Sept. 9, 1947. J. E. BOSH 2,427,187

LISTENING AND RINGING KEY FOR TELEPHONE SWITCHBOARDS

Filed May 10, 1945

Fig. 1

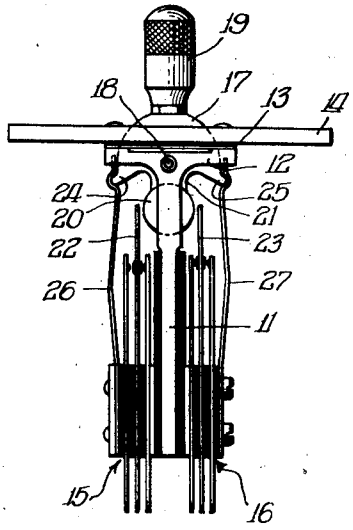


Fig. 2

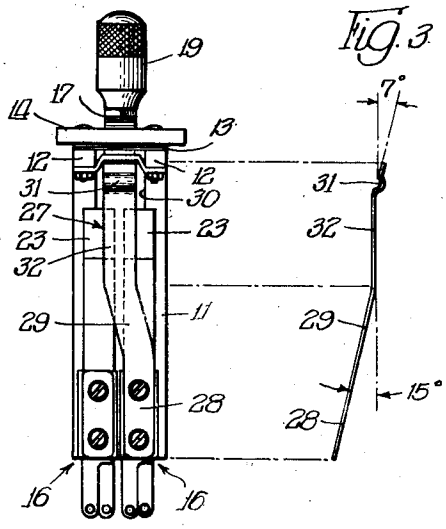


Fig. 3

Fig. 4

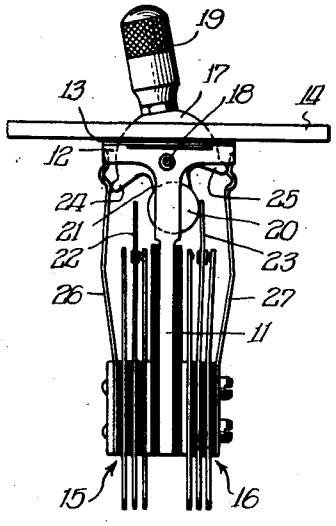
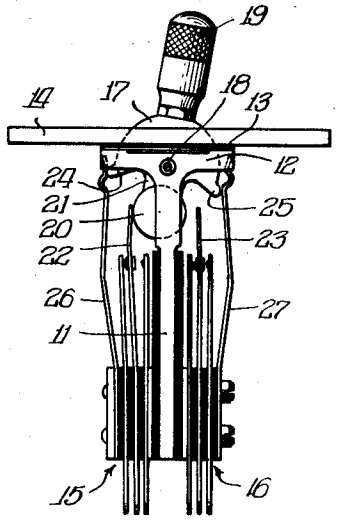


Fig. 5



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LISTENING AND RINGING KEY FOR TELEPHONE SWITCHBOARDS

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7 Claims. (Cl. 179—176)

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This invention relates to switching keys, and is particularly concerned with keys of the type used as ringing and listening keys in telephone switchboards.

As disclosed, for example, in the U. S. Patent No. 1,508,798, such a key comprises a pivotally mounted cam carrying actuating rollers of insulating material for selectively operating sets of contact springs arranged on either side thereof. The operation is effected by means of a lever or handle which may be tilted to one side or the other for the purpose of rotating the cam to displace the rollers into operative position with respect to the corresponding contact springs.

The prior patent recognizes as a source of trouble the rebound action of the key lever with its cam and rollers incident to its return from either of its operating positions to its normal position. Such rebound action causes chattering, i. e., vibration or oscillation of the operating parts including the rollers, and such chattering in turn may produce momentary actuation of the contacts and consequent disturbance of the circuits controlled by such contacts. The remedy proposed in the prior patent resides in the provision of spring means for cushioning the lever-operated cam incident to its displacement to one side, and a second spring means for cushioning the cam incident to its displacement to the opposite side.

The present invention improves upon the prior structure by the provision of a pair of snubber springs, each of which is arranged for elastic coaction with the key cam in either direction of operation. The new snubber springs jointly control the operating parts, that is, the key lever, the cam and the actuating rollers, throughout the displacement of these parts from normal to either actuated position and throughout their return to normal from either position.

The new arrangement provides a positive control for the operating parts and furnishes the desired cushioning and dampening, with greater assurance of avoiding the rebound action, and thus prevents chattering of the contact springs. The new arrangement also aligns the key cam in its normal position so that the handle is positioned perpendicular to the front face of the key escutcheon. In addition, the new arrangement provides a detent effect to assure a positive action of the cam to its fully operated position in either direction of operation.

These and other objects and features of the invention will appear from the detailed description which is rendered below with reference to

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the accompanying drawings, showing a preferred embodiment. In these drawings,

Fig. 1 represents a side view of a switching key made in accordance with the invention;

Fig. 2 is a right end view of Fig. 1;

Fig. 3 shows a side or edge view of the new snubber spring; and

Figs. 4 and 5 illustrate the new key in its two operating positions.

The drawings are more or less schematic and are only intended for descriptive and illustrative purposes. Well known details and elements will be described merely to the extent required for conveying an understanding of what is believed to be new. The various parts are indicated by identical reference numerals throughout the drawings.

The new key comprises a generally T-shaped frame having a rib or wall 11 and a base 12. A washer 13 is provided for deadening noise. The base of the frame and the washer are fastened to the escutcheon plate 14 by means of screws, as shown, with the frame rib 11 extending perpendicularly from the escutcheon plate in back thereof. Suitably mounted on the rib 11 of the frame are sets of contact springs generally indicated at 15 and 16. There are two sets of contact springs 15 on the left of the frame rib 11 and two similar sets of contact springs 16 on the right of the frame rib. An operating cam 17 is pivotally mounted in the frame by means of a pin 18. The frame base 12 and the rib are for this purpose slotted, as indicated in Fig. 2 by numeral 30. The cam 17 extends to the outside and partially projects from the front face of the escutcheon plate 14. A handle or lever 19, which is made of insulating material, is attached to the projecting portion of the cam, and the insulating rollers 20 are rotatably mounted on the cam extension 21 in back of the escutcheon plate. There are two such rollers, one for operating the sets of contacts 15 and 16 on the side of the key shown in Figs. 1, 4 and 5 and the other for operating similar sets of contacts on the other side.

In normal position, shown in Fig. 1, the rollers 20 are disposed between and out of engagement with the actuating springs 22 and 23 of the corresponding sets of contacts. In the operated position shown in Fig. 4 the rollers 20 are in engagement with the operating springs 23 of the sets of contacts 16 on the right of the frame rib 11 and have flexed these springs, as shown, so as to establish the illustrated contact conditions, with the inner contacts open and the outer con-

tacts closed; and in the other operated position, shown in Fig. 5, the rollers **20** are in engagement with the springs **22** of the sets of contacts **15** on the left of the frame rib **11** and have flexed these springs to establish corresponding contact conditions.

The cam is provided with projections or ears **24, 25** generally radially extending therefrom below the pivot point **18** for coaction with the new snubber springs **26—27**. In normal position of the key, as shown in Fig. 1, the ear **24** is disposed in a groove formed in the upper crimped portion of the snubber spring **26**, and the ear **25** is similarly disposed in the groove formed in the upper crimped portion of the snubber spring **27**.

The two snubber springs are shaped alike. Spring **26** is assembled together with the set of contact springs **15** disposed at the left of the frame rib **11** at the forward edge thereof, as seen in Figs. 1, 4 and 5; and the snubber spring **27** is turned around 180° with respect to spring **26** and is assembled together with the set of contact springs **16** disposed at the right of the frame rib **11** at the rearward end thereof, as seen in Figs. 1, 4 and 5, or right as seen in Fig. 2.

As shown in Figs. 2 and 3, the snubber spring has a lower mounting section **28**, a central section **29** which is offset from the median center line of the mounting section **28**, and an upwardly extending section **32** which is disposed in alignment with the corresponding edge of the cam **17** and is crimped at the free end to provide a groove **31** for engagement with the corresponding ear or projection of the cam, as previously described. The free end of the snubber spring above the groove **31** is offset outwardly from the plane of the section **32**, as seen in Fig. 3, for the purpose of facilitating the assembly of the springs on the key and their coaction with the cam; and the lower sections **29, 28** are offset inwardly from the plane of the section **32** for the purpose of providing inward pressure of the snubber springs with respect to the cam when the springs are mounted as shown. The snubber spring is produced from a suitable metal sheet in simple punching and forming operations. The specific angular displacement of the sections **29, 28** and of the free upper end of the snubber spring with respect to the plane of section **32**, as indicated in Fig. 3, is used in a certain practical embodiment, and is shown in the drawing merely to give an example. As noted above, the displacement is provided for the purpose of biasing the snubber springs on each side of the key inwardly in the direction of the cam, so that the snubber springs engage the cam with a certain pressure. The pressure that may be required in any given case may call for different angular displacement of the corresponding spring sections, depending on factors such as the size of the parts, the spring material, the thickness of the spring, and others.

The alignment of the key cam in its normal position, so that the handle **19** is disposed perpendicular to the front face of the key escutcheon **14**, is apparent from Fig. 1. The ears or projections **24, 25** of the cam are disposed and elastically locked within the grooves formed in the crimped upper ends of the snubber springs **26** and **27**. The springs exert an inward pressure; that is, they engage the ears or projections **24, 25** of the cam with a pressure applied below the pivot point **18** and of substantially the same magnitude on each side of the cam. The result is that the cam is aligned as stated and as shown

in Fig. 1, the snubber springs preventing inadvertent angular displacement of the cam from this normal position. The action is positive, the ears or projections **24, 25** operating in the nature of stops which are held elastically in normal position by engagement with the positively disposed locking grooves in the springs.

The detent function of the new arrangement, which assures positive action of the cam to its fully operated position in either direction of operation, may be explained with reference to Figs. 4 and 5.

Displacement of the key handle **19** from its normal position shown in Fig. 1 to the left, to the operated position as seen in Fig. 4, rotates the cam **17** in counter-clockwise direction, thus moving the ear or projection **24** downwardly out of the groove in the snubber spring **26** and moving the ear or projection **25** upwardly out of the groove in the snubber spring **27**. The resulting angular displacement shifts the lever arms formed by these ears or projections in coaction with the snubber springs, the lever arm formed by the ear or projection **24** allowing the full force of spring **26** to become effective, overbalancing the pressure of spring **27**, thus tending to continue the counter-clockwise rotation of the cam. The ear or projection **25** rides up on the upper end of the snubber spring **27** in cushioning and dampening engagement with the snubber spring. The counter-clockwise rotation of the cam continues until the cam has reached its fully operated position with the contact sets **16** properly actuated.

The operation of the key from its normal position illustrated in Fig. 1, into the position shown in Fig. 5, is similar except, of course, that the lever action described with reference to the cam ear **24** applies to the cam ear or projection **25** which is pressed inwardly by the snubber spring **27** with a force greater than the pressure exerted by the spring **26** on the cam ear or projection **24**. The result is that the angular displacement or rotation of the cam **17** in clockwise direction continues until the cam is in fully operated position with the contact sets **15** actuated as shown.

The cushioning and dampening function of the snubber springs **26** and **27** to prevent rebound of the cam and its associated parts becomes operative when the key is restored from either operated position shown in Figs. 4 and 5 to the normal position illustrated in Fig. 1.

Operation of the key handle to the right, as seen in Fig. 4, to restore it to normal, rotates the cam in clockwise direction. Such rotation is opposed by the pressure of the snubber spring **26** exerted on the ear or projection **24** for the same reason that the pressure of this spring assisted the counter-clockwise operative rotation of the cam, as previously described. The clockwise restoring motion of the cam is thus dampened and cushioned. The dampening and cushioning action persists until the ear **24** has reached the lower crest of the crimp in spring **26**, ready to move into its stop groove. The ear or projection **25** reaches at the same time the upper crest of the stop groove in spring **27**. During the further clockwise restoring motion of the cam the upper and outer surface of the ear or projection **25** becomes aligned with the corresponding surface in the stop groove of snubber spring **27**, substantially in parallel therewith and ready to slide into this groove, while the ear **24** is positioned substantially perpendicular to the

lower surface of the stop groove in spring **26**, thus providing a brake action which opposes the entrance of the ear **24** into its stop groove. The dampening and cushioning action thus persists for the remainder of the clockwise rotation of the cam to normal, until the ears or projections **24**, **25** have reached their proper positions in their stop grooves, when the rotation of the cam to normal position is effectively stopped and arrested. Vibration or oscillation of the cam, and therewith the rollers **20** and consequently momentary operation or chattering of the contacts is thus prevented.

The cushioning and dampening effect is likewise operative in a similar manner when the key handle is actuated to normal from the position shown in Fig. 5, except that the coaction of the snubber springs with the cam ears follows in reverse order. In other words, what has been said with respect to snubber spring **26** and its coaction with the cam ear **24** applies in the latter case to snubber spring **27** and cam ear **25**; and the action described with respect to spring **27** and cam **25** applies to spring **26** and cam **24**.

Changes may be made within the spirit and scope of the appended claims which define what is believed to be new and desired to have protected by Letters Patent of the United States.

I claim:

1. In an operator's key having a frame mounted on an escutcheon plate and carrying sets of contact springs and a pivotally mounted rotatable cam provided with an operating handle projecting from the escutcheon plate and having means on said cam for actuating said contact springs, a device for controlling the operation of said cam comprising separate spring means for coaction with said cam on either side thereof, each of said spring means being constructed and arranged for elastic engagement with said cam throughout the angular displacement thereof from normal position to operated position and back to normal position in either direction of operation for the three-fold purpose, first, of aligning the cam in its normal position so that the handle is perpendicular to the front face of the escutcheon plate, second, of providing a detent action to assure positive actuation of the cam to its fully operated position, and third, to cause the cam to return to its normal position and come to rest without rebound so as to prevent inadvertent actuation of said contacts.

2. In an operator's key having a frame carrying sets of contact springs and a pivotally mounted rotatable cam provided with an operating handle and having means for actuating said contact springs, a device for controlling the operation of said cam comprising separate spring means for coaction with said cam on either side thereof, each of said spring means being constructed and arranged for elastic engagement with said cam throughout the angular displacement thereof from normal position to operated position and back to normal position in either direction of operation thereof.

3. The structure and combination defined in claim 2, wherein said cam is provided with a projection extending therefrom on either side thereof, and wherein each of said separate spring means is provided with a groove for receiving the associated cam projection in normal stop position of the cam.

4. In an operator's key of the class described having a generally T-shaped member forming a rib carrying a set of contact springs mounted on either side thereof which extend substantially in parallel with said rib and having a cam which is pivotally mounted for angular displacement to either side for the purpose of actuating the contact springs mounted on either side of said rib, the improvement which consists in the provision of separate spring means disposed on each of said sets of contact springs outside thereof and extending substantially in parallel with said contact springs on either side of said rib for elastic engagement with said cam to cushion and to dampen the angular displacement thereof.

5. A device of the class described, including an escutcheon plate, a generally T-shaped mounting frame secured thereto and forming a rib carrying a set of contact springs secured to either side thereof, a cam member pivotally supported in the base of said T-shaped mounting frame and provided with means for operating said sets of contact springs, and auxiliary spring means disposed on each contact set outside thereof, said auxiliary spring means forming extensions for elastic engagement with said cam member peripherally on opposite sides thereof.

6. In a key switch having a mounting member carrying a set of contact springs which extend generally in parallel therewith and provided with a pivotally mounted cam carrying means for actuating said contact springs responsive to angular displacement of said cam, a device for controlling the operation of said cam, said device comprising a pair of leaf springs disposed generally in parallel with said contact springs and secured therewith on said mounting member, the free ends of said leaf springs extending beyond said contact springs into elastic engagement with said cam peripherally on opposite sides thereof along a line disposed below the pivot point of the cam to exert substantially equal generally radially inwardly directed pressure on said cam from opposite sides thereof throughout its angular displacement in either direction of operation.

7. The structure and combination defined in claim 6, wherein the free end of each of said leaf springs is crimped to form a groove for locking coaction with a corresponding ear projecting from the cam for the purpose of positively holding said cam in its normal position.

JAMES E. BOSH.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,508,798	Klay	Sept. 16, 1924
1,109,947	Tromp	Sept. 8, 1914