Dec. 23, 1958 D. C. GINN 2,866,024

SWITCH

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FIG. 1

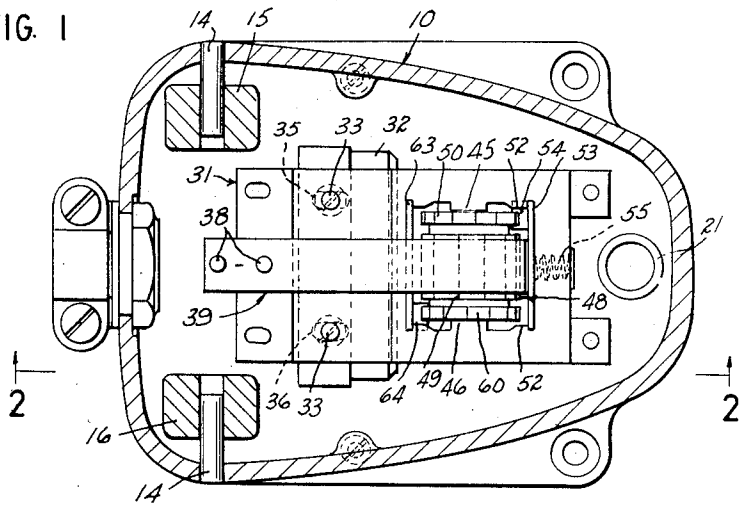


FIG. 2

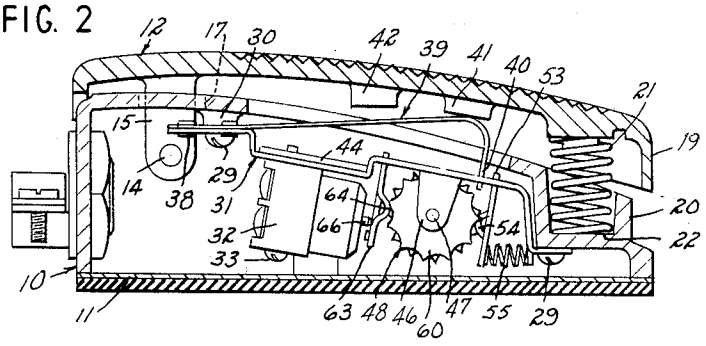


FIG. 3

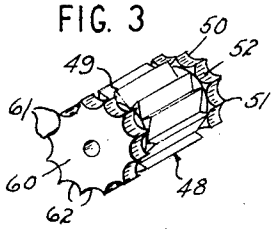
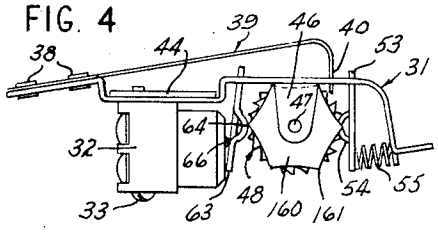


FIG. 4



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SWITCH

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7 Claims. (Cl. 200—86.5)

This invention relates to foot operated switches, and more particularly to an improved switch actuating mechanism for use in a foot operated switch.

It is an object of the invention to provide an improved and novel switch actuating mechanism for switches of the foot operated type which is simple and economical to fabricate and assemble, which is compact and utilizes a minimum of parts, many of which are interchangeable, and which will operate effectively over long periods of time without repair or replacement.

A more specific object is to provide a switch actuating mechanism of the type referred to which in one embodiment can be arranged to provide for an impulse type of operation which is to say, that the switch will be closed momentarily when the foot treadle is depressed and will remain open after the momentary closing even though the foot treadle is maintained depressed. Included in this object, is the provision for a simple change to convert the switch for maintained contact operation which is to say, that the switch will be alternately opened and closed by depression of the foot treadle and following one actuation will remain open or closed, as the case may be, until the foot treadle is raised and again depressed.

Other objects will be in part obvious, and in part pointed out more in detail hereinafter.

The invention accordingly consists in the features of construction, combination of elements and arrangement of parts which will be exemplified in the construction hereafter set forth and the scope of the application of which will be indicated in the appended claims.

Fig. 1 is a plan view of a foot operated switch incorporating the present invention with the treadle of the switch removed and with the top of the base cut away to expose certain of the operating parts;

Fig. 2 is a cross sectional view of the complete switch taken along the line 2—2 of Fig. 1 with the treadle in place;

Fig. 3 is a perspective view of one of the control elements of the switch; and

Fig. 4 is a side view of a modified form of the switch actuating elements.

With reference to the drawings, the switch is comprised of a base 10, an enclosing bottom plate 11, and a treadle 12. The treadle 12 is hingedly mounted on the base by means of the hinge pins 14 received in the depending lugs 15, 16 of the treadle which extend downwardly through slots 17, in the top of the base. The treadle 12 has a flange 19 which is arranged to telescope over the indented top portion 20 of the base 10. A spring 21 received in a well 22 in the base and engaged with the treadle 12 provides a bias to urge the cover in a counter clockwise direction as viewed in Fig. 2. Counter clockwise movement of the treadle is limited by engagement of the flange 19 at the rear of the base while clockwise movement is limited by engagement of the underside of the treadle with the top of the base.

Mounted in the body, such as by screws 29 threadably received in bosses 30 and the underside of the well 22 is a frame 31. The frame 31 is preferably in the form of a simple sheet metal stamping and is intended to carry all of the operating parts including an electrical switch 32 which is adjustably mounted on the underside of the frame by screws 33 extending into backing plate 44 through slots 35 and 36 in the frame which permit axial adjustment of the switch 32 for purposes to be hereinafter explained.

Also mounted at one end of the frame by means of rivets 38 is a leaf spring 39. The spring 39 extends generally parallel to the frame and has a downwardly struck end portion forming the pawl 40. The spring is disposed so as to engage the boss 41 of the treadle 12 by means of which it is actuated when the treadle is depressed.

The frame 31 is provided with downwardly struck flanges 45 and 46 which receive an axle 47 on which is mounted an elongated ratchet wheel or cylinder 48. The ratchet wheel is provided with a plurality of circumferentially arranged teeth 49 arranged so as to be engaged by the pawl 40 of the spring 39 as the treadle 12 is moved downwardly to move the ratchet wheel one tooth in a clockwise direction as viewed in Fig. 2.

Mounted on one end of the ratchet wheel for rotation therewith is a locking disc 50. This disc has a plurality of promontories 51 forming notches therebetween which are equal in number to the teeth 49 of the ratchet wheel 48. The locking disc 50 is adapted to be engaged by a holding detent in the form of a struck-up arcuate piece 54 on a depending locking plate 53 which is hingedly mounted on the frame 31. For simplicity of manufacture and assembly, the plate 53 is merely notched at its upper end so that it can be slid onto the inner edge portions 52 of the frame. The plate 53 is biased into engagement with the cam 50 by means of a spring 55 disposed between the plate and the adjacent end portion of the frame 31.

As the ratchet wheel 48 is rotated by means of the pawl 40 the detent 54 is first cammed out of engagement with one notch of the disc 50 until it passes the adjacent promontory 51 whereupon it is urged into engagement with the next counter clockwise notch by the spring 55. Thus, there is provided a snap action each time the treadle 12 is depressed and also means to hold the ratchet in predetermined rotated position, particularly during return movement of the pawl.

Mounted on the other end of the ratchet wheel for rotation therewith is an actuating cam 60 which, in the embodiment shown in Figs. 1–3, is identical to the locking disc 50 in that it has a similar plurality of promontories 61 and notches 62 equal in number to the ratchet teeth 49. Disposed between the ratchet wheel and the switch 32 is an actuating plate 63, which for convenience and simplicity of manufacture is a duplicate of plate 53, except that it is turned around and is similarly hingedly hung from the frame 31. The struck-up piece 64 on plate 53 acts as a cam follower and engages with the cam 60. The opposite side of plate 63 rests against the actuating plunger 66 of the switch 32 which is spring biased to an outward position.

The position of switch 32 is adjusted so that when the follower 64 is in engagement with a notch 62 of the cam 60, the plunger will be in fully extended position and when the follower 64 engages a promontory 61, the plate 63 is cammed to the left to push in the plunger 66 and actuate the switch 32. Inasmuch as the cam 60, in the embodiment shown in Figs. 1–3, has promontories and notches equal in number to the ratchet wheel teeth, the follower 64 will be only momentarily cammed to actuate the switch each time the ratchet wheel is advanced one notch. That is to say, the plate 63 will be moved rapidly to the left and then released to return to the right, as viewed in

Fig. 2, each time the treadle **12** is depressed thus providing an impulse in the circuit controlled by the switch **32**. It should also be noted that when the treadle **12** is depressed it may be maintained in its lower position without causing any further movement of the ratchet and thus actuation of the switch **32**.

From the above description it is believed that the operation of the switch will be apparent. However, one additional feature of the invention should be explained namely, that the cam **60** is mounted on ratchet wheel **48** with its promontories **61** slightly in advance of the promontories **51** of locking disc **50**. This feature precludes the possibility of a hang-up since the follower **64** and detent **54** will not both engage at dead center on a promontory at the same time.

In Fig. 4 there is shown a modification of the switch actuating means to provide for maintained contact or closing of the electrical switch when the treadle is depressed and to maintain the switch actuated until the treadle is again depressed and without the necessity of maintaining the treadle of the foot switch depressed.

The means of accomplishing this latter end is achieved merely by substituting an actuating cam **160** for the cam **60** which differs from cam **60** in that it has only one-half the number of promontories as indicated at **161**. As will be apparent, when the ratchet wheel **48** is advanced one tooth by depression of the treadle and assuming the follower **64** is originally engaged by a promontory **161** as shown in Fig. 4, the follower **64** will then be engaged on a flat between the promontories **161** permitting the plate **63** to be moved to the right as viewed in Fig. 4 and thus permit opening of the switch **37**. Inasmuch as the ratchet **48** can be rotated only one tooth each time the treadle **12** is depressed, it is obvious that once the switch **32** is opened or closed it will remain in this condition even though the treadle **12** is permitted to return to its upper position.

Thus, it can be seen that there has been provided a foot switch of single and novel construction which will provide an impulse in an electrical circuit each time the treadle is depressed and independent of whether the treadle is maintained in the depressed position or not and further which can easily be converted to a switch which will maintain an electrical circuit energized or de-energized regardless of whether or not the treadle is held in the depressed position.

As many changes could be made in the above construction and many apparently widely different embodiments of this invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the language used in the following claims is intended to cover all of the generic and specific features of the invention herein described and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

I claim:

1. In a foot operated switch of the type comprising a base and a foot treadle mounted for oscillating movement relative to the base between a raised and a depressed position, the combination comprising a ratchet wheel rotatably mounted on a fixed axis of rotation in the base, a pawl for operating the ratchet wheel mounted for oscillation with the treadle, a cam disc secured to the ratchet wheel for rotation therewith, an electrical switch mounted for actuation by the cam disc, a single holding disc separate from the same disc secured to the ratchet wheel for rotation therewith and having a plurality of notches equal in number to the teeth of the ratchet wheel, and a spring biased detent engaged in one of the notches of the holding disc to locate said cam disc in a predetermined rotated position in response to each depression of the treadle.

2. In a foot operated switch of the type comprising a base and a foot treadle mounted for oscillating movement relative to the base between a raised and a depressed position, the combination comprising a ratchet wheel rotatably mounted on a fixed axis of rotation in the base, a pawl for operating the ratchet wheel mounted between the ratchet wheel and treadle for oscillation with the treadle, a separate replaceable cam disc secured to one end of the ratchet wheel for rotation therewith, said cam disc having a plurality of promontories whose number is evenly divisible into the number of ratchet wheel teeth, an electrical switch mounted for actuation by the cam disc, a separate single holding disc secured to the other end of the ratchet wheel for rotation therewith and having a plurality of edge connected notches equal in number to the number of ratchet wheel teeth, and detent means biased into engagement with a notch on the holding disc to locate said cam disc in a predetermined rotated position in response to each depression of the treadle.

3. The combination set forth in claim 2 wherein the promontories of the cam disc are angularly offset from the notches of the holding disc.

4. In a foot operated switch of the type comprising a base and a foot treadle mounted for movement relative to the base, a ratchet wheel rotatably mounted in the base transverse of the direction of movement of the treadle and having a fixed axis of rotation, a pawl for actuating the ratchet wheel mounted for movement with the treadle, a first plate hingedly mounted at one side of the ratchet wheel having a struck-up portion adjacent one edge forming a detent, a holding disc having a plurality of edge connected notches equal to the number of ratchet teeth secured to one end of the ratchet wheel for rotation therewith and cooperating with said detent, a spring urging the plate toward the holding disc to provide snap action advance of the ratchet wheel subsequent to initial advance of the ratchet wheel by the pawl, a second plate hingedly mounted at the other side of the ratchet wheel having a struck-up portion adjacent one edge forming a cam follower, a cam disc separate from the holding disc secured to the end of the ratchet wheel opposite from the holding disc having a series of promontories whose number is evenly divisible into the number of ratchet wheel teeth, said cam disc being engaged with the said cam follower, and an electrical switch having an outwardly biased actuating element engaging the second plate, the actuation of said switch by the cam disc being timed to occur during the snap action advance of the ratchet wheel.

5. In a foot operated switch of the type comprising a base and a foot treadle mounted for movement relative to the base, the combination comprising a ratchet wheel mounted in the base transverse of the direction of movement of the treadle and having a fixed axis of rotation, a pawl for actuating the ratchet wheel mounted for movement with the treadle, a first rigid plate hingedly mounted at one side of the ratchet wheel having a struck-up portion adjacent one edge forming a detent, a holding disc having a plurality of edge connected notches equal to the number of ratchet teeth secured to one end of the ratchet wheel for rotation therewith and cooperating with said detent, a spring urging the plate toward the holding disc, a second rigid plate hingedly mounted at the other side of the ratchet wheel having a struck-up portion adjacent one edge forming a cam follower, a cam disc secured to the end of the ratchet wheel opposite from the holding disc having a series of V-shaped promontories whose number is evenly divisible into the number of ratchet teeth, said promontories having engageable with the said cam follower, and a two position electrical switch having an outwardly biased actuating element mounted for engagement by the second plate to place said notch in one of

its two positions in response to engagement of said cam follower by one of said promontories.

6. In a foot operated switch of the type comprising a base and a foot treadle mounted for movement relative to the base, the combination comprising a ratchet wheel mounted in the base transverse of the direction of movement of the treadle and having a fixed axis of rotation, a pawl overlying the ratchet wheel for engagement by the treadle, a first rigid plate hingedly mounted at one side of the ratchet wheel having a struck out portion forming a detent thereon, a holding disc having a plurality of edge connected notches equal to the number of ratchet teeth secured to one end of the ratchet wheel for rotation therewith, said detent being engaged in one of said notches, means urging the detent into notch engagement to provide snap action advance of the ratchet wheel relative to said pawl subsequent to initial advance of the ratchet wheel by said pawl, a spring urging the plate toward the holding disc, a second rigid plate substantially identical with the first plate hingedly mounted at the other side of the ratchet wheel with its struck out portion forming a cam follower thereon, a replaceable cam disc separate from said holding disc secured to the end of the ratchet wheel opposite from the holding disc having a series of promontories whose number is evenly divisible into the number of ratchet teeth, said cam disc being engaged with the said cam follower, and an electrical switch having an outwardly biased actuating element engaging the second plate.

7. In a foot operated switch of the type comprising a base and a foot treadle mounted for movement relative to the base, the combination comprising a frame mounted in the base, a ratchet wheel mounted on the frame transverse of the direction of movement of the treadle and

having a fixed axis of rotation, a leaf spring fastened at one end on the frame and overlying the ratchet wheel for engagement by the treadle, the other end of the leaf spring being struck over to form a pawl cooperating with the ratchet wheel, a first rigid plate hingedly depending from the frame along one side of the ratchet wheel having a struck-up portion adjacent one edge forming a detent, a holding disc having a plurality of edge connected notches equal to the number of ratchet teeth secured to one end of the ratchet wheel for rotation therewith and cooperating with said detent, a spring urging the plate toward the holding disc to provide snap action advance of the ratchet wheel subsequent to initial advance thereof by the treadle, a second rigid plate substantially identical with the first plate hingedly depending from the frame along the other side of the ratchet wheel with the struck-up portion thereof forming a cam follower, a replaceable cam disc separate from the holding disc secured to the end of the ratchet wheel opposite from the holding disc having a series of promontories whose number is evenly divisible into the number of ratchet teeth, said cam disc being engaged with the said cam follower, and an electrical switch having an outwardly biased actuating element, said switch being mounted on the frame to engage the actuating element with the second plate.

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