Sept. 20, 1960 R. J. KAVANAUGH 2,953,667

CAM-ACTUATED SWITCH ASSEMBLY FOR A REPEATING INTERVAL TIMER OR THE LIKE

Filed Aug. 4, 1958

FIG. 1

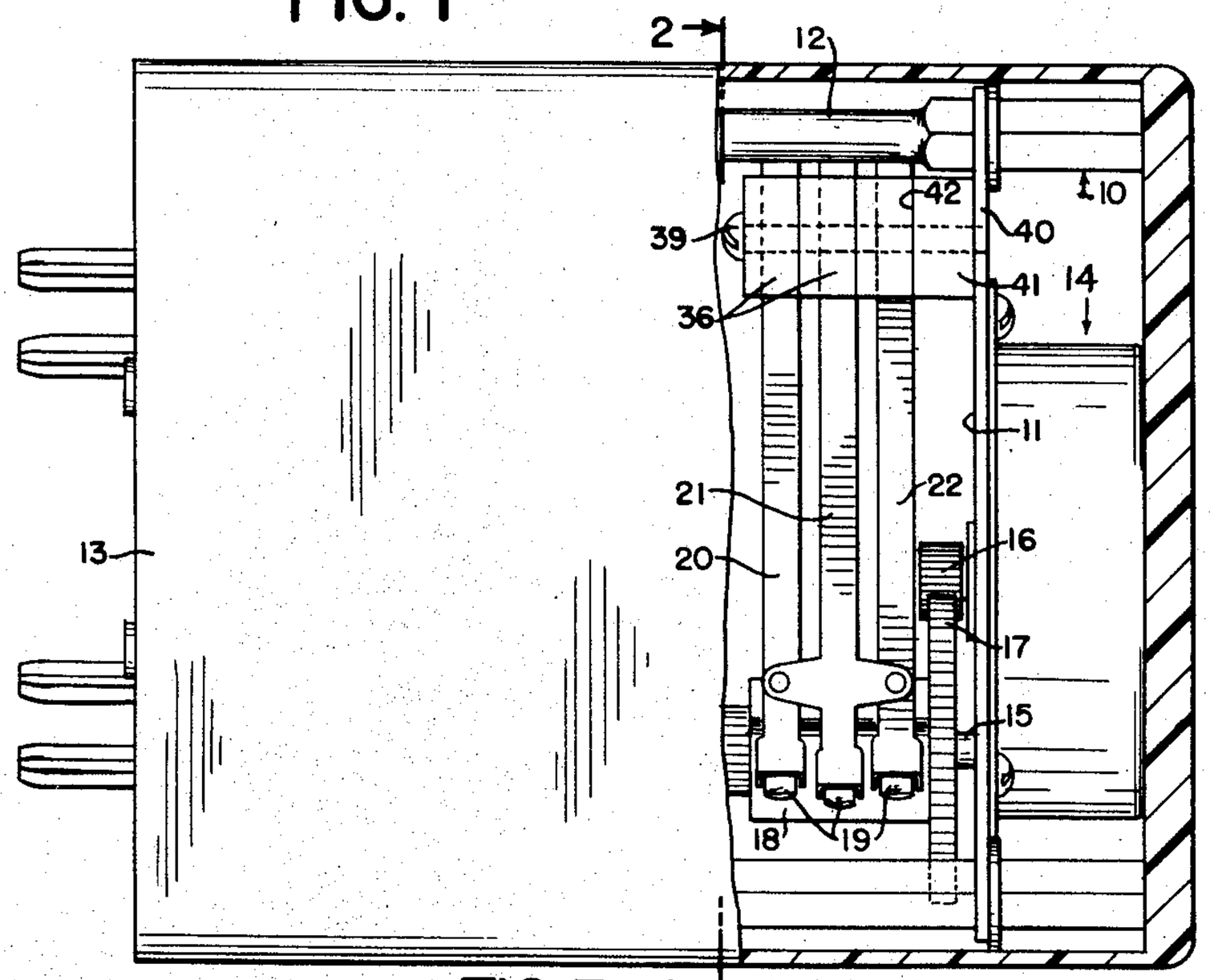


FIG. 2

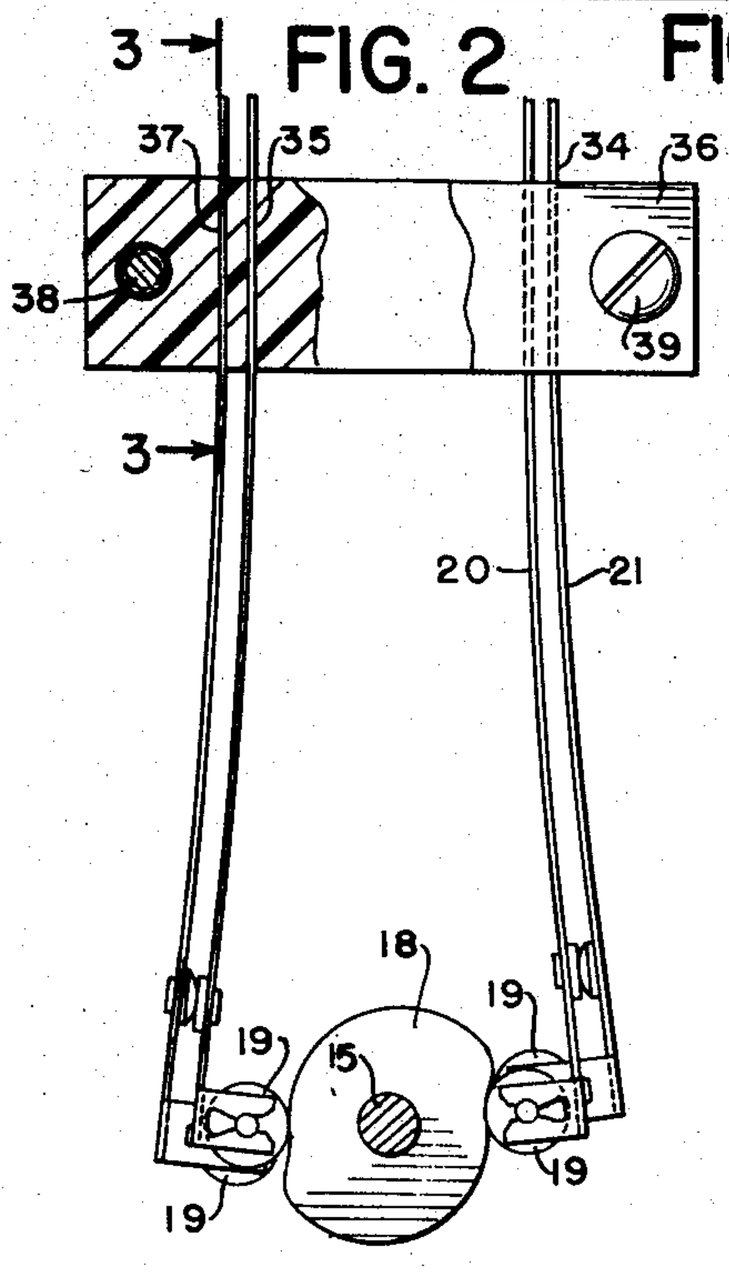


FIG. 3

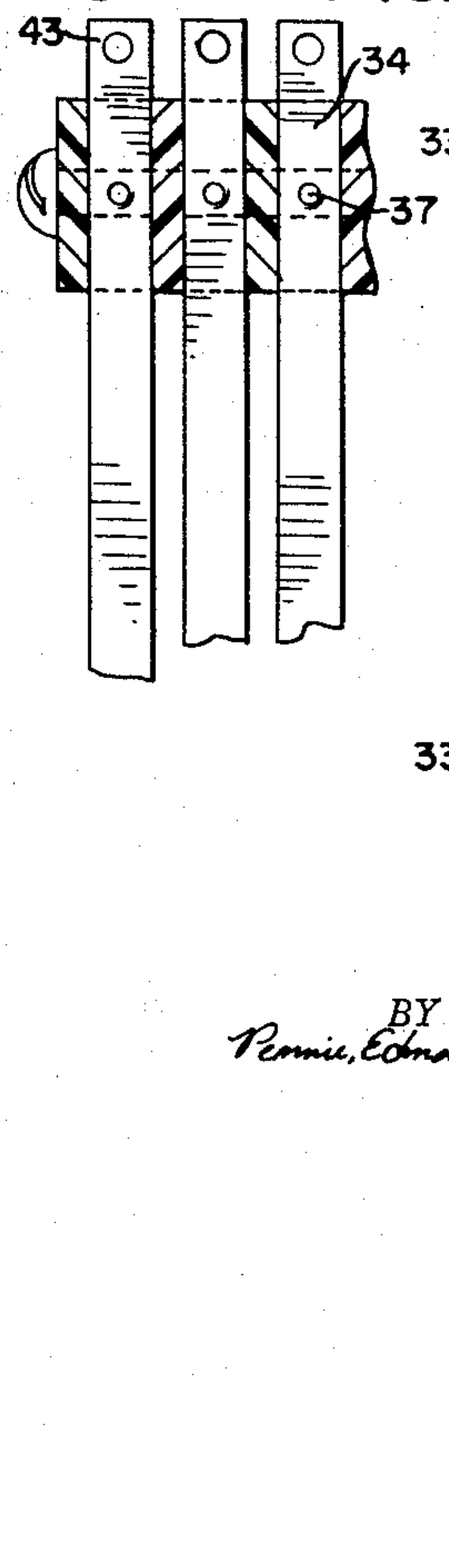


FIG. 4

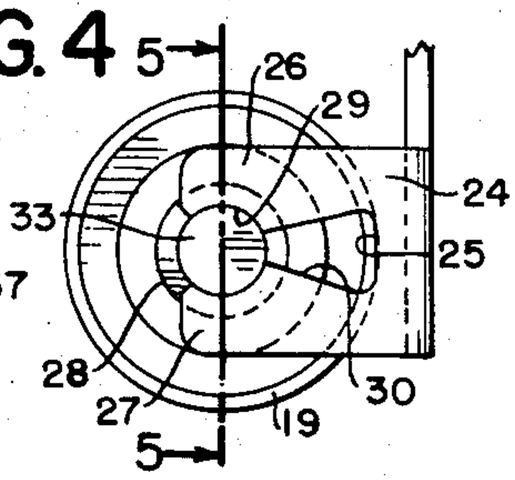
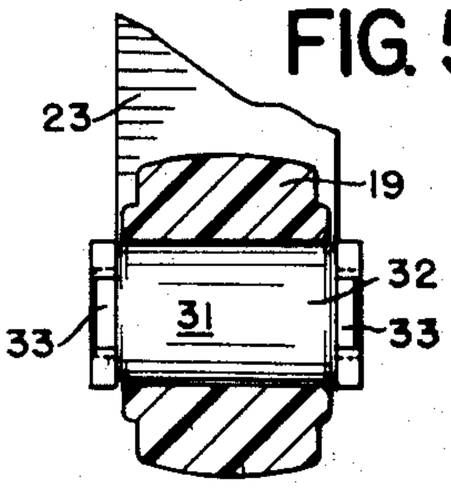


FIG. 5



INVENTOR.
RICHARD J. KAVANAUGH

BY
Pennie, Edmonds, Morton, Barrows & Taylor
ATTORNEYS

United States Patent Office

2,953,667

Patented Sept. 20, 1960

2,953,667

CAM-ACTUATED SWITCH ASSEMBLY FOR A REPEATING INTERVAL TIMER OR THE LIKE

Richard J. Kavanaugh, Bristol, Conn., assignor to Consolidated Electronics Industries Corp., Waterbury, Conn., a corporation of Delaware

Filed Aug. 4, 1958, Ser. No. 753,042

1 Claim. (Cl. 200—153)

The present invention relates to cam actuated devices, and more particularly to novel and improved cam follower means, and to a mounting therefor, especially for use in connection with electrical control devices, such as repeating interval timers.

In the copending application of Arthur W. Haydon, Serial No. 803,625, filed April 2, 1959, for Cam Actuator Switch, there is described and claimed an improved cam actuated mechanism for incorporation in a device such as a repeating interval timer for telephone control circuitry, for example. The present invention is closely allied with, although not necessarily limited to, the invention of the copending application, and relates specifically to improved components for use in a cam actuated device.

One of the specific features of the invention resides in the provision of novel and improved cam follower means which is of simplified construction, reliable in operation, and adapted for economical manufacture. The improved means includes a cam follower wheel and a movable member or blade for mounting the wheel in a novel manner. The blade has a pair of spaced arms, each provided with shaped slots for receiving portions of a follower wheel axle upon which a follower wheel is mounted for free rotation, whereby the axle may be simply snapped in place to effect the cam follower wheel assembly. Advantageously, the construction is such that the blade and wheel mounting arms are formed of a single, stamped section of sheet or strip material, or perhaps wire, and the material may be electrically conductive so that the arms may form active parts of cam actuated switching devices.

Another specific feature of the invention resides in the provision, in a cam actuated device having a resilient blade for supporting a cam follower, of improved arrangements for mounting the blade, permitting easy assembly of the device and providing ready adjustment of the blade to position the cam follower in desired relation to the cam. In this respect, a resilient blade is formed of sheet or strip material and has a mounting portion adapted for edgewise reception in a slotted or otherwise apertured block. In the slotted block type of mounting in particular, reception of the blade in the slot tends to force the slot open, so that the blade is gripped lightly to facilitate adjustment of its position, and the blade may then be locked firmly in position by clamping the ends of the block to close the slots. The improved arrangement is particularly advantageous in connection with assemblies, such as repeating interval timers, comprising a plurality of blades and cam followers, which must be adjusted accurately with respect to a cam.

For a better understanding of the invention, and for a discussion of other advantageous features thereof, reference should be made to the following detailed description and to the accompanying drawing, in which:

Fig. 1 is a side elevation, partly in section, of a device, such as a repeating interval timer, incorporating the improved features of the invention;

Fig. 2 is a fragmentary, cross-sectional view taken generally along line 2—2 of Fig. 1;

Fig. 3 is an enlarged, fragmentary, cross-sectional view taken generally along line 3—3 of Fig. 2;

Fig. 4 is an enlarged, fragmentary view of an improved arrangement for mounting a cam follower wheel; and

Fig. 5 is a fragmentary, cross-sectional view taken along line 5—5 of Fig. 4.

Referring now to the drawing, the numeral 10 designates, generally, the frame of a device, such as a repeating interval timer. The frame includes one or more deck plates 11, connected by spacer posts 12, and the frame is received in a suitable housing 13. In the illustrated device, a motor 14 is mounted on the deck plate 11 and is arranged to drive a gear 17 through a pinion 16. The gear 17 and a cam 18 to which it is affixed are mounted on a shaft 15 supported by deck plate 11. A plurality of cam followers 19, carried at the ends of movable blades 20–22, cooperate with the cam to perform control functions, such as the opening and closing of switch contacts, in accordance with rotations of the cam.

As one of the specific features of the invention, the blades 20–22, which are advantageously formed of a resilient, electrically conductive sheet or strip material, are provided at their lower ends with integral end portions 23 for mounting the cam followers 19. The end portions 23, as shown best in Figs. 4 and 5, comprise pairs of spaced arms 24, extending out from the plane of the blade at the opposite edges thereof, and each of the arms is provided with a slot 25 which opens at the end of the arm and divides the arm into pairs of opposed arm portions 26, 27. The slots 25 have diverging outer portions 28, partly circular intermediate portions 29, and inner portions 30 extending substantially to the roots or bases of the arms.

Advantageously, each of the follower wheels 19, which may be formed of a suitable non-conductive material, such as nylon, is journalled on an axle or shaft 31. The axle 31 has a center portion 32 of enlarged diameter and of greater axial length than the wheel 19, so that ends of the center portion project a short distance beyond the ends of the wheel. The end portions 33 of the axle are of reduced diameter and of relatively short length, usually not substantially greater in length than the thickness of the arms 24.

In accordance with one aspect of the invention, when the arms 24 are initially formed, the spacing between them, at least near their ends, is slightly less than the axial length of the center portion 32 of the axle, and the spacing between the opposed portions 26, 27 of each arm is such that the arcuate slot portions 29 define between them an opening of less diameter than the axle end portions 33. Accordingly, to assemble the followers 19 with the blade end portions 23, the axles are pressed into the open ends of the slots 25, separating the arms 24 slightly and spreading open the slots 25 sufficiently to permit the end portions 33 of the axles to snap into place between the arcuate slot portions 29. The blade end material, being inherently resilient, tends to return the arms and arm portions to their original condition, and the axles are thus locked firmly in place. At the same time, the wheels 19 are allowed to rotate freely, without substantial friction with the arms 24, since the arms are held separated by the axle 31.

In the illustrated apparatus, the cam followers 19 are arranged to cooperate with the cam 18, substantially in the manner indicated in Fig. 2, the followers 19, and the blades 20–22 supporting them, being arranged to move toward and away from the cam axis in timed relation to rotations of the cam. In order that the control functions effected by movement of the cam followers may take place at the desired instants, the followers

must be positioned accurately with respect to the cam axis. Accordingly, as one of the specific features of the invention, novel means are provided for mounting the blades **20–22** in a manner greatly facilitating the initial adjustment thereof, yet providing firm and permanent mounting of the blades after the initial adjustment is effected.

Advantageously, the main portions of the blades **20–22** are in the form of elongated flat strips of resilient material. The free ends **34** of the blades, which may be referred to as mounting portions, are arranged to be secured in fixed relation to the frame **10** and are located a substantial distance from the cam followers **19** so that stressing of the blades is minimized when the followers are displaced by the cam.

In accordance with one aspect of the invention, the mounting portion **34** of each blade is adapted for edgewise reception in a slot **35** in a clamping block **36**. The slot **35** is open along one side of the block and has a width not substantially greater than the thickness of the flat blade. In the illustrated apparatus, the blades are arranged in pairs, and each clamping block **36** has a pair of spaced slots **35** arranged to receive a pair of blades in a manner such that the blades extend on opposite sides of the cam **18** in a generally tangent relation.

As shown best in Figs. 2 and 3, the mounting portion **34** of each blade is provided with a boss or dimple **37** (or if desirable two or more such dimples) of limited area, which projects outward of the plane of the blade to increase the overall thickness of the blade at that point. The arrangement is such that, when the blades are inserted edgewise in the slots **35** of a clamping block, the slots tend to be forced open, since the overall thickness of the blades, in the area of the dimples **37**, is greater than the width of the slots. The tendency to thus open the slots **35** causes the blades to be gripped lightly by the clamping block, so that the blades will remain in preset positions in the slots **35**. However, the gripping force is sufficiently small to provide for such manual adjustments as may be necessary to position the followers **19** in desired relation to the cam **18**.

Generally, although not necessarily, a plurality of pairs of blades are provided in a complete mechanism. Accordingly, a separate clamping block **36** is provided for each pair of blades.

To mount the blades and clamping blocks on the frame **10**, the blocks are provided adjacent their ends with aligned openings adapted to receive screws **39**. The screws **39** are advantageously received in threaded openings **40** in the deck plate **11**, substantially as shown in Fig. 1, whereby the blocks **36** may be tightly secured to the plate **11**.

In accordance with one aspect of the invention, the screws **39** are so arranged, with respect to the clamping blocks **36** that, when the screws are tightened, the slots **35** tend to close upon the otherwise lightly gripped mounting portions of the blades, whereby the blades are gripped in a firm and permanent manner. Thus, in the illustrated device, the blocks **36** are oriented so the slots **35** all face in the same direction (toward the deck plate **11**) and are arranged to be tightened flat against a spacer block **41**. Generally, when the blades are inserted in the slots **35**, the blocks **36** will tend to bow slightly, becoming convex on the side at which the slots **35** open. Accordingly, when the screws **39** are tightened, the blocks **36** are flattened against the spacer **41**, closing the slots on the blades. If desired, the surface **42** of the spacer block **41**, which faces the clamping blocks, may be slightly convex to assist in the closure of the slots.

In assembling the complete device, the several pairs of blades are inserted in appropriate positions in the clamping blocks **36**, and the blocks are loosely mounted

in the frame by the screws **39**. The individual blades may then be adjusted vertically to bring the individual cam followers **19** into the desired relationship with the cam **18**, after which the screws **39** may be tightened down to lock the blades in their adjusted positions.

In the illustrated apparatus, portions of the blades **20–22** project above the clamping blocks **36** and form terminals **43** for connecting wires of a control system. The blades themselves, being formed of conductive material, become active parts of switches, arranged to open and close control circuits, as set forth in the co-pending application of Arthur W. Haydon.

In the improved device, manufacture, assembly and maintenance are rendered simpler and more economical, through the use of novel arrangements for mounting the cam follower wheels **19** and for mounting the blades **20–22**. The blades and follower mounting portions, which may be simple stampings, are arranged to facilitate greatly the initial assembly of the cam followers, as well as their subsequent replacement. Thus, the assembled follower wheel and axle may be quickly snapped in place in the mounting portions **23** to provide a rugged and wholly dependable blade-follower unit. In addition, the novel arrangement for mounting the blades greatly facilitates the assembly of an otherwise relatively complex control device by providing for easy individual adjustment of the several blades.

It should be understood, however, that the specific form of the invention herein illustrated and described is intended to be representative only, as certain changes may be made therein without departing from the clear teachings of the disclosure. Accordingly, reference should be made to the following appended claim in determining the full scope of the invention.

I claim:

A cam-actuated switch assembly for a repeating interval timer or the like comprising a cam mounted for rotation, an elongated switch blade formed of resilient strip or sheet material and mounting a switch contact, said blade having a fixed portion and being resiliently movable adjacent said contact, said blade being of substantially greater length than width, said blade having a portion provided with integral arm portions at the opposite side edges thereof, said integral arm portions being bent substantially at right angles to the principal plane of said blade to form spaced, opposed supporting arms, each of said arms being slotted throughout a substantial portion of its length and to the free end thereof, each of said arms being provided with opposed arcuate recesses intermediate the ends of the said slot therein, an axle inserted by force into the open ends of said slots and having end portions received in and releasably locked by said arcuate recesses, said axle having a central portion of enlarged diameter forming shoulders adjacent said end portions, said arm portions bearing resiliently inward against said shoulders, and a cam follower wheel supported by the central portion of said axle and having an axial length less than said central portion, said follower wheel being positioned for engagement by said cam.

References Cited in the file of this patent

UNITED STATES PATENTS

2,090,544	Michel	Aug. 17, 1937
2,348,088	Nichols et al.	May 2, 1944
2,435,727	Spencer	Feb. 10, 1948
2,675,442	Ryan	Apr. 13, 1954
2,714,859	Klemme	Aug. 9, 1955
2,748,619	Glover et al.	June 5, 1956
2,781,868	House	Feb. 19, 1957