Jan. 16, 1968 E. A. JONES 3,364,316

SWITCH GANGING MECHANISM

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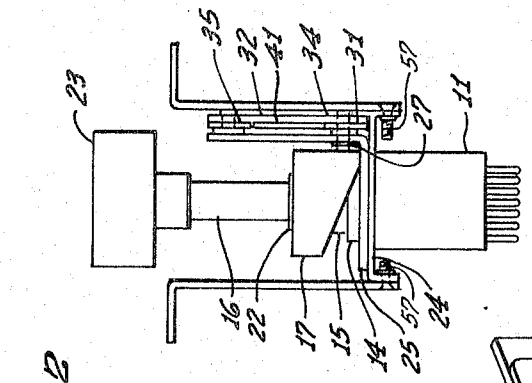


Fig. 2

Fig. 1

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Fig. 3

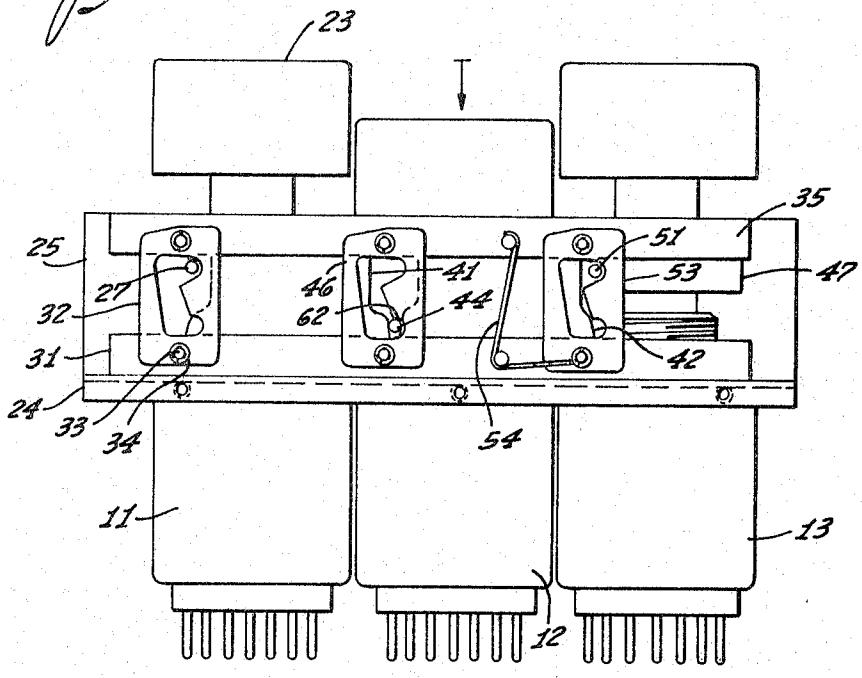
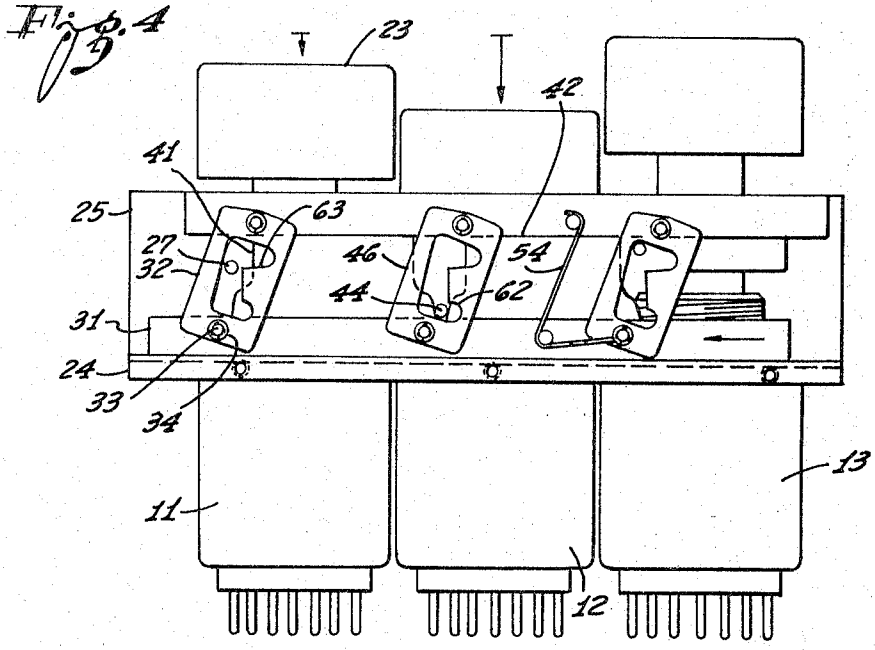


Fig. 4



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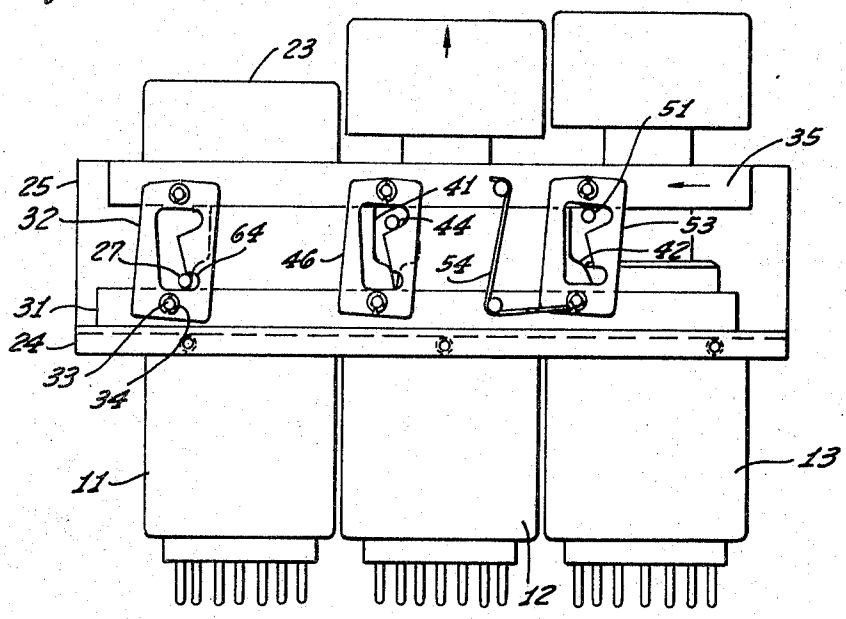
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SWITCH GANGING MECHANISM

Filed Oct. 11, 1966 3 Sheets-Sheet 3

Fig. 5



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SWITCH GANGING MECHANISM

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6 Claims. (Cl. 200—5)

ABSTRACT OF THE DISCLOSURE

A switch ganging mechanism in which the pivotally movable locking arm that is associated with each of a plurality of push button switches has a central cutout with a generally S-shaped wall; the upper loop of the wall forming a camming surface and the lower loop forming a locking surface. Partial depression of a switch pivots the locking arms to a switch-releasing position and full depression of a switch enables the locking arms to pivot to lock a switch in a depressed position.

The present invention relates to switch ganging mechanisms and more particularly to a switch ganging mechanism where two or more push button switches mounted in a row may be mechanically tied together to enable only one switch at a time to be operated.

A plurality of push button switches ganged together are frequently required to control complex modern electrical and electronic equipment. Each switch in the gang will normally set up a circuit for a desired mode of operation of the apparatus, or to connect the apparatus with a particular piece of auxiliary equipment. It is usually desirable that only one switch in the gang can be operated at a time. However, push button switch ganging mechanisms heretofore known to the art have been relatively bulky and complex, with the complexity increasing geometrically with the number of switches to be ganged together. Further, push button switch ganging mechanisms heretofore known in the art have required highly stressed parts which are prone to failure, resulting in low reliability. Further, prior art ganging mechanisms have been relatively bulky, requiring a considerable space between adjacent switches in the gang.

In contrast, the switch ganging mechanism of the present invention requires few parts which are not highly stressed. The mechanism is compact, enabling switches to be mounted side-by-side. The parts may be fabricated in a simple manner, as by stamping from sheet stock. A pivoting locking arm having a sinuous, generally S-shaped internal cam surface is provided adjacent each switch in the gang. The locking arms are interconnected by means of a simple parallel arm linkage. Each switch is provided with an actuating pin which cooperates with internal surface of the adjacent locking arm. Depression of the switch causes the actuating pin, cooperating with the internal camming surface of its associated locking arm, to pivot all of the locking arms, which simultaneously releases any switch which may have previously been depressed. Further depression of the switch carries the actuating pin into a locking portion of the locking arm, allowing a spring to urge the parallel arm linkage back to a switch locking position. Interlocks are provided between each pair of adjacent actuating pins. These are so proportioned that only one actuating pin may be depressed at a time, since the interlocks are forced against one another by a depressed actuating pin. The actuating pins are restrained to a linear motion by guide plate. The locking arms, the parallel arm linkage interconnecting the locking arms, and the interlocks are all mounted between the guide plate and an exterior cover plate, requiring a very small volume.

It is, therefore, an object of this invention to provide a push button switch ganging mechanism allowing only one switch at a time to be depressed.

Another object of this invention is to provide a push button switch ganging mechanism locking the depressed switch in its actuated position and releasing it upon depression of another switch.

Another object of this invention is to provide a push button switch ganging mechanism requiring few, simply fabricated parts which are not highly stressed.

Another object of this invention is to provide a push button switch ganging mechanism which is compact, simple and inexpensive to manufacture and is durable and reliable in use.

These and other objects and advantages of the present invention will become apparent from the following specification and accompanying drawings, wherein:

FIGURE 1 is an exploded view of the switch ganging mechanism of the present invention;

FIGURE 2 is a side view of the switch ganging mechanism of the present invention;

FIGURE 3 illustrates the ganging mechanism with a first switch depressed and locked;

FIGURE 4 illustrates the ganging mechanism with a second switch partially depressed; and

FIGURE 5 illustrates the ganging mechanism with the second switch completely depressed and the first switch returning to its normal position.

Referring now to the drawings, and particularly to FIGURE 1, a three-switch gang mechanism is illustrated. As will be apparent, the mechanism may be extended to gang as many switches as may be desired. Switches **11**, **12**, and **13** illustrated in the drawings are of the type disclosed in copending application Ser. No. 577,729, filed Sept. 7, 1966, now Patent No. 3,329,792, for Multi-Circuit Push Button Switch, by Edward A. Jones and Robert C. Carter. However, other types of push button switches may be employed.

Switch **11**, exemplary of switches **11**, **12**, and **13** is provided with a locking nut **14** cooperating with threaded collar **15** on the body of the switch. Drive cylinder **16**, extending from the top of the switch, is depressed to actuate the switch. An actuator arm **17** is fastened to drive cylinder **16** by means of locking rings **21** and **22**, cooperating with suitable grooves on drive cylinder **16**. Push button cap **23** is screwed or otherwise secured to the top of drive cylinder **16**. A channel cross section base plate **24** is secured to an angle cross section guide plate **25**. Base plate **24** and guide plate **25** are apertured to accept the bodies of the switches. In addition, guide plate **25** is provided with apertures such as **26** to cooperate with actuating pin **27**.

Lower linkage arm **31** is secured to guide plate **25**. Locking arm **32** is pivotally secured to fixed linkage arm **31** and to guide plate **25**, as by grooved pin **33** cooperating with C-clip **34**.

An upper linkage arm **35** is pivotally connected to locking arm **32** by means of grooved pin **36**, cooperating with C-clip **37**. Freely slideable interlocks **41** and **42** are positioned between upper linkage arm **35** and lower linkage arm **31**. Interlocks **41** and **42** serve to prevent more than one switch from being depressed into its actuated position at any one time, as will be further described hereinbelow.

Switch **12**, illustrated in FIGURES 3, 4, and 5, is supplied with actuator assembly **43**, including an actuator pin **44**. Actuator pin **44** penetrates guide aperture **45**, the gap between interlocks **41** and **42**, and locking arm **46**. Similarly switch **13** is provided with actuator assembly **47**, having an actuator pin **51**. Actuator pin **51** cooperates with guide aperture **52** and locking arm **53**. Locking arms

46 and 53 are pivotally mounted in the same manner as locking arm 32.

Movable linkage arm 35 is urged to its normal rest position in line with fixed linkage arm 31 by means of an L-shaped spring 54. Locking arms 32, 46, and 53 are thereby held perpendicularly to linkage arms 35 and 31. The switch assembly is completed by rear mounting plate 55 and front mounting plate 56. Mounting plates 55 and 56 has an L cross section. The mounting plates are secured to base plate 24 by suitable screws, such as 57, cooperating with aperture 61 in mounting plate 56 and threaded aperture 62 in base plate 24.

The three switch gang, illustrated in FIGURES 3, 4, and 5, is shown in FIGURE 3 with switch 12 depressed and locked. Actuator pin 44 is in the locking surface in the lower loop of the generally S-shaped inner wall at the bottom of locking arm 46. Switches 11 and 13 are in the up position and corresponding actuator pins 27 and 51 are in the upper sections of locking arms 32 and 53 respectively.

In FIGURE 4 push button 23 of switch 11 is illustrated partially depressed. The position of actuator pin 27 is illustrated as it is after locking arm 32 has been pivoted by depression of actuating pin 27, acting upon camming surface 63, in the upper loop of the generally S-shaped inner wall. Locking arms 46 and 53 are also pivoted, and linkage arm 35 has been moved to the right, stressing spring 54. Actuator pin 44 of switch 12 has been freed of locking surface 62 and is free to return to its upward position.

In FIGURE 5, switch 12 is illustrated almost completely returned to its normal, up, position. Switch 11 has been completely depressed, and spring 54 is moving upper linkage arm 35 back to its rest position. Upon attaining rest position, locking arm 31 will be vertical, and actuating pin 27 will be held by locking surface 64 of locking arm 31.

Referring back to FIGURE 3, it will be noted that interlocks 41 and 42 are on either side of actuating pin 44, illustrated in the down, or actuated, position. Interlocks 41 and 42 are so dimensioned that if switch 11 or 13 is depressed while switch 12 is held down, actuating pins 27 and 51 cannot be fully depressed due to interference by the lower portions of interlocks 41 and 42.

In FIGURE 5, actuating pin 44 has been moved from between interlocks 41 and 42. Interlock 41 is, therefore, free to be moved to the right by actuating pin 27. Upon full locking, interlocks 41 and 42 will be in contact with one another, blocking full depression of switches 12 or 13. Thus, neither of the other switches can be depressed while switch 11 is in the depressed position.

It is to be understood that the above-described embodiment of the present invention is merely illustrative of the application of the principles thereof unless other arrangements have been devised by those skilled in the art without departing from the spirit and scope of the invention as defined by the appended claims.

What I claim is:

1. Switch ganging mechanism including:

a plurality of push button switches;

a pivotally movable locking arm having a central cut-out with a generally S-shaped wall, the upper loop of said S-shaped wall forming a camming surface and the lower loop forming a locking surface, a locking arm being associated with each of said switches;

actuating means including an actuating pin secured to each of said switches and cooperating with said camming surface and said locking surface of said generally S-shaped wall of said locking arm; and

means interconnecting said locking arms for simultaneous movement, whereby partial depression of a switch pivots said locking arms to a switch-releasing position and full depression of a switch enables said locking arms to pivot to lock a switch in depressed position.

2. In the switch ganging mechanism of claim 1; said means interconnecting said locking arms including:

a fixed linkage arm;

a slideably movable linkage arm; and

fastening means for pivotally securing said locking arms to said fixed and movable linkage arms.

3. In the switch ganging mechanism of claim 2:

resilient means connected to said slideably movable linkage arm and urging said locking arms to a depressed-switch-locking position.

4. In the switch ganging mechanism of claim 1:

a guide plate having a plurality of slotted apertures for restraining said actuating means to linear movement; and

means securing said fixed linkage arm to said guide plate.

5. In the switch ganging mechanism of claim 4:

interlocking means slideably positioned between said linkage arms, and parallel to said guide plate.

6. In the switch ganging mechanism of claim 5, said interlocking means including:

a platelike interlock element slideably positioned between adjacent switches,

each of said interlock elements having an upper portion and a lower portion wider than said upper portion, said actuating pins being normally positioned adjacent said upper portion and a depressed actuating pin positioned adjacent said lower portion,

camming sections between said upper and lower portions adapted to cooperate with said actuating pins and enable said actuating pin to slideably move adjacent interlock elements.

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