Jan. 21, 1936. J. BRUSTLEIN 2,028,587

MULTIPLE SWITCH

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Fig. 1

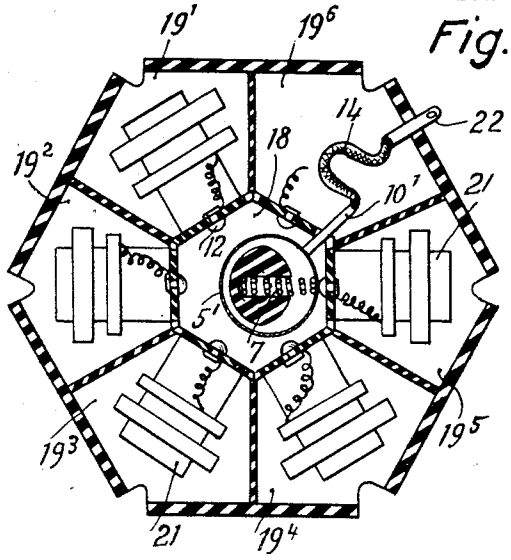


Fig. 2

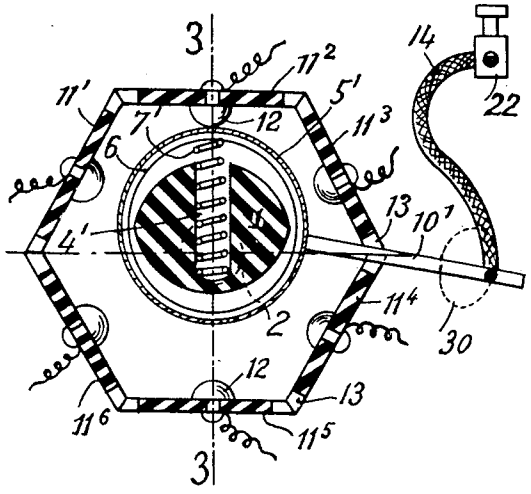


Fig. 3

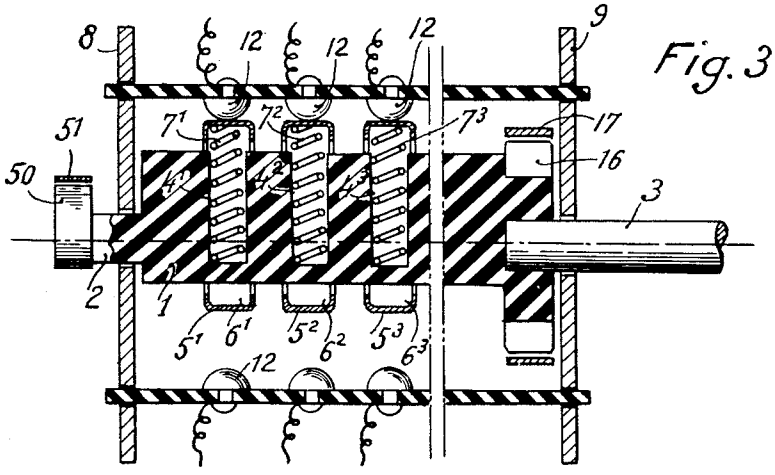
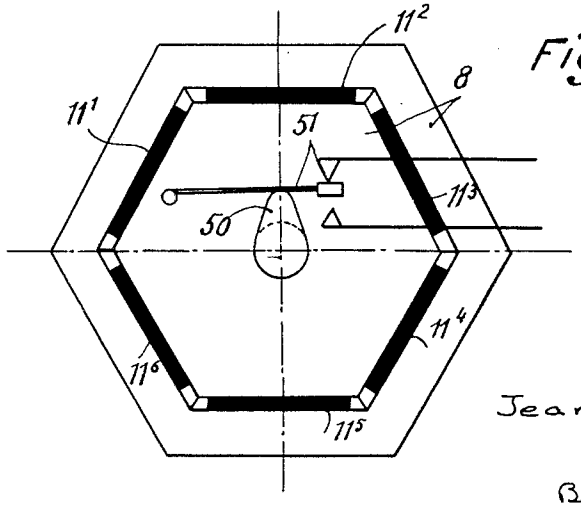


Fig. 4



Jean Brustlein
INVENTOR

By Otto Munk
his ATTY.

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Fig. 5

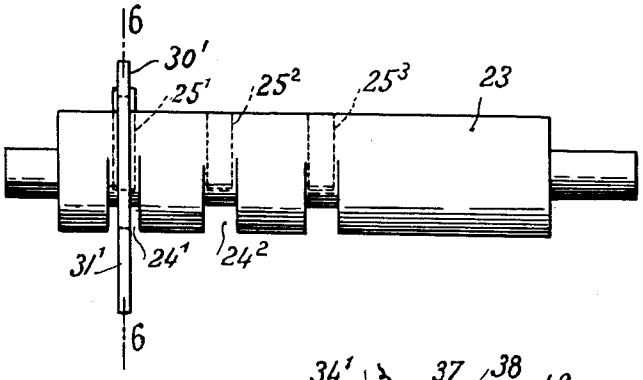


Fig. 6

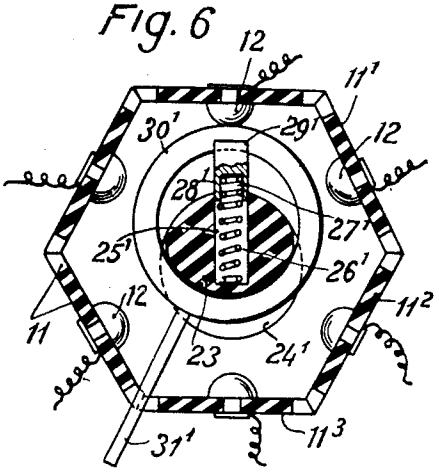


Fig. 7

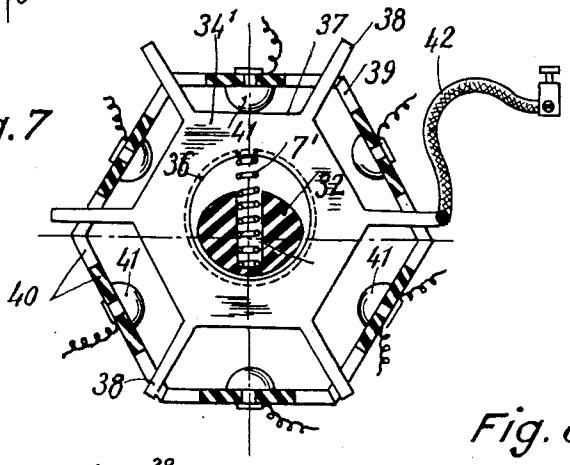
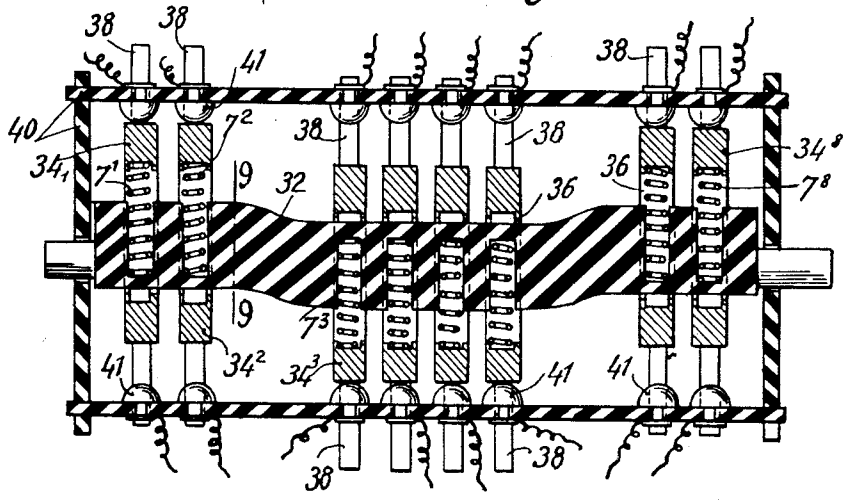


Fig. 9



Fig. 8



Jean Brustlein
INVENTOR

By Otto Munk
his ATT'Y.

UNITED STATES PATENT OFFICE

2,028,587

MULTIPLE SWITCH

Jean Brustlein, Paris, France, assignor to Georges Gavoret & Cie, Paris, France, a limited company of France

Application October 20, 1934, Serial No. 749,143
In France September 4, 1934

9 Claims. (Cl. 200—8)

The object of the present invention is to provide a multiple switch or contactor of low residual capacity and small space requirements, while at the same time enabling the switch to control a large number of circuits.

A further object is to provide a multiple switch which is particularly suited for wireless apparatus, and is very robust and easy to manipulate.

More particularly, its object is to avoid the development of any abnormal effect at the end of a manipulation and to eliminate all risk of the switch being put out of action due to accident.

Switches by means of which the foregoing objects may be realized possess the characteristic features set forth in the description below and in the claims appended at the end of the said description.

Switches according to the invention are illustrated, by way of example, in the annexed drawings, wherein:

Fig. 1 is a transverse sectional view of a set of high-frequency coils for a wireless set covering five wave ranges and including a switch according to the invention.

Fig. 2 is a section, on a larger scale, through a plane at right angles to the axis of the switch and passing through one of the rings.

Fig. 3 represents a longitudinal section taken on the line 3—3 in Fig. 2.

Fig. 4 is an end view of the switch in question.

Figs. 5 and 6 represent respectively an elevation of a part and a transverse section of a second constructional form of the invention.

Fig. 7 represents a cross-sectional view of a third constructional form of the invention.

Fig. 8 is a longitudinal section of this third constructional form.

Fig. 9 is a transverse section of the shaft taken on the line 9—9 in Fig 8.

Fig. 1 represents, in transverse section, a practical constructional form of the switch according to the invention as utilized for switching sets of coils, covering five wave ranges, for a wireless station.

The containing casing is provided with a central compartment 18 having six sides and six compartments 19^1, 19^2 . . . arranged symmetrically around the central one. The central compartment contains the rotary switch described in detail below. The coils 21 for the five ranges of reception of the station are located in the five compartments 19^1, 19^2 . . . 19^5, while the flexible cables 14 linking up the extremities of the connecting rods 10^1 of the switch to the stationary terminals or tags 22 are located in the sixth compartment 19^6. The position of the spindle 1 corresponding to this sixth compartment may, for example, be that in which a pick-up is connected in circuit. The stationary tags or terminals 22 project through the side of the insulating casing which closes the compartment 19^6 and are connected to the wiring of the remainder of the wireless set.

This arrangement makes possible the assembly in a single block, occupying very little space, of the coils for the various reception ranges and also of the range selecting switch, and it further makes possible that the lengths of the connecting wires between the coils and the contacting studs may be reduced to a minimum.

In the first constructional form (Figs. 2 and 3) the switch includes a spindle or shaft 1, made, for instance, of moulded insulating material. At one of its extremities this spindle 1 forms a journal or bearing 2 integral with the shaft and at its other extremity it is provided with a metallic shaft 3 embedded in the insulating spindle when it is moulded or fixed by any other known means (Fig. 3). This metallic shaft 3 also constitutes a journal and its projecting end serves as an operating spindle.

The spindle 1 has an oval cross-section (Fig. 2) and, along the small diameter of this oval cross-section, it is provided with blind holes or sockets 4^1, 4^2, 4^3 spaced at equal distances along the spindle 1. Surrounding the spindle 1 opposite the holes 4^1, 4^2, 4^3 are loose circular-conducting rings 5^1, 5^2, 5^3 provided with inner grooves 6^1, 6^2, 6^3 formed, for instance, by folding over the edges of each ring towards the centre.

Each ring 5^1 has an inner diameter slightly larger than the longer diameter of the oval cross-section of shaft 1, which allows the said ring to move relatively to the shaft 1 over a considerable distance in the direction of the smaller diameter of the oval and over a very small distance in the direction of the larger axis of the oval (Fig. 2).

On each ring 5^1 is secured, for example, by welding or soldering, a rigid, conducting rod 10^1, electrically connected with the ring to which it is attached.

In each hole 4^1, 4^2, 4^3 of the shaft 1 a thrust spring 7^1, 7^2, 7^3, is located which bears against the groove 6 of the corresponding ring 5^1, 5^2, 5^3.

The shaft 1 of the switch is mounted by its journals 2 and 3 in two end cheeks 8 and 9. These two end cheeks 8 and 9 serve as supports for plates of insulating material 11^1, 11^2, 11^3

arranged parallel to the axis of the switch spindle. Each plate carries studs 12 arranged parallel to the axis of the shaft 1 and facing the rings 5^1, 5^2. Notches 13 cut in the plates 11^1, 11^2 enable the rods 10^1 of the rings 5^1 to pass through, and guide them in their movement.

The terminals of the circuits to be switched are attached, on one side, to the studs 12 of the plates 11^1, 11^2, and, on the other, to the ends of the rigid rods 10^1. The latter connection is established by means of the flexible cables 14 each attached at one end to the end of a rod 10^1 and, at the other end, secured to a stationary terminal or connecting tag 22.

The system just described functions in the following manner:

As the shaft 1 is rotated around on its journals 2 and 3 it carries with it the springs 7^1, 7^2, the outer ends of which slide in the grooves 6 of the rings 5^1, 5^2. Under the action of these rotating springs 7^1, 7^2, the rings 5^1, 5^2 are pushed in a radial direction and come into contact successively with the lines of studs 12 on the plates 11^1, 11^2. These rings 5^1, 5^2 may act either on the studs 12 of two successive plates 11^1, 11^2 simultaneously or on the studs of one plate only. In the latter case, the oval cross-section of the shaft 1 is such that the rings 5^1 are kept by the said shaft 1 at a certain distance from the studs 12 of two successive plates 11^1, 11^2 whenever the springs 7^1 occupy a mean position relatively to adjacent plates 11^1, 11^2.

In the former case the circuits corresponding to the studs 12 of two successive plates 11^1, 11^2 are connected in parallel with each other during the time contact is made with their studs.

In the second case a break is produced between the moment when the circuits connected to the studs 12 of the plate 11^1 are broken and the moment when contact is made with the studs 12 of the succeeding plate 11^2.

The location and retention of the shaft 1 in the correct positions, in which the springs 7^1 are opposite the studs 12, is obtained by means of an interlocking device consisting, for instance, of a star wheel 16 cast integral with the shaft 1 and positioned between two blade-springs 17.

The shaft 1 may also carry one or more cams or bosses 50, which, in certain definite positions and by processes already known, may close supplementary contacts 51 or perform any other useful mechanical action (Fig. 4).

In the second practical constructional form shown in Figs. 5 and 6, the shaft 23, which is of circular cross-section, is provided with channels 24^1, 24^2, which are cut so that the shaft has an oval section at these points and on the opposite side to these channels 24^1, 24^2 and along the lesser axis of the oval, the shaft is provided with blind holes 25^1, 25^2, in which are located spiral springs 26^1, 26^2. The outer ends of these springs 26^1, 26^2 press into recesses 27^1, 27^2 in projecting heads 28^1, 28^2 which are slidable in the holes 25^1, 25^2. Each head 28^1, 28^2 has, on its outside, a groove 29^1, 29^2, in which works a ring 30^1, 30^2 with an integral rod 31^1.

The shaft and the contact rings described above are arranged in the interior of a compartment formed by the terminal plates 11^1 as in the construction shown in Figs. 1–4.

In the third constructional form shown in Figs. 7–9, the shaft 32 has a symmetrical oval section, and the contact members 34^1, 34^2, instead of consisting of rings moved by a thrust spring, take the form of a metallic hexagonal piece having a circular, central opening 36, with contact faces 37 and radiating arms 38. The radiating arms 38 extend through the transverse grooves 39 cut in the insulating plates 40, which carry the contact studs 41. One of the arms 38 of the hexagon is welded to the flexible cable 42 through which contact is made. In this arrangement it is the arms 38 which, as they slide in the grooves 39 of the plates 40, ensure the guiding of the hexagons 34^1 and the location of the contact faces 37 opposite the contact studs 41.

Furthermore, when, with switches of considerable length the resultant effect of these thrusts would cause deflection of the shaft, it is easy to obviate this inconvenience by making the shaft (Figs. 8 and 9) from a number of different sections positioned at 180° to each other, which arrangement balances the thrusts and reduces their effect considerably.

The arrangements described above have the following technical advantages:

(1) The number of sliding contacts is less by one half than in known switches, which comprise no flexible connections and, therefore, require two contact members per circuit, the whole arrangement is, therefore, particularly simple and safe.

(2) All the connections affecting a contact member are situated in the plane crosswise to the said member; in consequence, the space at disposal is made use of in a scientific manner and the space occupied by the switch is very much reduced. Furthermore, the connections are, for this reason, very short, a condition which lessens the capacity effect of the switch.

(3) The spindle of the switch may be rotated without limiting the rotation, which obviates the necessity of providing limiting stops and eliminates the stress developed in the shaft when its rotation is suddenly stopped. The shaft may, therefore, without risk, be of a lighter construction than in the known forms of switches.

(4) The flexible connecting cable 14 (Fig. 2) has only a very limited movement because the end of the rod 10^1 (Fig. 3) describes a curve 30 of only very restricted dimensions. The risks of fracture in the flexible cable 14 from cold-working of the metal are, therefore, avoided and, besides, this flexible cable may be very short and therefore have a low resistance.

(5) The pressure of the contact member on the studs is effected by spiral springs of considerable length which do not carry any current. It follows that these springs may be of sufficient length to ensure their constant elasticity in spite of wear and manufacturing irregularities, a feature which is difficult to obtain in the ordinary small switches with blade-springs for which the blades are necessarily too short.

What I claim as my invention and desire to secure by Letters Patent is:—

1. In a multiple switch; an insulated casing; a shaft rotating within said casing; a conducting contact member freely surrounding the shaft and capable of displacement relatively to the said shaft in a plane perpendicular to the axis of the shaft; a rigid conducting rod fastened to said conducting contact member and guided by the casing so as to prevent the rotation of said rod and member; studs distributed over the inner surface of the casing in the plane of the conducting, contact member; a resilient mem-

ber mounted on the rotary shaft and exerting a pressure on the contact member in a radial direction to press it against the stud situated in this direction.

2. In a multiple switch; an insulated casing; a shaft of oval cross-section rotating within the said casing; a contact member consisting of a ring freely surrounding the oval shaft, the said ring having an inner diameter slightly greater than the major axis of the oval and being free to move relatively to the said shaft in a plane at right angles to the axis of the shaft and only in the direction of the minor axis of the oval; a rigid conducting rod fastened to said conducting contact member and guided by the casing so as to prevent the rotation of said rod and member; studs distributed over the inner face of the casing in the plane of the conducting, contact member; a resilient member mounted on the rotary shaft and exerting a pressure in a radial direction on the contact member to press it against the stud situated exactly in this direction.

3. In a multiple switch; an insulated casing; a shaft of oval cross-section rotating within the said casing; a contact member consisting of a ring freely rotatable on the oval shaft, the said ring having an inner diameter slightly greater than the major axis of the oval and being free to move itself relatively to the said shaft in a plane at right angles to the axis of the shaft and only in the direction of the minor axis of the oval; a rigid conducting rod fastened to said conducting contact member and guided by the casing so as to prevent the rotation of said rod and member; studs distributed over the inner surface of the casing in the plane of the conducting, contact member; a resilient member mounted on the rotary, oval shaft and exerting a radial pressure on the contact member in the direction of the lesser axis of the oval to press said contact member exactly against the stud situated in this direction.

4. In a multiple switch; an insulated casing; a shaft rotating in the said casing; a conducting, contact member freely rotatable on the said shaft and free to move relatively to this shaft in a plane perpendicular to the axis of the shaft; a rigid conducting rod fastened to said conducting contact member and guided by the casing so as to prevent the rotation of said rod and member; and studs distributed over the inner surface of the casing in the plane of the conducting, contact member.

5. In a multiple switch; an insulated casing; a shaft rotating in the said casing; a conducting, contact member in the form of a ring having an internal groove, the said ring working freely on the shaft and being free to move relatively to the said shaft in a plane perpendicular to the axis of the said shaft; a rigid conducting rod fastened to said conducting contact member and guided by the casing so as to prevent the rotation of said rod and member; studs distributed over the inner surface of the casing in the plane of the conducting, contact member; a spring carried by the rotary shaft and engaging, at its free end the groove of the contact ring and pressing said ring in a radial direction against the stud situated in this direction.

6. In a multiple switch; an insulated casing having guiding slots; a shaft rotating within the said casing; a conducting, contact member working freely on the shaft and capable of displacement relatively to the said shaft in a plane perpendicular to the axis of the said shaft; arms carried by the contact member and moving in guiding slots in the casing and retaining the contact member in its plane of displacement; contact studs distributed over the inner surface of the casing in the plane of the conducting contact member; a resilient member mounted on the rotary shaft and exerting a thrust on the contact member in a radial direction to apply it to the stud situated in this direction.

7. In a multiple switch; an insulated casing; a shaft rotatable within the casing and having a groove such as to produce an oval cross-section at the groove and a radial socket; a conducting, contact member in the form of a ring working freely on the shaft in the groove and capable of displacement relatively to the said shaft in a plane perpendicular to the axis of the shaft; studs distributed over the inner surface of the casing in the plane of the conducting, contact member; a spiral spring fitted in the radial socket of the shaft; a projecting head with a guiding groove sliding in the radial socket under the action of the spring, and engaging, by its groove, with the contact ring and exerting on the said contact ring a thrust in a radial direction to apply it to the stud situated in this direction.

8. In a multiple switch; an insulated casing with an aperture; a shaft rotating in the said casing; a conducting, contact member working freely on the shaft and capable of displacement relatively to the said shaft in a plane perpendicular to the axis of the shaft; a rigid connecting rod carried by the contact member and passing through the aperture in the casing; studs distributed over the inner surface of the casing in the plane of the conducting, contact member; a resilient member mounted on the rotary shaft and pressing in a radial direction on the contact member to apply it to the stud situated in this direction.

9. In a multiple switch; an insulated casing; a shaft rotating in the said casing, the said shaft being made up of several sections situated eccentrically and angularly opposed to each other; conducting, contact members working freely on the various sections of the shaft and capable of free displacement relatively to the said shaft in planes perpendicular to the axis of the shaft; studs distributed over the inner surface of the casing in the planes of the various conducting, contact members; resilient members mounted on the rotary shaft and exerting a thrust in a radial direction on the different contact members to apply them respectively to the stud situated in this direction.

JEAN BRUSTLEIN.