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3,134,862

PUSH-TURN SWITCHING KEY

Filed Nov. 17, 1960

FIG. 3

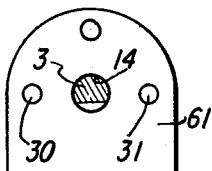


FIG. 4

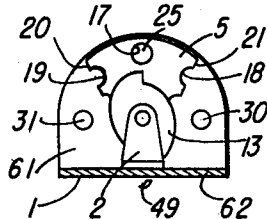


FIG. 1

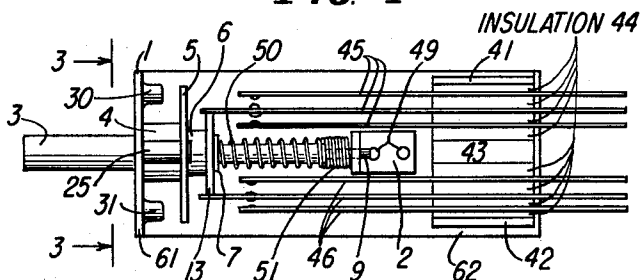


FIG. 2

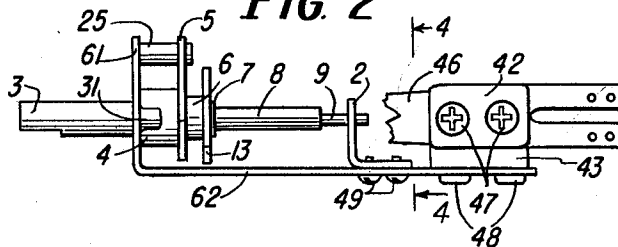


FIG. 5

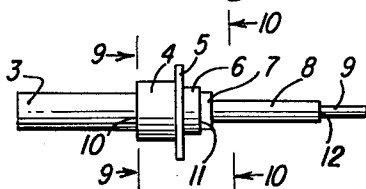


FIG. 7

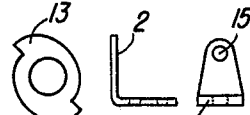


FIG. 6

FIG. 8

FIG. 9

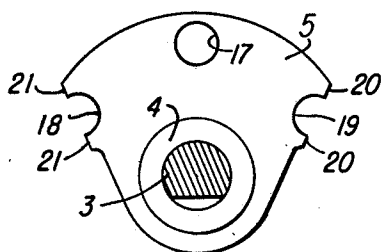
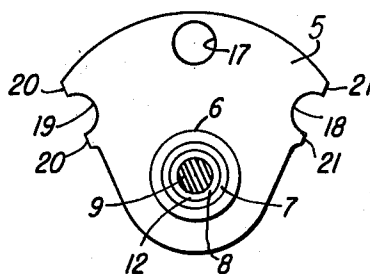


FIG. 10



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PUSH-TURN SWITCHING KEY

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This invention relates in general to a switching key for selectively controlling a plurality of sets of circuit controlling contact spring assemblies.

The main object of the invention is to provide a combination push-turn key having a segmental locking plate mounted on the key shaft and provided with a plurality of locking positions to positively lock the key shaft in any one of a plurality of rotary circuit closing positions and wherein the key shaft is manually moved longitudinally in one direction against spring tension to release the shaft from its locked rotary position before the shaft may be rotated to another rotary locking position.

Another object of the invention in combination with the above object is to provide shoulders on the key shaft which cooperate with the shaft mounting members to limit longitudinal movements in opposite directions while permitting rotary movement of the shaft only while the shaft is manually moved into one of the limited longitudinal directions against spring tension.

A feature of the invention is to provide straight edges on the segmental locking plate, which cooperate with the shaft mounting member to limit clockwise and anti-clockwise rotation of the shaft and wherein in combination with the locking pin in registration with the extreme clockwise and anti-clockwise locking positions in the locking plate lock the shaft against rotation.

Other objects and features of the invention will become apparent from the following detailed description and accompanying drawings in which:

FIG. 1 is a top view of the push-turn switching key;

FIG. 2 is a side view with the helical spring removed and with the contact spring assemblies broken away;

FIG. 3 is an end view as seen from the left end of FIG. 1;

FIG. 4 is an end view as seen from the right end of FIG. 1, with the contact spring assemblies removed;

FIG. 5 is a top view of the key shaft with its segmental locking plate;

FIG. 6 shows the insulating cam for controlling the contact spring assemblies;

FIGS. 7 and 8 are side and end views of one of the shaft mounting members, or brackets;

FIG. 9 is an end view of the shaft and locking plate as seen from the left of FIG. 5 and drawn to an enlarged scale; and

FIG. 10 is an end view of the shaft and locking plate as seen from the right of FIG. 5 and drawn to an enlarged scale.

Referring now to the drawing, the shaft mounting members comprise an L-shaped heel piece 1, having a short leg 61 and a long leg 62 and a small bracket 2 secured to the long leg 62 of the heel piece by any well-known means, such as by screws 49, extending through the heel piece into tapped holes in bracket 2.

The short leg 61 of the heel piece 1 has a circular hole 14, as shown in FIG. 3, for accommodating the enlarged end portion 3 of the key shaft for both longitudinal and rotary movements. The bracket 2, as shown in FIG. 8, has a bearing hole 15 for accommodating the reduced portion, or bearing pin 9, of the key shaft for both longitudinal and rotary movements. The bearing hole 15 of bracket 2 is aligned with the circular bearing hole 14 in the short leg 61.

The key shaft includes an enlarged cylindrical portion 4 forming a shoulder 10 with said end portion 3, so

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that the shoulder 10 will abut the inner face of the short leg 61 when the key shaft is set in any one of its locking positions.

Near the center of the key shaft is provided a locking plate 5 which may be formed integrally with said shaft or may be secured to the shaft in the position shown in FIGS. 1, 2 and 5 by any well-known means.

Cylindrical portions 6 and 7 of the key shaft form a shoulder 11 for positioning the insulating cam 13 on the shaft. The cam 13 is press-fitted on the portion 7, as shown in FIGS. 1 and 2, or secured thereto in any well-known manner.

A reduced portion 8 of the shaft extends to the right, as seen in FIG. 5, and forms a shoulder 12 with the bearing pin extension 9 of the shaft. The extension 9 cooperates with bearing hole 15 in bracket 2 to permit longitudinal and rotary movements of the shaft while the shoulder 12 in combination with the bracket 2 limits longitudinal movement to the right, as shown in FIG. 2.

A helical compression spring 50 encircles the reduced portion 8 of the shaft and is provided with open turns at one end and closed turns 51 at the other end. The closed turns 51 abut the face of the bracket 2, as shown in FIG. 1, and extend beyond the shoulder 12 of the shaft. These closed turns 51 are provided to prevent any spring turn from being positioned between the shoulder 12 of the shaft and the bracket 2, so as not to interfere with the longitudinal manual movement of the shaft.

The locking plate 5 is provided with locking openings 17, 18 and 19, which are equally and arcuately spaced from each other. The locking opening 17 comprises a circular hole while the openings 18 and 19 are semi-circular and are located in the straight edges 21 and 20 of the segmentally shaped locking plate 5.

A locking pin 25 is secured to the short leg 61 and normally extends through one of the openings 17, 18 or 19, to lock the shaft against rotation. The straight edges 20 and 21 of the locking plate cooperate with the inner face of the long leg 62 of the heel piece 1 to limit clockwise and anti-clockwise rotation of the shaft while the locking pin 25 in combination with the openings 18 and 19 lock the shaft against rotation.

The contact spring assemblies comprise the contact springs 45 and 46 secured to a metallic block 43 by means of insulators 44, end plates 41 and 42, and screws 47 in the usual spring pile-up. This assembly is secured to the long leg 62 of heel piece 1 by means of screws 48 and tapped holes in block 43.

The short leg 61 is provided with shakeproof lock nuts 30 and 31 for mounting the key by means of screws to a desired panel.

An insulating knob or pointer of any design may be secured to the shaft portion 3 to enable manual longitudinal movement and rotation of the shaft.

After the locking plate 5 and insulating cam are secured to the shaft, as described, the helical spring 50 is positioned over the reduced portion 8 of the shaft and the shaft portion 3 is inserted through hole 14 in the short leg 61. The bearing pin 9 is inserted in hole 15 of bracket 2 and the bracket 2 is then secured to the long leg 62 by means of screws 49.

With the locking pin 25 in registration with any one of the locking openings 17, 18 or 19, the helical spring 50 forces the shaft longitudinally until the shoulder 10 on shaft portion 4 engages the inner face of the short leg 61 to limit longitudinal movement to the left, as shown in FIG. 1.

When it is desired to operate the key to a new circuit closing position, the knob is manually moved longitudinally to the right, as shown in FIGS. 1 and 2, until

the shoulder 12 at the reduced shaft portion 8 engages the bracket 2 which limits longitudinal movement in this direction. When the shoulder 12 engages bracket 2, the locking plate has moved the locking openings out of registration with the locking pin 25 to enable the shaft and the locking plate 5 to be rotated.

After the plate 5 has been rotated far enough out of registration with any of the locking openings, the release of manual force enables the helical spring 50 to move the shaft and locking plate 5 so that the locking pin 25 now rides on the face of the locking plate between the locking openings as the shaft is manually rotated. Further rotation of the locking plate 5 into registration with a locking opening enables the helical spring 50 to move the shaft longitudinally to the left, as shown in FIG. 1, to lock the shaft against rotation.

The straight edge 21 of the segmental locking plate 5 limits the clockwise rotation of the shaft, as seen in FIG. 4, by engaging the inner face of the long leg 62 of heel piece 1 while the locking pin 25 in registration with locking opening 19 locks the shaft against anti-clockwise rotation. In a similar manner, the straight edge 20 of the locking plate 5 limits the anti-clockwise rotation of the shaft by also engaging the inner face of the long leg 62 while the locking pin 25 in registration with the locking opening 18 locks the shaft against clockwise rotation.

In the preferred embodiment of the invention, as shown in the drawings, only three locking positions are shown, and it will be understood that additional locking positions may be added and that a different shaped cam would then be necessary to control the contact spring assemblies.

The contact spring assemblies shown are commonly known of the make type, and it will be understood that other types of break, break-before-make, or make-before-break types may be substituted therefor, dependent upon the type of circuits controlled by these contacts.

This type of key is designed so as to positively lock in any one of its rotary locking positions when subjected to excessive vibration which is encountered in planes, missiles, or other movable objects, and will satisfy all G vibration forces up to contact separation of the springs in the switching unit.

While I have chosen to show and describe a preferred embodiment of my invention, I have done so by way of example only, as there are many modifications and adaptations which can be made by one skilled in the art within the teachings of the invention.

Having thus complied with the statutes and shown and described a preferred embodiment of my invention, what I consider new and desire to have protected by Letters Patent is pointed out in the appended claims.

What I claim is:

1. A push-turn key comprising:

- an L-shaped heel piece having short and long legs and having a perforation in said short leg,
- a rotatable and axially movable shaft projecting through said perforation and journaled therein,
- a shoulder on said shaft engaging said short leg to define a first fixed axial position of said shaft,
- a locking plate, fixed upon said shaft, spaced from said short leg and containing a plurality of perforations,
- a locking pin fixed upon said short leg and projecting through one of the perforations in said plate when the shaft is in said first position,
- a mounting bracket fixed upon said long leg and containing a perforation through which said shaft projects and is journaled thereby,
- a second shoulder on said shaft spaced from said bracket when said shaft is in said first position and moved into engagement with the bracket as the shaft is moved axially to disengage said pin completely from said plate, thereby to define a second axial position of said shaft,
- a helical spring encircling said shaft and engaging said bracket and shaft and tension to bias the shaft into said first position,
- spring assembly means fixed upon said long leg and insulated therefrom,
- and a cam fixed upon said shaft and rotatable therewith to operate said spring means as said shaft is rotated when in said second position.
2. A push-turn key as specified in claim 1 in which the locking plate is segmental in shape, the radial edges of which contain semicircular indentations with which the locking pin may register, said edges being adapted to engage the long leg of the heel piece to establish limits positions for rotations of the shaft.
3. A push-turn key as specified in claim 1 in which the cam is fixed upon the shaft between the locking plate and the second shoulder thereon.
4. A push-turn key as specified in claim 3 in which there is a third shoulder in fixed position on the shaft adjacent the cam against which shoulder the spring abuts to bias the shaft towards said first position.

References Cited in the file of this patent

UNITED STATES PATENTS

1,836,838	Coldwell	Dec. 15, 1931
1,878,692	Ringbloom	Sept. 20, 1932
2,103,792	Peterson	Dec. 28, 1937
2,289,736	Snively et al.	July 14, 1942
2,748,204	Woods et al.	May 29, 1956
3,030,478	Paolino	Apr. 17, 1962