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Mehner et al.

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[45] **June 28, 1974**

[54] **HINGED KEYBOARD SWITCH**

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[73] Assignee: **DIEHL**, Nurnberg, Germany

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[30] **Foreign Application Priority Data**

Apr. 22, 1972 Germany 2219820

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[51] **Int. Cl.** **H01h 3/04**

[58] **Field of Search** ..... 200/172 A, 61.7, 86.5, 200/153 J, 5 A, 159 R; 340/365 A; 179/90 K

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Primary Examiner—Robert K. Schaefer
Assistant Examiner—William J. Smith
Attorney, Agent, or Firm—Walter Becker

[57] **ABSTRACT**

A keyboard switch having a housing for mounting on the conductor of a data processing device with a keyhead hinged to the housing. The housing and keyhead contain cooperating elements of circuit control means actuated by tilting of the keyhead on the housing. The hinge connecting the keyhead to the housing is constructed for assembly without tools. A latch device is provided which will latch the keyhead in depressed position on the housing when the keyhead is pressed downwardly and which will then release the keyhead upon again pressing downwardly on the keyhead.

9 Claims, 7 Drawing Figures

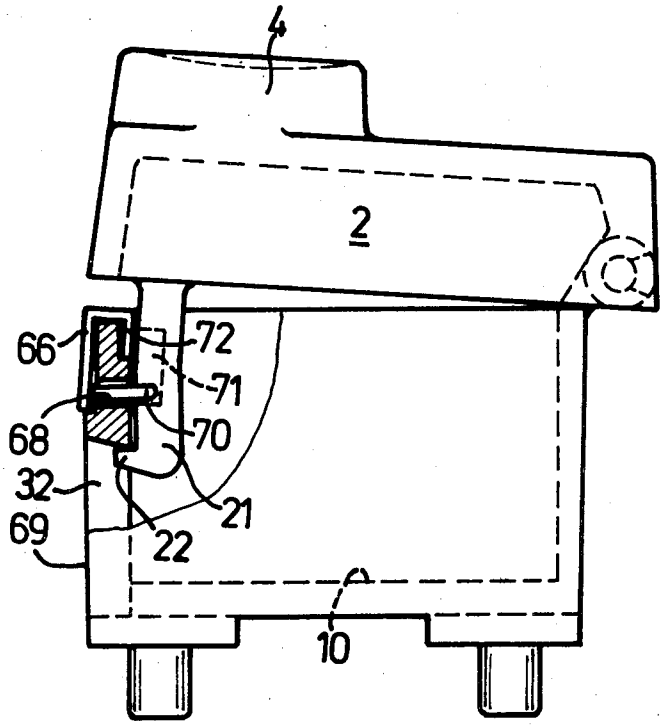


Fig. 1

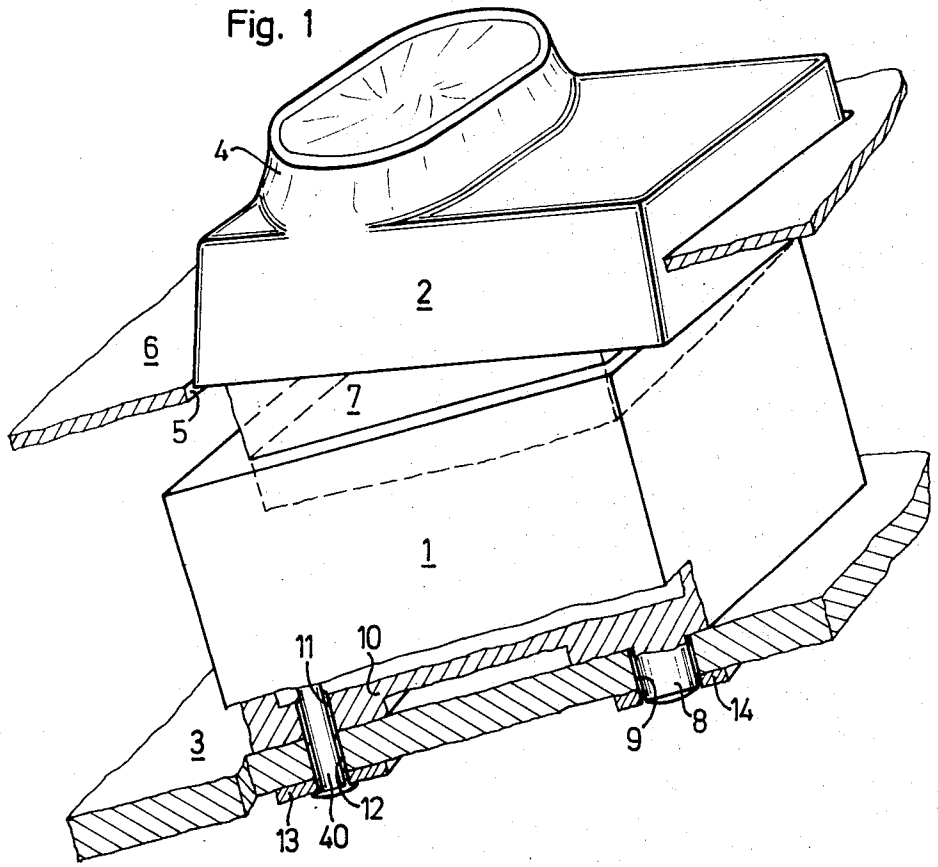


Fig. 2

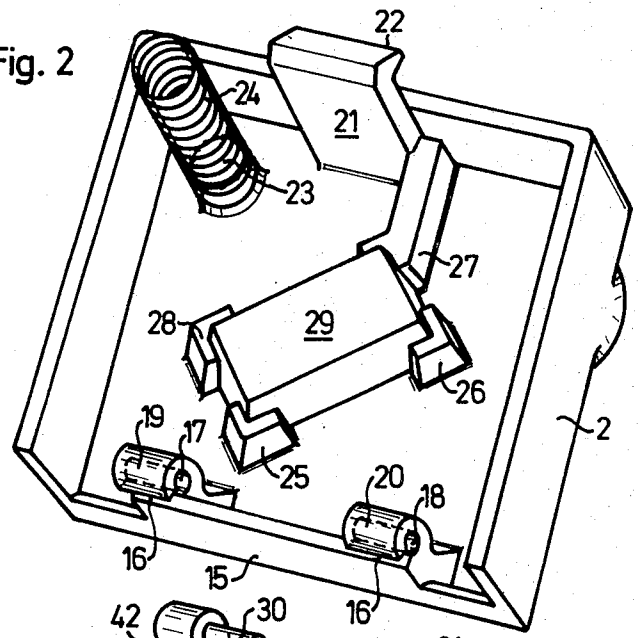

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Fig. 3

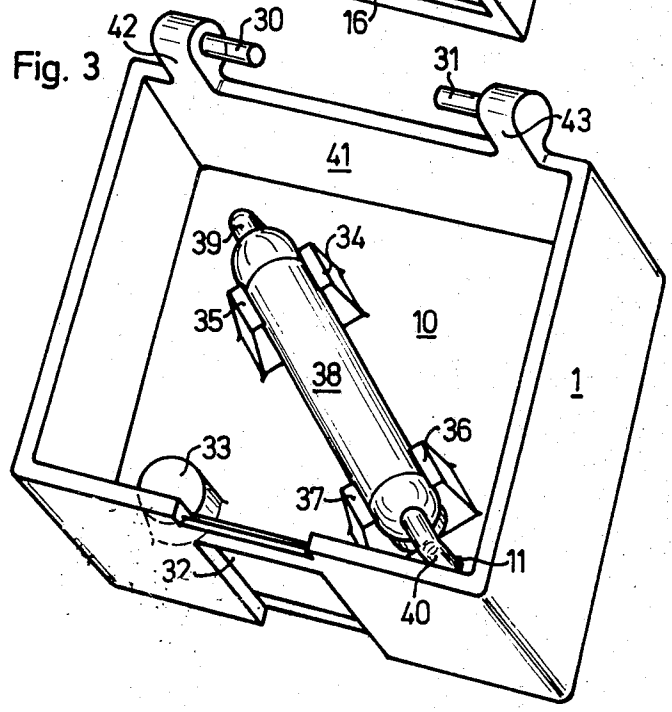

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Fig. 4

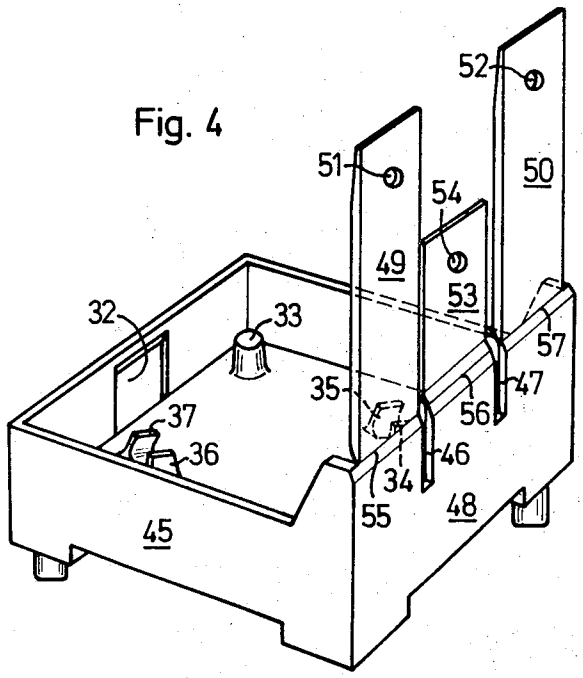

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Fig. 5

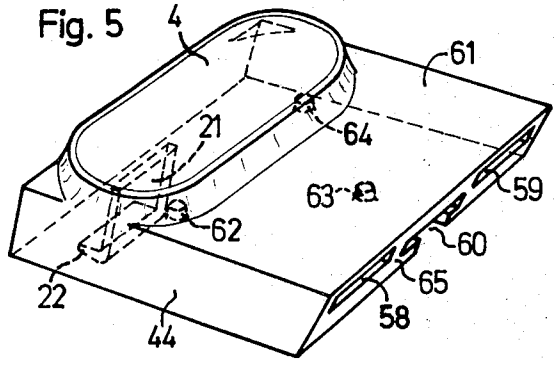

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Fig. 6

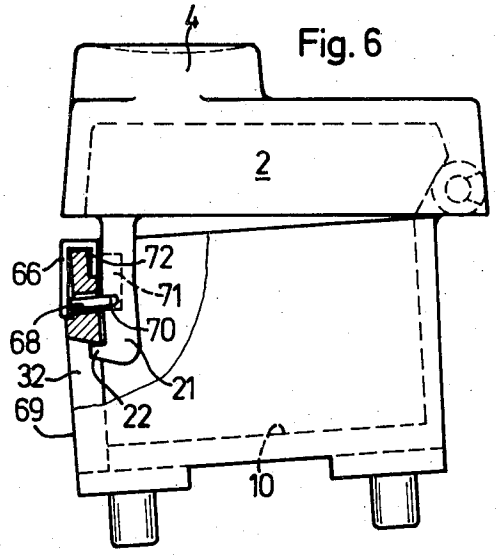
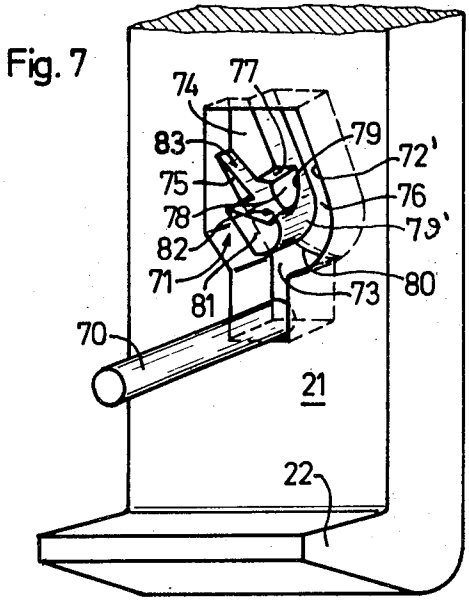

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72
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32
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22
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Fig. 7


74
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72'
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78
79'
82
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80
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HINGED KEYBOARD SWITCH

The present invention relates to a keyboard switch for assembly on conductor plates of data processing devices, which comprises a housing provided with centering means for the conductor plate, a spring-loaded keyhead pivotable against the thrust of a spring element, and contact means operable by the keyhead.

An input keyboard system has become known according to which at the bottom side of the keys push-rods are provided for actuating contacts. These keys are pivotally mounted while the bearings of a key line are located below the keys of a preceding key line.

It is an object of the present invention to provide a universally usable keyboard switch of a substantially closed and flat construction which comprises only a few elements which are easy to produce and to assemble.

It is another object of this invention to provide a keyhead for the keyboard switch system set forth in the preceding paragraph which when operated carries out only a slight tilting movement.

These and other objects and advantages of the invention will appear more clearly from the following specification in connection with the accompanying drawings, in which:

FIG. **1** illustrates a side view of a keyboard switch according to the present invention.

FIG. **2** is a bottom view of the keyhead of FIG. **1.**

FIG. **3** shows a top view of the keyboard switch housing of FIG. **1.**

FIG. **4** illustrates a top view of a modified housing for a keyboard switch according to the invention.

FIG. **5** is a top view of a keyhead pertaining to the housing of FIG. **4.**

FIG. **6** diagrammatically illustrates a keyboard switch according to FIGS. **1** and **4** with a latching or catching mechanism.

FIG. **7** represents a detail of the latching or catching mechanism, of FIG. **6.**

The keyboard switch according to the present invention is characterized primarily by bearings which are provided within the region of the upper edge of the rear wall of the housing and into which the keyhead is adapted to be pressed by bearing means likewise provided within the region of the rear wall. To this end, the housing rear wall may be extended in the direction toward the keyhead beyond its upper edge for forming bearing pins, and the rear wall of the keys may have slotted bearing bores into which the bearing pins snap.

The switch according to the present invention may advantageously be produced of injection molded synthetic material. The bearings and abutments for the pivotal keyhead as well as the holding means for the contact elements and for the return springs may be formed as one piece with the keyhead or the housing. The assembly of the housing and keyhead is possible in a simple manner by latching the bearing pins into the bearing bores. The bearings provided on the upper edge of the housing rear wall permit an easy and jam-proof operation of the keyhead at a slight inclination only. Furthermore, the housing will assure a safe and long lasting functioning of the key switch which can be further improved by providing on the keyhead or on the housing a foil which covers up the space between

the keyhead and the housing and forms a protection against the entry of dust.

Referring now to the drawings in detail, the keyboard switch illustrated in FIG. **1** comprises a housing **1** and a keyhead **2** pivotally linked thereto. The housing **1** and the keyhead **2** may consist of injection moldable synthetic material. The key switch **1, 2** is connected to a conductor plate **3.** For actuating the key, the keyhead is provided with an elevation **4.** The keyboard switch has its keyhead **2** extend through a cutout **5** provided in a cover plate **6.** As protection against dust, the keyhead **2** has arranged thereon a foil **7** which covers up the space between the housing **1** and the keyhead **2.** For centering the location of the housing **1** on the center plate **3,** the housing has two pins of which one pin only, namely the pin **8,** is visible in a bore **9** of the conductor plate. Furthermore, the bottom **10** of housing **1** and the conductor plate **3** are respectively provided with two bores each for two connecting wires of a contact element as shown in FIG. **3.** These bores (in FIG. **1** only bores **11, 12** are shown) are provided within the region of conductor strips **13, 14,** a connecting wire **40** being soldered to the conductor strip **13.**

As will be seen from FIG. **2,** the rear wall **15** of the keyhead **2** has arranged thereon two bearing blocks **19, 20** which are provided with slots **16** having chamfered edges and with bores **17** and **18.** Furthermore, the keyhead **2** has an arm **21** with a protrusion **22,** with a pin **23** for receiving a return spring **24** and with four supports **25–28** into which latter a permanent magnet **29** may be clamped.

Pins **30, 31** (FIG. **3**) which form one piece with the housing **1** are adapted to be snapped into the slotted bores **17, 18** of the bearing blocks **19, 20.** The pins **30, 31** are located above the upper edge of housing **1** and outside the housing rear wall **41** so that they are offset in upward direction and in rearward direction in order to obtain a pivot arm as long as possible for the keyhead **2** and thereby a slight tilting inclination only of the keyhead. Furthermore, a cutout **32** in housing **1** is provided for the protrusion **22** of arm **21.** The protrusion **22** engages the cutout **32** for limiting the stroke of the key. To secure the position for the spring **24,** there is provided a pin **33** which likewise forms one piece with the housing **1** and which, when the key head is assembled, engages the spring **24.** In addition to the pin **33,** on the bottom **10** there are provided four resilient clamping elements **34–37** which cooperate with each other in pairs. These clamping elements are adapted in a positive and frictional manner to connect a magnetic contact of known type which is mounted in a sleeve **38.** The sleeve **38** is equipped with connecting wires **39, 40** which, when the magnetic contact snaps into the latching elements **34–37,** extends through the bores **11** of the housing bottom **10** and through bores **12** of the conductor plate **3** of FIG. **1** into the range of conductor strips **13, 14** and are soldered thereto.

FIG. **4** shows a housing **45** which in addition to the above described cutout **32** and the latching elements **34–37** has two molded-on film hinges **49, 50** with bores **51, 52,** these hinges and bores being provided in a rear wall **48** having two cutouts **46, 47.** Between the hinges **49, 50** and likewise on the rear wall **48** there is injection molded a leaf-shaped return spring **53** which is laterally defined by the cuts **46, 47,** spring **53** being provided with a bore **54.**

For fixing the turning point of the hinges **49, 50** as well as of the return spring **53,** the hinges and the return spring are provided with notches **55–57** at the height of the upper end of the rear wall **48.**

The keyhead **44** according to FIG. **5** is, in addition to the elevation **4** referred to above in connection with FIGS. **1** and **2** and the arm **21** with protrusion **22,** provided on its rear wall **65** with three cutouts **58–60** in the manner of guiding elements for drawers. Within the region of these cutouts **58–60,** a cover plate **31** has three pins **62–64** which as to their diameter correspond to the bores **51, 52, 54** of the hinges **49, 50** and return spring **53.**

For purposes of assembling the keyhead **44,** at the same time the hinges **49, 50** are passed through the cutouts **58, 59** and the return spring **53** is passed through the cutout **60.** In this connection the keyhead **44** is slipped onto the hinges until the pins **62–64** snap into the bores **51, 52** of the hinges and into the bore **54** of the return spring **53.**

The invention is not limited to the specific embodiments discussed so far. Thus, the keyhead and the housing may be formed as one piece by injection molding. Furthermore, with a keyboard switch equipped with a latching mechanism, a lamp may be provided in the interior of the switch, which lamp may advantageously be made of transparent material and which is so connected that the keyhead latched into operating position will be illuminated.

A latching mechanism is shown in FIG. **6** for the keyboard switch of FIGS. **1** and **4.** Such latching mechanism comprises a pin **70** which is axially displaceable in a bore **68** of a housing end face **69** and is laterally pivotable. Pin **70** is adapted by a spring yoke **66** to be pressed against a latching path **71** arranged in the arm **21.** The spring yoke or spring frame **66** has a U-shape and is clamped into a somewhat undercut recess **72** provided on the upper edge and on the inner side of the housing end side **69.**

As will be seen from FIG. **7,** pin **70** is, in the starting position of the keyhead **2** shown in FIG. **6,** located in a recess provided at the bottom of the latching path **72'** and rests with its axially outer end face on a path **73.**

Reference to left, right, top, and bottom herebelow refers to the respective directions in the plane of the drawing. With this in mind, path **73** ascends in the left-hand upward direction and is also inclined in the front to back direction so as to decrease in axial depth in the upward direction. The path **73** terminates at the top at a step or corner **75** which is connected by axial surface **83** with an axially facing plane surface **74** which is disposed at a greater axial depth than the upper portion of path **73.** Axial surface **83** faces rightwardly and inclines toward the left in the upward direction.

At the lower edge of plane surface **74** there is a downwardly facing step **77** leading axially to an axially facing plane surface **78** located at a lower axial depth than plane surface **74** but at a lesser axial depth than path **76** which is located rightwardly from place surfaces **74** and **78.** At the right side, surface **78** terminates in a corner **79** and an axial surface **79'** facing toward the right connects corner **79** to path **76.**

Path **76,** at the lower end, terminates in a corner that is connected by a downwardly facing axial step **80** to the axially deepest and lowermost region of path **73.** Step **80** preferably inclines upwardly toward the left side.

Surrounded by the paths **73** and **76** and the plane surface **78,** there is provided an axially protruding latching cam **81** in the recess **72'.** This cam **81** has a wedged shaped downwardly tapering notch **82** which forms an upwardly facing pin arresting notch and which is connected to step **75** by the inclined rightwardly facing axial surface **83.** The notch **82** is closed at the bottom by plane surface **78.** The left side of cam **81** guides pin **70** along path **73** during downward movement of keyhead **2.**

When the keyhead **2** according to FIG. **6** is pressed downwardly, the spring-loaded pin **70** is guided along the path **73** by step **80** and cam **81,** and drops through the intervention of step **75** onto the plane surface **74.** During a further downward movement of the keyhead **2,** the protrusion **22** of arm **21** pushes against the housing bottom **10.** This completes the manual depressing of the keyhead **2.** By means of the return spring **24** (FIG. **2; 53** in FIG. **4**) the keyhead **2** is tilted back until the pin **70,** guided along the inclined axial surface **83,** drops over step **77** to the plane surface **78** and moves therealong into the wedge-shaped notch **82.** The keyhead **2** is then held by the spring-urged pin **70** in the switched-on position of switch **38** (FIG. **3**).

After a further short depressing of the keyhead **2,** the pin **70,** which may at this time be guided by step **77,** drops over corner **79,** and comes to rest on the path **76.** As a result thereof, the return spring **24** (FIG. **2; 53** in FIG. **4**) will now be able to return the keyhead to its starting position while in the course of this return movement the pin **70** drops over step **80** to the path **73** and comes to a halt in the recess at the bottom of the path thereby stopping the upward movement of keyhead **2.**

It is, of course, to be understood that the present invention is, by no means, limited to the particular showing in the drawings, but also comprises any modifications within the scope of the appended claims.

What is claimed is:

1. A switch especially for use as a keyboard switch for assembly on conductor plates of data processing devices, which comprises: a housing having means for connection thereof to a conductor plate and having one of a pair of circuit controlling elements therein, a keyhead having the other of said circuit controlling elements therein, said elements cooperating to control circuit means in response to relative movement of said elements when the keyhead is assembled with said housing, said housing and keyhead each having at least one wall, said walls being in substantially coplanar relation when the keyhead is assembled with said housing portion, detachably interengageable elements of hinge means on the opposed edges of said walls for tilting movement of said keyhead on said housing, spring means acting between said housing and keyhead and biasing said keyhead away from said housing, the said wall of said housing having at least one region extended toward the said wall of the keyhead, said wall of said keyhead having at least one region extending toward the said wall of the housing and said regions being disposed in side by side relation, and a pin in one of said regions and extending laterally into the range of the other of said regions, said other regions having a pin receiving bore therein and a slot parallel to the pin and

leading into the bore whereby the pin can be snapped into the bore through the slot in the radial direction.

2. A switch according to claim **1** in which said pin is in the region extending from the wall of the housing and is offset from the plane of the wall toward the outside of the housing.

3. A switch according to claim **1** in which the housing has a bottom wall which on the bottom rests on the conductor plate, the upwardly facing side of said bottom wall comprising upstanding resilient fingers, the circuit controlling element in said housing comprising a component which is snapped into engagement with said fingers from above, said component having wire means connected thereto, and hole means in said bottom wall through which said wire means lead for connection of said component to circuit means.

4. A switch according to claim **1** in which said keyhead has an arm projecting therefrom on the side opposite the hinged connection of the keyhead to the housing, said arm overlapping the housing and extending from the keyhead in the direction of movement of the keyhead on the housing, said arm having a protrusion on the free end thereof, and said housing being formed with a cutout in which said protrusion is moveable, at least one end of said cutout forming an abutment for engagement by said protrusion to halt said keyhead.

5. A switch especially for use as a keyboard switch for assembly on conductor plates of data processing devices, which comprises: a housing having means for connection thereof to a conductor plate and having one of a pair of circuit controlling elements therein, a keyhead having the other of said circuit controlling elements therein, said elements cooperating to control circuit means in response to relative movement of said elements when the keyhead is assembled with said housing, said housing and keyhead each having at least one wall, said walls being in substantially coplanar relation when the keyhead is assembled with said housing portion, detachably interengageable elements of hinge means on the opposed edges of said walls for tilting movement of said keyhead on said housing, spring means acting between said housing and keyhead and biasing said keyhead away from said housing, said keyhead having an arm projecting therefrom on the side opposite the hinged connection of the keyhead to the housing, said housing having a further wall inside which said arm is disposed, said arm and further wall being in substantially parallel adjacent relation, a latching recess formed in the side of said arm which faces said further wall, and a pin in said further wall extending axially into said recess and spring urged in the axial direction on said further wall, said latching recess and pin cooperating releasably to hold said keyhead in depressed component actuating position on said housing.

6. A switch according to claim **5** in which said one wall of said housing has hinge tabs and a spring leaf flexibly joined thereto and projecting toward said keyhead, slots formed in the said one wall of said keyhead for receiving said tabs and leaf endwise, and means formed on said tabs and leaf and on said keyhead for holding said keyhead in assembled relation with said tabs and leaf.

7. A switch according to claim **5** which includes a flexible dust excluding foil closure member engaging said keyhead at the top and at the bottom engaging said housing and sealing between the keyhead and the housing.

8. A switch according to claim **5** in which said keyhead has a top wall with a downwardly facing underneath side, said circuit controlling element in said keyhead comprising a member on the underneath side of said top wall, and resilient elements dependant from the underneath side of said top wall and supportingly engaging said member.

9. A switch according to claim **6** in which said housing is molded from synthetic material and said tabs and leaf are molded integrally therewith.

* * * * *