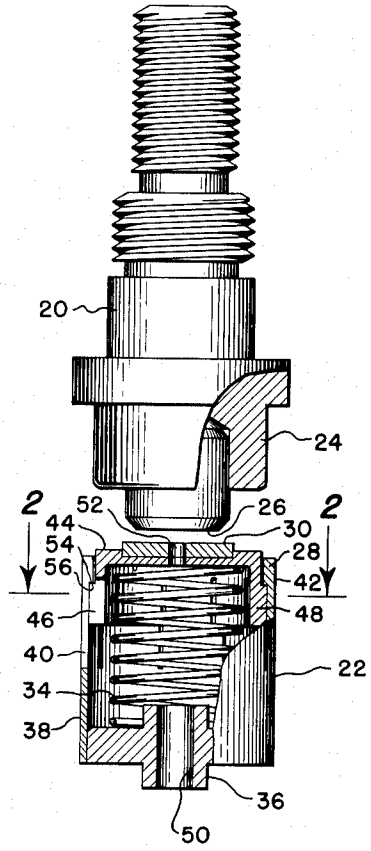
Sept. 7, 1965 E. R. PRICE ETAL 3,205,332

SWITCH HAVING TWO PAIRS OF CONTACTS, ONE PAIR BEING FORMED OF MATERIAL HAVING HIGHER RESISTIVITY CHARACTERISTIC THAN THE OTHER PAIR

Filed Aug. 15, 1963

FIG. 1



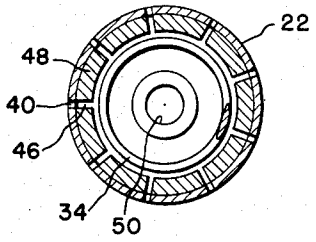


FIG. 2

INVENTORS
BERTRAM F. BUTLER
JOHN F. PRESCOTT
EVERETT R. PRICE
JERRY L. WHITCOMB

BY Fulwider, Patton, Rieber, Lee & Utecht
ATTORNEYS

United States Patent Office 3,205,332 Patented Sept. 7, 1965

3,205,332

SWITCH HAVING TWO PAIRS OF CONTACTS, ONE PAIR BEING FORMED OF MATERIAL HAVING HIGHER RESISTIVITY CHARACTERISTIC THAN THE OTHER PAIR

Everett R. Price, Escondido, Bertram F. Butler, Encinitas, Jerry L. Whitcomb, Cardiff, and John F. Prescott, Encinitas, Calif., assignors to Kinetics Corporation, Solana Beach, Calif., a corporation of California

Filed Aug. 15, 1963, Ser. No. 302,392
7 Claims. (Cl. 200—166)

The present invention relates to an electrical switch which is resistant to electric arc erosion.

Electric arc erosion can change the electrical operating characteristics and reduce the lifetime of a switch. Arc erosion becomes an increasingly difficult problem as higher and higher electric currents are interrupted by a switch.

In recent years there has been an increasing interest in small lightweight equipment for rockets and space vehicles. For a given electrical current, the problem of electric erosion increases as the size of the switch decreases.

The switch of the present invention comprises a pair of mating contacts, each having two distinct contacts which make electrical contact, one of the contacts of one of the pair of contacts making contact with one of the contacts of the other of the pair of contacts prior to the making contact of the other contacts of the pair of contacts. The contacts first making contact with one another are formed of a material which is resistant to electric arc erosion, for example tungsten. The contacts to subsequently make contact are formed of a material which has a low electrical resistivity, for example copper.

In order to accomplish sequential contacting, one of the two contacts which first makes contact is resiliently displaceable relative to the contact of which it is a part.

Spring means are incorporated in the switch to provide forces to maintain contact pressures between the contacting surfaces.

Openings are provided for the passage of coolants, either liquids or gases, through the switch.

Other features and advantages of the present invention will be apparent from the following description, reference being made to the accompanying drawing wherein a preferred embodiment of the invention is illustrated.

In the drawing:

FIG. 1 is a fragmentary view of the invention;

FIG. 2 is a sectional view taken along line 2—2 of FIG. 1.

Referring in detail to the drawing, the switch is shown as comprising two mating contacts, namely the plug **20** and the socket **22**.

The mating contacts **20** and **22** each have two distinct contacts which make electrical contact, **24** and **26**, and **28** and **30** respectively. Contacts **26** and **30** make electrical contact prior to sections **24** and **28** making contact.

Contacts **26** and **30** which are the first to contact one another are made of a material which is resistant to electric arc erosion, such as tungsten. Contacts **26** and **30** are replaceable since they are subject to arc erosion. Contacts **24** and **28** which contact one another last are made of a material which has a low electrical resistivity such as copper.

To accomplish sequential contacting socket contact **22** is in the form of a cylindrical open top pocket which slidably receives and guides a snapper type, cup-shaped element or holder **44**. This holder carries contact **30** and is resiliently displaceable relative to contact **22** of which they are parts. This resilient displacement is made possible by the presence of a spring **34**. Spring **34** is disposed within the pocket and is confined by the stop plate **36** which is secured to the main body **38** of contact **22**.

The main body **38** of contact **22** is slotted with slots **40** so as to divide the upper portion of the main body into spring tangs **42**, and these tangs provide contact force between contact section **28** of contact **22** and contact section **24** of contact **20**. The spring tangs **42** being resiliently displaceable in a direction laterally, and herein shown as radially to the longitudinal axis of the switch.

The diameter portion **24**, the maximum diameter of spring tangs **48**, and the minimum diameter of spring tangs **42**, uninfluenced by external forces, are such that when contacts **20** and **22** are fully engaged, there is contact force between contact portions **24** and **28** and between the snapper element **44** and the main body **38**.

The switch is cooled by the passage of the gases through the cooling passages **50** and **52**, when in the presence of a gaseous atmosphere. The switch is cooled by the passage of the liquid through the cooling passages **50** and **52**, when in the presence of encompassing liquid.

The movement of the snapper element **44** in the direction parallel to the longitudinal axis of the switch, is limited by the stop plate **36** in one direction and by ridges forming shoulders **54** and **56**, which shoulders are formed integrally with the main body **38** and the element **44** respectively.

While the form of embodiment herein shown and described constitutes a preferred form, it is to be understood that other forms may be adopted falling within the scope of the claims that follow.

We claim:

1. An electrical switch comprising in combination:
   (A) A plug including:
      (1) a contact formed of material having low electrical resistivity,
      (2) a second contact formed of material having higher resistance characteristic to arc erosion relative to the material of the first mentioned contact, said second mentioned contact extending longitudinally outwardly beyond the first mentioned contact;
   (B) a socket including:
      (1) a contact forming a pocket for receiving the contacts of the plug, said contact of the socket being formed of material having low electrical resistivity,
         (a) said contact having an inwardly extending and integrally formed shoulder,
      (2) an element having spring tangs slidably guided by and longitudinally movable in the pocket of the first mentioned contact of the socket and forming a second contact, said second mentioned contact of the socket being formed of material having higher resistance characteristic to arc erosion relative to the material of the first mentioned contact of the socket,
         (a) said element of the socket having an integrally formed and outwardly extending shoulder adapted to engage the first mentioned shoulder for retaining said latter contact in the pocket,
      (3) and means normally biasing the second mentioned contact of the socket longitudinally and outwardly of the first mentioned contact of the socket;
   (C) one of the two first mentioned contacts of the plug and socket having means associated therewith for biasing it laterally toward the other of said two contacts.

2. An electrical switch as defined in claim 1, characterized in that the respective first mentioned contacts of sociated with the first memtioned contact of the socket.

3. An electrical switch as defined in claim 1, character-

ized in that the respective first mentioned contacts of the plug and socket are formed of copper.

4. An electrical switch as defined in claim 1, characterized in that the respective first mentioned contacts of the plug and socket are formed of tungsten.

5. An electrical switch as defined in claim 1, characterized in that the respective first mentioned contacts of the plug and socket are formed of copper and the respective second mentioned contacts of the plug and socket are formed of tungsten.

6. An electrical switch as defined in claim 1, characterized to include:

(D) one of the contacts of the socket having means associated therewith for biasing it laterally toward the other contact of the socket.

7. An electrical switch comprising in combination:

(A) a plug including:

(1) a contact formed of material having low electrical resistivity,

(2) a second contact formed of material having higher resistance characteristic to arc erosion relative to the material of the first mentioned contact, said second mentioned contact extending longitudinally outwardly beyond the first mentioned contact;

(B) a socket including:

(1) a contact forming a pocket for receiving the contacts of the plug, said contact of the socket being formed of material having low electrical resistivity,

(a) said contact having an inwardly extending shoulder,

(2) a second contact slidably guided by and longitudinally movable in the pocket of the first mentioned contact of the socket, said second mentioned contact of the socket being formed of material having higher resistance characteristic to arc erosion relative to the material of the first mentioned contact of the socket,

(a) said second mentioned contact of the socket having a shoulder adapted to engage the first mentioned shoulder for retaining said latter contact in position and including spring tangs in frictional engagement with the interior wall of the socket,

(3) and means normally biasing the second mentioned contact of the socket longitudinally and outwardly of the first mentioned contact of the socket;

(C) one of the two first mentioned contacts of the plug and socket having means associated therewith for biasing it laterally toward the other of said two contacts.

References Cited by the Examiner

UNITED STATES PATENTS

1,913,522	6/33	Thompson et al.	200—166
2,295,338	9/42	Ely	200—166 X
2,445,588	7/48	Skeats	200—146
2,455,998	12/48	Hoye	200—146
3,167,630	1/65	Alderman et al.	200—148 X

FOREIGN PATENTS

526,635	3/31	Germany.

KATHLEEN H. CLAFFY, *Primary Examiner.*

ROBERT K. SCHAEFER, *Examiner.*

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,205,332 September 7, 1965

Everett R. Price et al.

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 1, line 21, before "erosion" insert -- arc --; column 2, line 8, before "portion" insert -- of --; line 23, before "element" insert -- snapper --; lines 69 to 71, strike out "An electrical switch as defined in claim 1, characterized in that the respective first mentioned contacts of sociated with the first memtioned contact of the socket" and insert instead -- An electrical switch as defined in claim 1, characterized in that the means (C) for biasing laterally is associated with the first mentioned contact of the socket --; column 3, line 4, for "first" read -- second --.

Signed and sealed this 29th day of March 1966.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents