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(54) **EXPLOSION-PROOF KEY SWITCH.**

EXPLOSIONSGESCHÜTZTER SCHLÜSSELSCHALTER

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to an explosion-proof key switch, which is mainly applied to explosion-proof vehicles in various explosive gas environments.

BACKGROUND OF THE INVENTION

[0002] A key switch is an essential electrical element for starting vehicles. However, for various work vehicles containing a mixture of explosive gases, conventional key switches cannot be used at all. Moreover, at present, no true explosion-proof key switch is available commercially. Among present key switches for explosion-proof vehicles, some key switches are operated by the conventional key switch driving a set of lever mechanism to switch on/off self-made contacts, which have complex structures and are bulky and extremely prone to failure; some key switches need several actions to start vehicles, which is inconvenient for operation.

SUMMARY OF THE INVENTION

[0003] The technical problem to be solved by the invention is to provide an explosion-proof key switch with a simple structure, a low cost, a reliable work and a convenient operation.

[0004] The technical solution of the invention is to provide an explosion-proof key switch including a switch seat and a cover plate, wherein a switch lock core and a rotating shaft connected with each other are provided in the switch seat, an output end of the rotating shaft extends through the cover plate to the outside of the switch seat, a microswitch fit with the output end of the rotating shaft is mounted on the cover plate, characterized in that an input end of the rotating shaft is mounted in the switch seat by a copper jacket sleeved on the rotating shaft, both a clearance between the copper jacket and the rotating shaft and a clearance between the copper jacket and the switch seat have a width less than 0.2mm and a length larger than 12.5mm, a notch is provided on an end surface of the output end of the rotating shaft, an rolling wheel being in contact with a longitudinal cutting surface of the notch is provided at one side of a drive end of an elastic rod mounted on the microswitch, and the other side of the drive end of the elastic rod is in contact with a movable contact.

[0005] The middle portion of the rotating shaft is provided with an annular disc which has a diameter larger than the diameter of the rotating shaft and is formed integrally with the rotating shaft. The annular disc is embedded in a space between the switch seat and the cover plate. Two recesses are provided on an end surface of the annular disc. A blind hole is correspondingly provided in the switch seat, and a spring and a steel ball are placed in the blind hole.

[0006] A positioning pin being axially symmetrical to the blind hole is mounted in the switch seat. An elongate groove fit with the positioning pin is provided in the annular disc, and a maximum rotatable angle of the positioning pin within the elongate groove is the same as an angle between the two recesses with respect to an axis of the annular disc.

[0007] The switch lock core and the rotating shaft are connected together by a protrusion-groove structure.

[0008] The invention has some advantageous effects. In the invention, the input end of the rotating shaft is mounted in the switch seat by the copper jacket sleeved on the rotating shaft, and the clearances between the copper jacket and the rotating shaft, the switch seat have a width less than 0.2mm and a length larger than 12.5mm, so as to effectively prevent explosive flame of explosive gas mixture from extending to the exterior through clearances between components of the switch. The present invention adopts the conventional key switch and the microswitch to achieve the explosion-proof function of the system, which has a simple structure, a convenient operation, a low cost and a convenient maintenance.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009]

Fig. 1 is a front sectional view of the invention; and
Fig. 2 is a top view of the invention.

DETAILED DESCRIPTION OF THE INVENTION

[0010] As shown in Figs. 1 and 2, the embodiment has a switch seat 2 and a cover plate 6. A switch lock core 1 and a rotating shaft 7 connected with each other are provided in the switch seat 2. In this embodiment, the switch lock core 1 and the rotating shaft 7 are connected with each other by a protrusion-groove structure, such that the rotating shaft 7 may be rotated together with the switch lock core 1 under the action of the switch lock core 1. The output end of the rotating shaft 7 extends through the cover plate 6 to the outside of the switch seat 2. A microswitch 9 fit with the output end of the rotating shaft 7 is mounted on the cover plate 6. An input end of the rotating shaft 7 is mounted on the switch seat 2 via a copper jacket 5 sleeved on the rotating shaft 7. Both a clearance between the copper jacket 5 and the rotating shaft 7 and a clearance between the copper jacket 5 and the switch seat 2 have a width of 0.1mm and a length of 25mm. Since the clearances are very narrow and their length is relatively long (in comparison with the clearance width of 0.1mm), it is possible to effectively prevent explosive flame from extending to the exterior, so as to achieve the explosion-proof effect. A notch 14 is provided on the end surface of the output end of the rotating shaft 7. A rolling wheel 15 being in contact with the longitudinal cutting surface of the notch 14 is provided at one side of a drive end of an elastic rod 16 mounted on the micros-

witch 9, and the other side of the drive end of the elastic rod 16 is in contact with a movable contact 17.

[0011] The middle portion of the rotating shaft 7 is provided with an annular disc 10 which has an diameter larger than the diameter of the rotating shaft 7 and is formed integrally with the rotating shaft 7. The annular disc is embedded in the space between the switch seat 2 and the cover plate 6, so that the rotating shaft 7 can rotate only around its axis. Two recesses 11 are provided on an end surface of the annular disc. Correspondingly, a blind hole 12 is provided in the switch seat 2, and a spring 3 and a steel ball 4 are placed in the blind hole 12. When the switch reaches on/off position, the steel ball 4 enters into one of the recesses 11 under an elastic force of the spring 3, so as to achieve a good hand feeling of a driver at the on/off position.

[0012] A positioning pin 8 being axially symmetrical to the blind hole 12 is mounted in the switch seat 2. An elongate groove 13 fit with the positioning pin 8 is provided in the annular disc 10. The maximum rotatable angle of the positioning pin 8 within the elongate groove 13 is the same as an angle between the two recesses 11 with respect to the axis of the annular disc 10. When the switch reaches the on/off position, the positioning pin 8 reaches one of the two limit positions of the elongate groove 13, so as to prevent an excessive operation.

[0013] The operation principle of the embodiment is as follows. In practical use, the whole switch is installed in an explosion-proof instrument box 18, wherein the switch seat 2 and the explosion-proof instrument box 18 are connected together by screws and the clearance therebetween has a width of 0.1mm and a length of 25mm, which is the same as the requirement of the clearances between the copper jacket 5 and the rotating shaft 7, the switch seat 2 respectively, so as to achieve the explosion-proof effect. When the switch is in the off state, the steel ball 4 is located in one of the recesses 11, and the positioning pin 8 abuts against one limit end of the elongate groove. When being operated, the key is inserted into the switch lock core 1 and then is turned to rotate the rotating shaft 7, so that the rolling wheel 15 moves from the notch 14 onto the outer circumferential surface of the rotating shaft 7 and the elastic rod 16 is deformed to come close to the body of the microswitch 9, so as to push the movable contact 17 to actuate, thereby switching the power on. The elongate clearances between the copper jacket 5 and the rotating shaft 7, the switch seat 2, and the elongate clearance between the switch seat 2 and the explosion-proof instrument box 18 are used to achieve the explosion-proof of the system. At the same time, the steel ball 4 comes into the other recess 11, which not only achieves a good hand feeling of a driver at the on/off position but also may hold the switch in the position, and the positioning pin 8 abuts against the other limit ends so as to prevent the excessive operation. When the switch is required to be turned off, the key is rotated in a reverse direction, so that the rotating shaft 7 is rotated in the reverse direction and the rolling wheel 15 moves from the outer circumferential surface of the rotating shaft 7 to the notch 14. Thus, the elastic rod 16 is returned under the action of its own elastic force, namely moves far away from the body of the microswitch 9, and the movable contact 17 is simultaneously returned under the action of its own elastic force, so that the power is switched off.

Claims

1. An explosion-proof key switch comprising a switch seat (2) and a cover plate (6), wherein a switch lock core (1) and a rotating shaft (7) connected with each other are provided in the switch seat (2), an output end of the rotating shaft (7) extends through the cover plate (6) to the outside of the switch seat (2), a microswitch (9) fit with the output end of the rotating shaft (7) is mounted on the cover plate (6), **characterized in that** an input end of the rotating shaft (7) is mounted in the switch seat (2) by a copper jacket (5) sleeved on the rotating shaft (7), both a clearance between the copper jacket (5) and the rotating shaft (7) and a clearance between the copper jacket (5) and the switch seat (2) have a width less than 0.2mm and a length larger than 12.5mm, a notch (14) is provided on an end surface of the output end of the rotating shaft (7), an rolling wheel (15) being in contact with a longitudinal cutting surface of the notch (14) is provided at one side of a drive end of an elastic rod (16) mounted on the microswitch (9), and the other side of the drive end of the elastic rod (16) is in contact with a movable contact (17).

2. The explosion-proof key switch according to claim 1, wherein the middle portion of the rotating shaft (7) is provided with an annular disc (10) which has a diameter larger than the diameter of the rotating shaft (7) and is formed integrally with the rotating shaft (7), the annular disc is embedded in a space between the switch seat (2) and the cover plate (6), two recesses (11) are provided on an end surface of the annular disc, a blind hole (12) is correspondingly provided in the switch seat (2), and a spring (3) and a steel ball (4) are placed in the blind hole.

3. The explosion-proof key switch according to claim 2, wherein a positioning pin (8) being axially symmetrical to the blind hole (12) is mounted in the switch seat (2), an elongate groove (13) fit with the positioning pin (8) is provided in the annular disc (10), and a maximum rotatable angle of the positioning pin (8) within the elongate groove (13) is the same as an angle between the two recesses (11) with respect to an axis of the annular disc (10).

4. The explosion-proof key switch according to claim 1, 2 or 3, wherein the switch lock core (1) and the

rotating shaft (7) are connected with each other by a protrusion-groove structure.

Patentansprüche

1. Explosionssicherer Schlüsselschalter umfassend einen Schaltersitz (2) und eine Abdeckplatte (6), wobei ein Schaltschloss-Kern (1) und eine rotierende Welle (7), welche miteinander verbunden sind, in dem Schaltersitz (2) bereitgestellt sind, ein Ausgabeende der rotierenden Welle (7) sich durch die Abdeckplatte (6) zu der Außenseite des Schaltsitzes (2) erstreckt, ein Mikroschalter (9), welcher dem Ausgabeende der rotierenden Welle (7) angepasst ist, an der Abdeckplatte (6) montiert ist, **dadurch gekennzeichnet, dass** ein Eingabeende der rotierenden Welle (7) in dem Schaltersitz (2) mittels eines Kupfermantels (5) montiert ist, welcher die rotierende Welle (7) umgibt, sowohl ein Freiraum zwischen dem Kupfermantel (5) und der rotierenden Welle (7) als auch ein Freiraum zwischen dem Kupfermantel (5) und dem Schaltersitz (2) eine Breite kleiner als 0,2 mm und eine Länge größer als 12,5 mm aufweisen, eine Ausnehmung (14) an einer Endfläche des Ausgabeendes der rotierenden Welle (7) bereitgestellt ist, ein rollendes Rad (15), welches in Kontakt mit einer longitudinalen Schnittfläche der Ausnehmung ist, an einer Seite eines An¬triebsendes einer elastischen Stange (16) bereitgestellt ist, welche an dem Mikroschalter (9) montiert ist, und die andere Seite des Antriebsendes der elastischen Stange (16) in Kontakt mit einem bewegbaren Kontakt (17) ist.

2. Explosionssicherer Schlüsselschalter nach Anspruch 1, wobei der mittlere Abschnitt der rotierenden Welle (7) mit einer ringförmigen Scheibe (10) bereitgestellt ist, welche einen Durchmesser aufweist, welcher größer ist als der Durchmesser der rotierenden Welle (7), und integral mit der rotierenden Welle (7) gebildet ist, die ringförmige Scheibe in einem Raum zwischen dem Schaltersitz (2) und der Abdeckplatte (6) eingebettet ist, zwei Aussparungen (11) an einer Endfläche der ringförmigen Scheibe bereitgestellt sind, ein Sackloch (12) entsprechend in dem Schaltersitz (2) bereitgestellt ist, und eine Feder (3) und eine Stahlkugel (4) in dem Sackloch platziert sind.

3. Explosionssicherer Schlüsselschalter nach Anspruch 2, wobei ein Positionierungs-Stift (8), welcher zu dem Sackloch (12) achsensymmetrisch ist, in dem Schaltersitz (2) montiert ist, eine längliche Nut (13), welche dem Positionierungs-Stift (8) angepasst ist, in der ringförmigen Scheibe (10) bereitgestellt ist, und ein maximaler Rotationswinkel des Positionierungs-Stifts (8) innerhalb der länglichen Nut (13) derselbe ist wie ein Winkel zwischen den beiden Aussparungen (11) bezüglich einer Achse der ringförmigen Scheibe (10).

4. Explosionssicherer Schlüsselschalter nach Anspruch 1, 2 oder 3, wobei der Schaltschloss-Kern (1) und die rotierende Welle (7) miteinander durch eine Vorsprung-Nut-Struktur verbunden sind.

Revendications

1. Interrupteur à clé antidéflagrant comprenant un support d'interrupteur (2) et une plaque de protection (6), dans lequel un noyau de ver-rouillage (1) d'interrupteur et un arbre rotatif (7) reliés l'un à l'autre sont disposés dans le support (2) d'interrupteur, une extrémité de sortie de l'arbre rotatif (7) s'étend à travers la plaque de protection (6) jusqu'à l'extérieur du support (2) d'interrupteur, un microinterrup-teur (9) associé à l'extrémité de sortie de l'arbre rotatif (7) est monté sur la plaque de protection (6), **caractérisé en ce qu'**une extrémité d'entrée de l'arbre rotatif (7) est montée dans le support d'interrupteur (2) par une gaine en cuivre (5) manchonnée sur l'arbre rotatif (7), un espace libre situé entre la gaine en cuivre (5) et l'arbre rotatif (7) et un espace libre situé entre la gaine en cuivre (5) et le support d'interrupteur (2) ont une largeur infé-rieure à 0,2 mm et une longueur supérieure à 12,5 mm, une encoche (14) est prévue sur une surface d'extrémité de l'extrémité de sortie de l'arbre rotatif (7), une roue roulante (15) en contact avec une surface de découpe longitudinale de l'encoche (14) est disposée sur un côté d'une extrémité d'entraînement d'une tige élastique (16) montée sur le microinterrupteur (9), et l'autre côté de l'extrémité d'entraînement de la tige élastique (16) est en contact avec un contact mobile (17).

2. Interrupteur à clé antidéflagrant selon la revendication 1, dans lequel la partie inter-médiaire de l'arbre rotatif (7) est pourvue d'un disque annulaire (10) qui a un diamètre supérieur au diamètre de l'arbre rotatif (7) et fait partie intégrante de l'arbre rotatif (7), le disque annulaire est incorporé dans un espace situé entre le support d'interrupteur (2) et la plaque de protection (6), deux renfoncements (11) sont ménagés sur une surface d'extrémité du disque annulaire, un trou borgne (12) est ménagé de façon correspondante dans le support d'interrup-teur (2) et un ressort (3) et une bille en acier (4) sont placés dans le trou borgne.

3. Interrupteur à clé antidéflagrant selon la revendication 2, dans lequel une cheville de positionnement (8) étant axialement symétrique au trou borgne (12) est montée dans le support d'interrupteur (2), une rainure allongée (13) associée à la cheville de positionnement (8) est ménagée dans le disque annu-

laire (10), et un angle de rotation maximum de la cheville de posi-tionnement (8) dans la rainure allongée (13) est le même qu'un angle entre les deux renfoncements (11) par rapport à un axe du disque annulaire (10).

4. Interrupteur à clé antidéflagrant selon la revendication 1, 2 ou 3, dans lequel le noyau de verrouillage (1) d'interrupteur et l'arbre rota-tif (7) sont reliés l'un à l'autre par une struc-ture saillie-rainure.

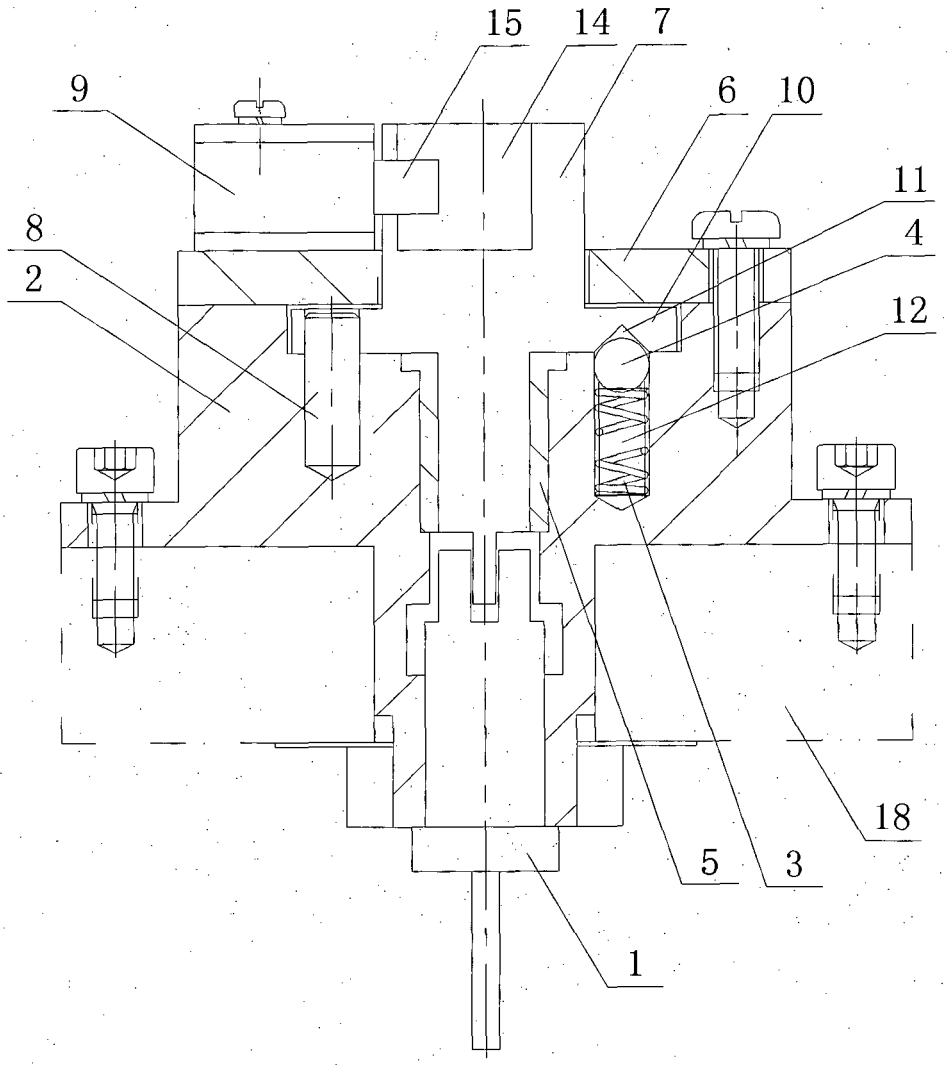

Fig. 1

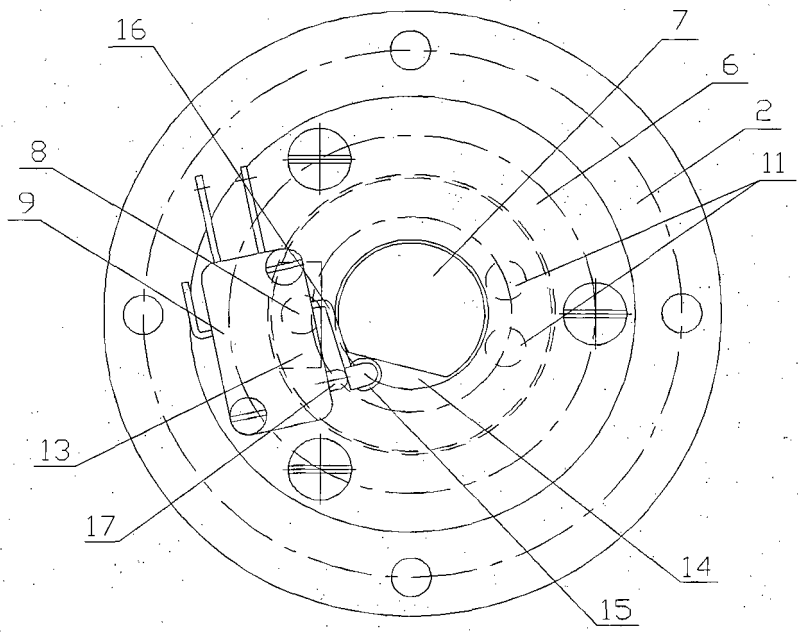

Fig. 2