the angular position of shaft 22 can be determined by adjustment of brush holder 58 along curved support bar 68. This portion of the electric switch is thus completely adjustable and the last mentioned adjustment of the brush holder along its support bar can be effected while the switch is in operation.

It will be understood that the brushes 60 could be mounted in separate holders adjustable individually so that the duration of the period of interconnection of the wires 76 could be regulated while the switch was in operation if so desired. In this case, the brush holders would have individual curved support bars where it would be possible merely to divide brush holder 58 into two parts, separately movable and having individual clamp screws associated therewith.

Sleeve like shaft portion 36 also has a plurality of rings mounted thereon which are indicated at 80 and which also comprise pairs of rings having segments 82 on the periphery, some of which are conductors and some of which are not conductive. The peripheries of these rings are engaged by brushes 84 carried in the stationary support means 86. The several rings 80 are clamped against flange 88 of shaft portion 36 by clamp nut 90 so that these rings can be selectively angularly adjusted relative to each other to determine the duration of the period in which the brushes pertaining to adjacent rings are interconnected and also to adjust the timing or occurrence of such period with respect to the angular positioning of the switch shaft means.

With respect to rings 80, these are angularly adjustable within the switch as a unit by the use of knob 32 and it will be apparent that this adjustment of rings 80 has no influence whatsoever on the adjustment of brushes 60 with respect to the rings 40. Each of the adjustments provided in the switch is, therefore, entirely independent of the other adjustment and this makes it possible to effect the adjustments as required and without the necessity of having to modify some adjustments in case others are made.

It will be understood that this invention is susceptible to modification in order to adapt it to different usages and conditions; and accordingly, it is desired to comprehend such modifications within this invention as may fall within the scope of the appended claims.

What is claimed is:

1. A rotary control switch comprising; a housing, a shaft rotatably mounted in said housing, a first portion on said shaft having a driven end extending out of said housing, a pair of relatively angularly adjustable rings insulatingly mounted on said first portion, each of said rings having an electrical conducting segment mounted on a portion of its periphery and contactable with the similar segment of the other ring of said pair, a brush engaging the periphery of each of said pair, movable brush holder means adjustable circumferentially about the axis of said shaft comprising, a curved insulating support bar mounted in said housing in spaced concentric relationship with said shaft, a brush holder slidable over and for clamping to said support bar and electrical conductor means on said bar for connecting said brushes with the terminals of the switch, a second portion of said shaft having an end extending out of said housing, a sleeve rotatably mounted on said second portion and rotatable therewith, a plurality of spaced pairs of rings insulatingly mounted on said sleeve, each of said rings of said plurality of pairs of rings having an electrical conducting segment mounted in a portion of its periphery and contactable with the similar segment of the other ring of the pertaining pair, each said ring angularly adjustable in relation to one another, a brush engaging the periphery of each ring of said pairs of rings and conductors for electrically connecting each said brushes with a terminal on said switch, adjusting means on said sleeve and said second portion of said shaft comprising, a splined element fixedly connected to the end of said second portion of said shaft, an internally splined ring slidably keyed to said sleeve, and biasing means to urge said splined ring in driving engagement with said splined element, said splined ring being movable axially along said sleeve against said biasing means to disengage said splined ring from said sleeve and permit angular adjustment thereon.

2. A rotary control switch comprising; a housing, a shaft rotatably mounted in said housing, a first portion of said shaft having a driven end extending out of said housing, a pair of rings insulatingly mounted on said first portion and angularly adjustable in relation to each other, each of said rings having an electrical conducting segment mounted in a portion of its periphery and contactable with the similar segment of the other ring of said pair, a brush engaging the periphery of each ring of said pair, movable brush holder means adjustable; circumferentially about the axis of said shaft comprising, a curved insulating support bar mounted in said housing in spaced concentric relationship with said shaft, a brush holder slidable over and for clamping to said support bar and electrical conductor means on opposite sides of said bar for connecting said brushes with the terminals of the switch, a second portion of said shaft having an end extending out of said housing, a sleeve rotatably mounted on said second portion and rotatable therewith, a plurality of spaced pairs of rings insulatingly mounted on said sleeve, each of said rings of said plurality of pairs of rings having an electrical conducting segment mounted in a portion of its periphery and contactable with the similar segment of the other ring of the pertaining pair, all said pairs of rings adjustable in relation to each other, a brush engaging the periphery of each ring of said pairs of rings and conductor means for joining each said brush with a terminal on said switch, stationary support means fixed in said housing for mounting said brushes engaging said pairs of rings, adjusting means on said sleeve and said second portion of said shaft comprising, a splined element fixedly connected to the end of said second portion of said shaft, an internally splined ring slidably keyed to said sleeve, and biasing means to urge said splined ring in driving engagement with said splined element, said splined ring movable axially along said sleeve against said biasing means to disengage said splined ring from said sleeve and permit angular adjustment thereon.

3. A rotary control switch comprising: a shaft having a driven portion adapted to effect rotation of the shaft, a housing providing journal portions far rotatably supporting said shaft at spaced portions thereon, a pair of spaced insulating rings mounted for rotation on said shaft and each having electrically conductive segments mounted at the outer periphery of a respective one of said pair of insulating rings, a brush disposed radially from each said pair of insulating rings and engageable at the outer periphery to effect electrical conduction therebetween, means for circumferentially adjusting said pair of spaced rings to control the duration of conduction between said rings, additional adjuster means for positioning said brushes angularly about said insulating rings to define the timed occurrence of contact and which together with the circumferential adjustment of said rings provides a switch operation of controlled duration and sequence, a sleeve coaxially mounted on said shaft and movable longitudinally thereon, means for selectively coupling and decoupling said sleeve and shaft and providing relative angular positioning thereon whereby said shaft is in a pre-selected angular disposition therein and in drivable relation with said sleeve to effect its co-rotation in coupled position and further to provide adjustable relative rotation between said sleeve

and shaft in decoupled relation for other angular positioning, a plurality of circular means spaced longitudinally on said shaft and rotatable therewith, said circular means having electrically conductive portions, brush means engageable with the outer periphery of said circular means to provide for electrical switching operation of a duration and sequence independent of said first-named switching operation.

4. A rotary control switch comprising: a shaft having a driven portion adapted to effect rotation of the shaft, a housing providing journal portions for rotatably supporting said shaft at spaced portions thereon, a pair of spaced insulating rings mounted for rotation on said shaft and each having electrically conductive segments mounted at the outer periphery of a respective one of said pair of insulating rings, a brush disposed radially from each said pair of insulating rings, and engageable at the outer periphery to effect electrical conduction therebetween, means for circumferentially adjusting said pair of spaced rings to control the duration of conduction between said rings, additional adjuster means for positioning said brushes angularly about said insulating rings to define the timed occurrence of contact and which together with the circumferential adjustment of said rings provides a switch operation of controlled duration and sequence, a sleeve coaxially mounted on said shaft and movable longitudinally thereon, means for selectively coupling and decoupling said sleeve and shaft and providing relative angular positioning thereon whereby said shaft is in a pre-selected angular disposition therein and in drivable relation with said sleeve to effect its co-rotation in coupled position and further to provide adjustable relative rotation between said sleeve and shaft in decoupled relation for other angular positioning, a plurality of circular means spaced longitudinally on said shaft and rotatable therewith, said circular means having electrically conductive portions, brush means engageable with the outer periphery of said circular means to provide for electrical switching operation of a duration and sequence independent of said first-named switching operation, and yieldable means for urging said sleeve and shaft into coupled relation and selectively compressed to provide decoupling and angular adjustment between said shaft and sleeve to adjust switching operation.

5. A rotary control switch comprising: a shaft having a driven portion adapted to effect rotation of the shaft, a

housing providing journal portions for rotatably supporting said shaft at spaced portions thereon, a pair of spaced insulating rings mounted for rotation on said shaft and each having electrically conductive segments mounted at the outer periphery of a respective one of said pair of insulating rings, a brush disposed radially from each said pair of insulating rings and engageable at the outer periphery to effect electrical conduction therebetween, means for circumferentially adjusting said pair of spaced rings to control the duration of conduction between said rings, additional adjuster means for positioning said brushes angularly about said insulating rings to define the timed occurrence of contact and which together with the circumferential adjustment of said rings provides a switch operation of controlled duration and sequence, a sleeve coaxially mounted on said shaft and movable longitudinally thereon, means for selectively coupling and decoupling said sleeve and shaft and providing relative angular positioning thereon whereby said shaft is in a pre-selected angular disposition therein and in drivable relation with said sleeve to effect its co-rotation in coupled position and further to provide adjustable relative rotation between said sleeve and shaft in decoupled relation for other angular positioning, a plurality of circular means spaced longitudinally on said shaft and rotatable therewith, said circular means having electrically conductive portions, brush means engageable with the outer periphery of said circular means to provide for electrical switching operation of a duration and sequence independent of said first-named switching operation, and means for circumferentially adjusting the relative position of circular means on said sleeve.

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