Jan. 20, 1959 H. BRAND 2,870,282

TOGGLE SWITCH SYSTEM

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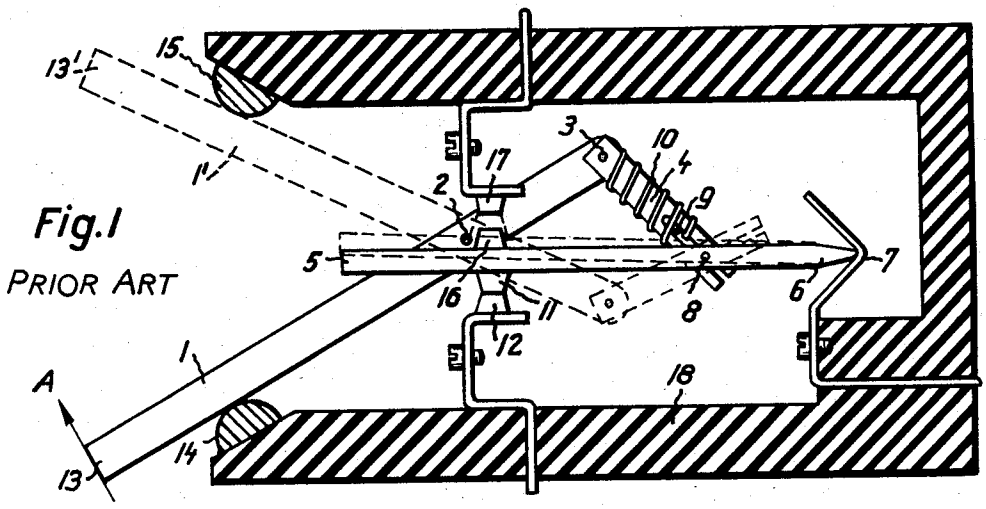


Fig.1

PRIOR ART

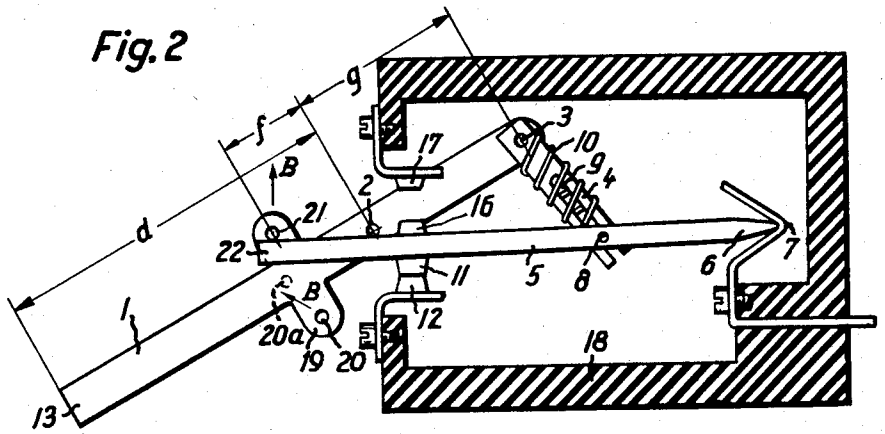
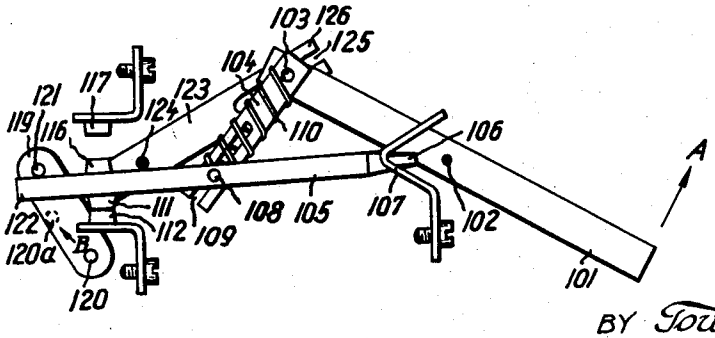


Fig.2

Fig.3



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Fig. 4

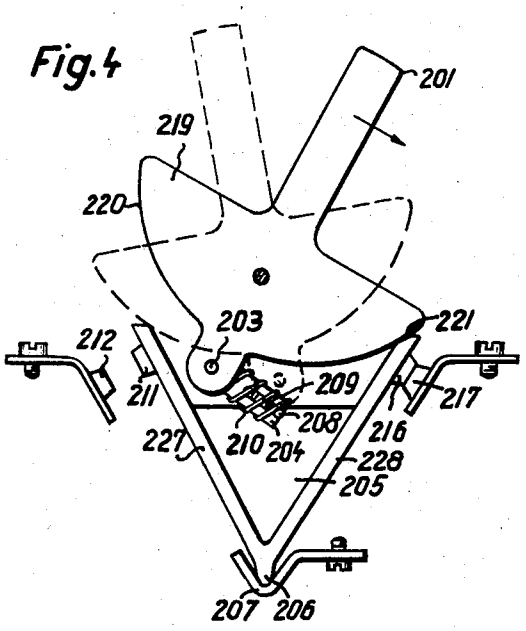


Fig. 5c

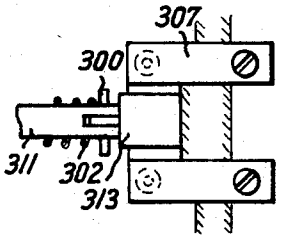


Fig. 5a

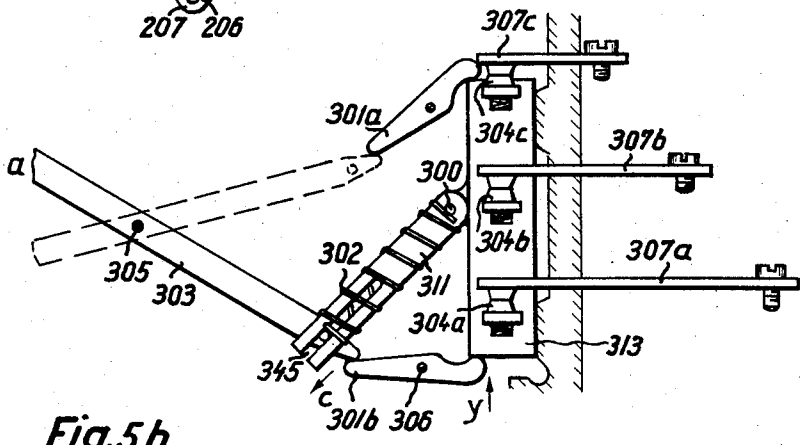
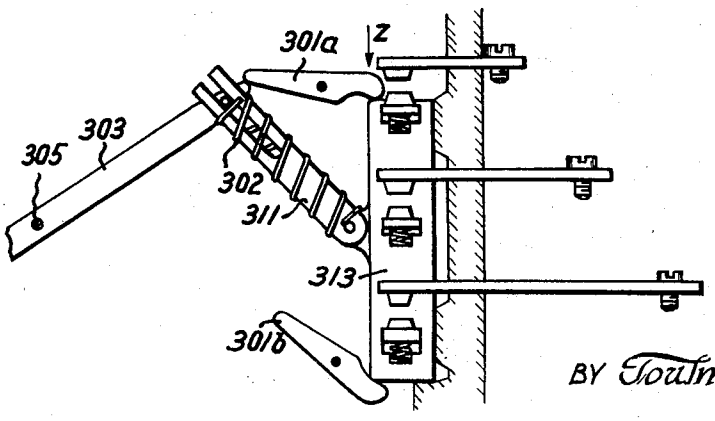


Fig. 5b



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Fig. 6

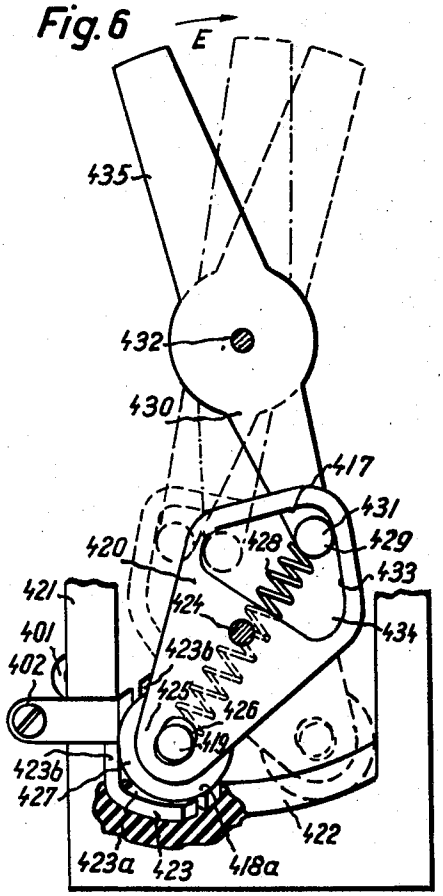


Fig. 7

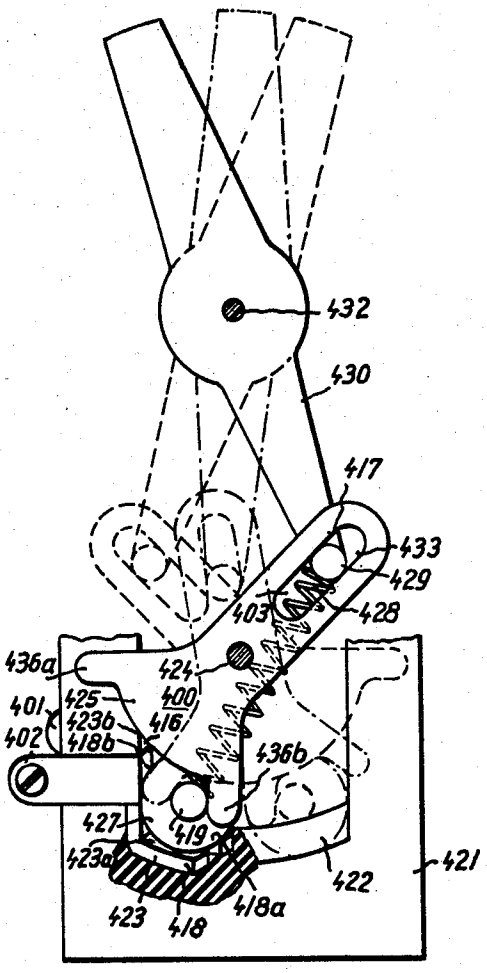
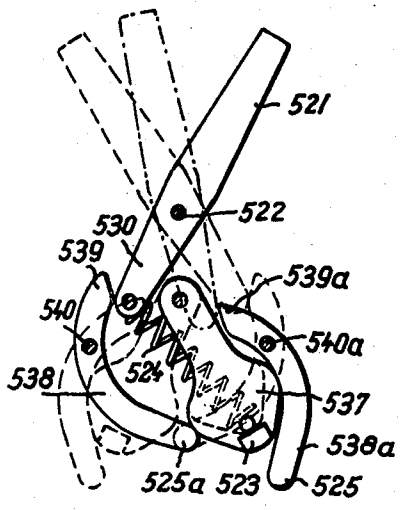


Fig. 8



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2,870,282

TOGGLE SWITCH SYSTEM

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Application June 12, 1956, Serial No. 590,902

Claims priority, application Germany June 15, 1955

7 Claims. (Cl. 200—67)

This invention relates to a toggle switch, and more particularly to a toggle switch of the mechanical type used, for instance, in remote control installations.

It is an object of my invention to provide a toggle switch which permits to achieve a high contact pressure by means of relatively low switching forces.

It is another object of the invention to provide a toggle switch of the above mentioned properties which is combined with automatic contact breaking means.

It is yet another object of the invention to provide a toggle switch in combination with means for multiplying contact pressure in the contact positions of the switch whereby the danger of sticking contacts is avoided and the possible frequency of making and breaking contacts is greatly increased.

It is a final object of the invention to provide a toggle switch construction which is easy to manufacture and to which existing toggle switch constructions may be converted.

Toggle switches have found wide application in electric apparatus. They are increasingly used in all sorts of devices for household and industry. At the same time, the demands as to the effectiveness of the switching operations carried out with them, have been equally augmented. In particular, the power to be switched on and off in the operation of modern actinic screen tubes and gas discharge lamps is so great as to exceed the requirements that can be fulfilled by the presently available toggle switches.

Even in toggle switches controlled for instance, by program circuits, which switches are usually mechanically operated, the possible frequencies and efficiencies are not adequate for the above-mentioned and other modern requirements.

It has been attempted to solve the arising technical problem by either enlarging the toggle switches by fitting them out with auxiliary devices such as sparking chambers or with an electromagnet used as an arc blow out magnet to achieve an extinction. However, these toggle switches are also usually required to be of especially small size, which prohibits the use of the aforesaid auxiliary means.

Since the danger in handling great power lies in the tendency of the contacts of toggle switches to stick and be arc welded together during operation, it has also been attempted to provide auxiliary means for abruptly separating the contacts by jerking them apart, or enforce separation of the contacts in the same manner if welding should already have begun.

Finally, in order to increase the contact pressure in the limiting positions of the switch, the force of the toggle spring has been increased. However, this could only be achieved by a correspondingly stronger construction of all parts of the switch, in order to permit the resulting increase in the mechanical or manual forces required to operate the switch, which led in turn to an undesirable increase in the size of the entire switch.

The above described drawbacks have been overcome,

and the objects stated hereinbefore have been achieved by my invention which is based on the idea that contact pressure in a toggle switch can be greatly increased by utilizing the reactive force, i. e. the return pressure of the toggle switch spring without the necessity of enlarging the dimensions of the latter. According to another main feature of the invention, the reactive force of the toggle switch spring which is used in increasing the contact pressure of the switch in its limiting positions, is further increased several times by a suitable selection of the lever transmission ratios in the switch as well as by a wedge-like securing of the levers transmitting the reaction toggle spring force, in the limiting positions of the switch.

My invention is based on the fact that, if a spring is to exercise a certain force at its one end to exert pressure or effect work, this spring must be supported at its other end and must exercise an equally large, but oppositely directed reactive force on its support. In toggle switches, tension springs or compression springs are usually employed as toggle springs, which springs exert their reactive forces on the switch casing either directly or by means of a lever transmission. In most cases, a manually or automatically actuated toggle lever on which the spring acts, is urged against a stop in the casing in which position it is rigidly supported against the aforesaid reactive force of the toggle spring.

The basic invention feature of using this reaction force for increasing the contact pressure of a toggle switch can be applied to practically all types of toggle switches irrespective of their use or construction. The adaptation of the latter to the invention depends largely on the use for which the switch is destined, and can thus take a variety of forms.

In practice, this is achieved by supporting the toggle spring on an action turnabout device which comprises lever means for transmitting the reaction force of the toggle spring in the limiting positions of the switch to the contact elements of the latter.

According to another feature of the invention the transmission of spring reactive pressure by means of the action turnabout device is effected by means of projections such as lugs or noses provided at one or several of the levers of the switch, which projections act so as to increase contact pressure and/or simultaneously enforce contact break. Thus, one and the same lug on a lever of the switch may exercise both functions successively.

The reactive force of the toggle switch spring is preferably caused to act upon a swivel lever of the above mentioned action turnabout device, which lever is so fulcrumed as to have the reactive spring force act upon the longer lever arm, the shorter arm of the lever thereby transmitting this reactive spring force increased upon the contact element of the contact maker of the switch. One of the arms of the swivel lever may be extended to form a detector lever which is acted by a register control roller or a similar mechanical control device.

The swivel lever, which represents an important feature in the toggle switch according to my invention, may be steered to pass over the center of attack of the toggle spring force by means of a separate switching lever.

The swivel lever according to the invention may be of T-shape, cross shaped or of another suitable shape.

The invention will be still better understood by the detailed description thereof which is given below in connection with the accompanying drawings, illustrating the invention, by way of example only, in a number of embodiments.

In the drawings:

Figure 1 illustrates schematically a known toggle switch comprising a knife-edge suspended toggle contact lever.

Figure 2 illustrates schematically a preferred embodiment of the toggle switch according to the invention which comprises a knife-edge suspended toggle contact lever similar to the one shown in Figure 1.

Figure 3 illustrates schematically an embodiment somewhat similar to that shown in Figure 1, with the toggle contact lever knife-edge suspended in a different arrangement.

Figure 4 shows yet another embodiment of the invention comprising a V-shaped toggle contact lever.

Figure 5*a* shows a schematic sideview of a multipole toggle switch according to the invention in one limiting position.

Figure 5*b* shows a sideview of the same multipole toggle switch in its other limiting position.

Figure 5*c* is a schematic top view of the toggle switch shown in Figures 5*a* and 5*b*.

Figure 6 illustrates a further embodiment of a toggle switch according to the invention, comprising roller contacts.

Figure 7 shows an improved construction of the embodiment shown in Figure 6 which is particularly adapted for enforced contact break by jerking the contact elements apart, and

Figure 8 is a further embodiment of the invention in which the toggle switch is a knife blade switch.

In the known toggle switch illustrated in Figure 1, reference numeral **1** designates a swivel lever which is fulcrumed about pivot **2** fixed to the switch casing **18** and is articulatedly connected by means of joint **3** to bifurcated knee lever **4**.

Contact lever **5** is suspended with its knife-blade end **6** in the V-shaped knife blade bearing **7** and bears a pin **8** which protrudes into guide slot **9** of knee lever **4**. Spring **10** is mounted on the latter lever and tends to spread the pivot points **8** on lever **5** and **3** on lever **1** apart.

Thereby, in the limiting position of the toggle switch shown in Figure 1, spring **10** urges the contact **11** on the lower side of lever **5** against contact terminal **12**, while the reactive force of spring **10** urges the free end **13** of lever **1** against the stop **14**.

If a mechanical control device such as a control or program device (not shown) lifts the free end **13** of swivel lever **1** in the direction of arrow A towards the position **13'** shown in dashed lines in Figure 1, i. e. into contact with stop **15**, lever **1**, turning about fulcrum **2** will compress spring **10** and cause pin **8** on lever **5** to enter deeper into guide slot **9** of lever **4** until both levers **4, 1** pass dead center (i. e. from a straight line). Once past dead center, spring **10**, in its effort to expand, will push lever **5** out of contact with terminal **5** and upwardly with its nose **16** into contact with terminal **17**, the reaction force of spring **10** being taken up by stop **15**. Both stops **14** and **15** as well as support bearing **7** are, for instance, mounted in the switch casing **18**, which is made of insulating material.

The danger of the contact elements, for instance **11** and **12**, or **16** and **17** as the case may be, sticking and welding together, is greatest when the levers **1** and **4** have just passed dead center and the vector component of force which acts upon the contacts and has been zero in dead center, is gradually rising to move the contacts apart. If welding occurs by arc formation between the contacts because the latter are not jerked apart sufficiently abruptly, the force of spring **10** will not be strong enough to separate the contacts which leads to failure of the switch and correspondingly of the entire apparatus, controlled thereby.

Fig. 2 shows a preferred embodiment of a toggle switch according to my invention, wherein parts identical with those shown in Figure 1 have like reference numerals.

This preferred embodiment thus comprises a knife edge suspended toggle contact lever **5** having contacts **11** and **16** for making and breaking contact with contact terminals **12** and **17** respectively. Current passes, for instance, from the blade bearing **7** through lever **5** to contact terminal **12** in the position shown in full lines in Figure 2.

According to a main feature of the invention swivel lever **1** is now provided with a transverse bar **19** on which there are mounted two pins **20** and **21** spaced from each other and adapted to engage at different times the free end **22** of lever **5**.

Thus, in the position shown in Figure 2, the pin **21**, engages the top side of the force end **22** of lever **5** and serves thereby as the supporting means for absorbing the reactive force of spring **10**, which, in the known construction illustrated in Figure 1, was absorbed by stop **14**. Not only is this stop made superfluous, but the reaction force is now caused to press down the contact **11** of lever **5** into contact with terminal **12**, thereby adding greatly to the pressure exerted on these contact elements by the direct force of spring **10** exerted via pin **8**.

In addition, however, to this primary function of increasing contact pressure, the pins **20** and **21** also have the function of enforcing separation of the contacts when the toggle switch is operated to break contact **11** and **12** and make contact **16** and **17**.

If the free end **13** of the swivel lever **1** is lifted, for instance by a program drum (not shown) in the direction of arrow A, the levers **1** and **4** will pass through the same dead center position as described above in connection with Figure 1; however, while the lever passes through dead center and as spring **10** inverts its pressure on pin **8** of lever **5** from a downwardly to an upwardly directed force component, pin **21** on bar **19** of lever **1** is lifted out of contact with the upper side of the free end **22** of lever **5**, while pin **20** comes into contact with the lower side of the aforesaid lever and lifts lever **5**, thereby separating the contacts **11** and **12**.

Any sticking or welding of these contacts is overcome by the superior separating forces which are composed of the direct, though initially small force component of spring **10** via pin **8**, by the reactive force component transmitted from spring **10** via lever **1** to pin **20**, and by the lifting force of the control drum (not shown) on the free ends **13** of lever **1**.

Therefore, if the force of spring **10** alone is not sufficient to lift contact **11** from terminal **12**, pin **20** will enforce separation by hitting against the lower side of free end **22** of lever **5** and jerk contact elements **11** and **12** apart.

In the opposite limiting position, i. e. when contact is made between contact elements **16** and **17**, pin **20** presses against the lower side of lever **5** and transmits thereon the reactive pressure from spring **10**, thereby considerably increasing the contact pressure exerted on this contact by the direct force of spring **10** via pin **8** of lever **5**.

The position of abutting pin **20** shortly before hitting against the free end **22** of lever **5** when moving in the direction indicated by arrow B, is indicated by dashed circle **20***a* in Figure 2.

It is further to be noted that the separating force exerted by pins **20** or **21**, as the case may be, is greatly increased by the fact that the steering organ attaching lever **1** at its free end **13** is at a distance *d* from the fulcrum **2** of lever **1** which is much greater than distance of pins **20** and **21** from the same fulcrum. In the same manner the reactive force of spring **10** is increased due to the distance *g* of pivot **3** from fulcrum **5** being greater than the aforesaid distance *f*.

Of course, instead of having the free end **13** of lever **1** by a mechanical steering organ such as the above mentioned register drum, this lever may also be operated manually.

In the embodiment shown in Figure 3, all parts fulfilling the same functions are designated by the similar reference numerals as in Figure 2. Thus, swivel lever

101 corresponds to swivel lever 1, fulcrum 102 to fulcrum 2, pivot 103 to pivot 3 and so forth.

If the switch would only comprise levers 101, 104, 105 and spring 110, only the direct force exerted by spring 110 via pin 108 on lever 105 would be utilized to make contact in the position shown in full lines in Figure 3. Furthermore, however, T-shaped auxiliary lever 123 is mounted about fulcrum 124, which lever bears at the crossbar 119 of the T the abutment means 120 and 121 and engages guidingly in a slot 125 provided at its end opposite cross bar 119 the aforesaid pivot 103 which hingedly connects levers 101 and 105.

In the position shown in Figure 3, the reactive force of spring 110 is transmitted via pin 103 on the upper side of wall 126 of guide slot 125 in lever 123, whereby the pin 121 on crossbar 119 of the lever is urged downwardly upon free end 122 of lever 105, and exerts a multiple increase in contact pressure of contact nose 111 on contact terminal 112 corresponding to that aforesaid reactive spring face. The path traveled by the contact noses 111, 116 is much shorter than the path traveled at the same time by pin 103 (at which the reaction force of spring 110 attacks); consequently the increase in pressure is inversely correspondent to the ratios of the two aforesaid paths.

While in Figure 2 a force component of spring 10 presses the blade end 6 of lever 5 into its bearing 7, spring 110 in Figure 3 pulls, in a manner of speaking, the blade end 106 against the surface of bearing 107.

In the embodiment of the invention shown in Figure 4 the contact lever 205 is suspended with its knife blade end 206 in knife blade bearing 207 which serves at the same time as one terminal for the circuit to be switched. The contact lever has the shape of a V and bears at the ends of both shanks 227, 228 contact noses 211 and 216 which are adapted to make contact with terminals 212 and 217 respectively. In the position shown in full lines in Figure 4 contact nose 216 mounted on the right shank 228 of contact lever 204 makes contact with terminal 217, while the contact between elements 211 and 212 is broken.

Toggle lever 201 is turned to the right about its fulcrum 202 and bears at its end protruding into the open end of V-shaped lever 205 a pivot joint 203 on which there is pivotally mounted the knee lever 204. The latter bears a compression spring 210 which exerts direct pressure on pin 208 mounted in central position on lever 205, thereby pressing the lever 205 and its contact nose 216 into contact with contact element 217. Pin 208 is guided in slot 209 of lever 204.

In accordance with the main feature of my invention toggle lever 201 bears a transversely extending member 219 which, in this embodiment, has the shape of a circular segment, and whose right segment nose 221 bears against the inside surface of shank 228 of V-shaped lever 205, exerting thereon a pressure corresponding to the reactive force of spring 210 on lever 201 via pin 203, thereby greatly increasing contact pressure between elements 216 and 217.

At the same time, segment 219 also fulfills the second function according to the invention, namely, when lever 201 is shifted to the left and has just passed through dead center, the left segment nose 220 will come to bear, at a point intermediary both limiting positions of the switch and indicated by the dashed lines in Figure 4, against the upper end of left shank 227 of lever 205 and thus enforce breaking of contact between elements 216 and 217 at a moment when the force component of spring 210 may not yet be sufficiently strong to effect break in particular if the contacts tend to stick as in a high power circuit.

Figures 5*a* to 5*c* illustrate a multipole toggle switch to which the features of the invention have been applied.

In Figure 5*a* the swivel lever 303 can be turned about its fulcrum 305 and is articulatedly connected in a conventional manner with a knee lever 311 via a slot 345. Levers 303 and 311 form a knee joint. A spring 302 is mounted on lever 311 and urges the levers 311 and 303 into an angular position relative to each other. Lever 311 is also hingedly mounted by means of pivot 300 on an upwardly and downwardly displaceable contact rail 313 bearing spring loaded contact plates 304*a*, 304*b* and 304*c*. These contact plates are adapted to make contact with line terminals 307*a*, 307*b* and 307*c*.

In the position shown in full lines one component of the force of spring 302 acts in the direction of making the contacts, by means of lifting contact rail 313 via pivot 300. At the same time the reactive force of spring 302 acts upon swivel lever 303 in the direction indicated by arrow C in Figure 5*a*. The end of lever 303 thus acts upon an auxiliary detour lever 301*b* fulcrumed at 306 which so deflects the reactive force of spring 302 that a force component indicated by an arrow at *y* contributes to raising contact 313 and making the contacts.

By giving the detour levers 301*a* and 301*b* an adequate shape, a wedge-like tensioning of levers 303 and 301*b* can be achieved, whereby the contact pressure in the switch can be further multiplied.

In Figure 5*b* the same switch as in Figure 5*a* is shown, however after contact break. In this position, the reactive force of spring 302 acting on lever 303 is transmitted by the latter to detour lever 301*a* which acts solely as a contact breaker and does not increase contact pressure as does lever 301*b* in Figure 5*a*.

The position of lever 303 shown in dashed lines in Figure 5*a* indicates the instant in which that lever engages lever 301*a* and causes the latter to assist in breaking contact by pressing on contact rail 313 in the direction indicated by arrow Z (Fig. 5*b*).

The top view of Fig. 5*c* serves to illustrate the distribution of parts of the above-described switch.

In Figure 6, yet another embodiment of a toggle switch according to the invention is illustrated, in which reference numeral 421 designates the switch casing. Part of the interior wall of this casing 421 is devised as a cam track 422 in which there are embedded two contact terminals 423 and 418 (the latter being behind 423). A toggle-lever like contact carrier 420 is fulcrumed about stationary pin 424 which is mounted in the wall of the switch casing 421. At its lower arm 425 lever 420 bears a roller contact 427 whose shaft 419 is disposed in slot 426 of arm 425 and somewhat displaceable therein toward and away from the lever fulcrum at 424. This roller contact is subject to the direct pressure of spring 428 urging the roller contact principally against surface portion 323*a* of contact terminal 423 (and 418*a* of a terminal 418 respectively).

The other end of spring 428 rests upon the lower end 429 of swivel lever arm 430 which is fulcrumed about pivot 432.

In Figure 6 the limiting position shown in full lines is that of the contact roller 427 making contact between contact terminals 423 and 418. The dashed lines indicate the position of the main parts of the switch when contact between the aforesaid terminals is broken.

In the contact making position, spring 428 exerts its reactive force (i. e. the force opposed to the direct force exercised on roller shaft 419) on the end 429 of lever 430, and the latter would turn about its fulcrum 432 if it were not prevented from doing so by its pivot 431, mounted on end 429 of lever 430, abutting against the oblique inner wall 433, of the triangular window 434 of the toggle lever 420, thereby attempting to turn the latter in the direction of arrow D and consequently exerting an additional contact pressure mainly on surface 423*b* and 418*b* respectively of contact terminals 423 and 418.

When the upper arm 435 of lever 430 is shifted in the direction of arrow E toward the opposite limiting position of the toggle switch, which position is indicated by dashed lines, it can move through dead center position to a posi-

tion indicated by dashed and dotted lines in Figure 6, without abutting with its end 429 the inner walls of triangle window 434.

This free path of travel must be sufficiently large to enable the toggle spring 428 to shift contact carrier 420 and contact roller 427 therewith so as to break contact. If this breaking of contact is impeded, for instance by sticking or welding effects at the contacts, end 422 of lever 430 will strike against inner wall 417 of window 434 when reaching the position shown in dashed and dotted lines, will jerk the contact carrier 420 and contact roller 427 into the position shown in dashed lines in Figure 6, and thus abruptly break the contact.

This abrupt breaking effect is assisted by the spring 428 expanding after passing through dead center and thus contributing to the lever 430, contact carrier 420 and contact roller 427 being pushed into the limiting position shown in dashed lines.

If this spring force is not sufficient by itself, the lever end 429 will enforce shifting of carrier 420 and roller 427 to the aforesaid limiting position, i. e. contact will be broken by the force pulling the lever 430 in direction of arrow E.

Since the reactive force of toggle spring 428 acts at an oblique angle on either one of inner walls 417 or 433 of window 434, a wedge-like tensioning is achieved which permits to a considerable increase in contact pressure due to a multiplication of the resulting reactive force components of spring 428.

Reference numeral 401 designates the lead in for terminal 418 and 402 the lead in for terminal 423.

While in the embodiment shown in Figure 6 a contact roller 427 makes contact with two contact terminals 423 and 418, it is also possible to use the switch for the operations by a suitable different arrangement of the contact terminals in the casing 421.

Thus the embodiment shown in Figure 7 shows a toggle switch of the same basic construction as in Figure 6, and in which those parts exercising like functions are designated with like reference numerals. However, in Figure 6 contact lever 400 bears an arm 425*a* which has the shape of a circular segment with two marginal legs 436 and 436*a* and a cam end surface 416 therebetween. At the opposite end lever 400 bears an elongated guide slot 403 with lateral inner walls 417 and 433, between which pin 429 of lever 430 is guided. This slot 403 fulfills part of the functions of triangular window 434 of Figure 6.

In the position shown in full lines in Figure 7, the reactive force of spring 428 pushes pin 429 of 430 in outward direction and thereby creates a lateral force component on inner wall 433 of slot 403 thereby pressing leg 436 of contact lever 400 against the shaft 419 of contact roller 427 and holding the same under pressure primarily on surfaces 418*b* and 423*b* of contact terminals 418 and 423 respectively.

Since the movement of pin 429 about fulcrum 432 is on a circle, its tangential force component forms a very acute angle with the wall surface 33, thereby creating a wedge-like effect which multiplies the pressure exerted by leg 436 on contact roller 427 several times.

The direct force of spring 428 urges the contact roller 427 at the same time primarily against surfaces 423*a* and 418*a*.

During the contact break movement, pin 429 of lever 430 causes contact lever 400 to swing about its fulcrum 424. If, after the knee lever system comprising swivel lever 430 and lever 400 has reached the position shown in dashed and dotted lines, and the switch does not break circuit thereby alone (due to sticking of the contacts), leg 436*a* of lever 400 will force contact roller 427 to break contact.

The limiting position of contact 427 when contact is broken is illustrated by dashed lines.

Figure 8 shows a further embodiment which is particularly suitable for switches comprising a contact bridge member which, in make contact position is clamped in between two resilient contact elements. It is more important in the case of such switches to ensure constant break, than to increase contact pressure.

In Figure 8, swivel lever 521, fulcrumed at 522 and contact carrier lever 537 which bears the contact bridge 523, correspond to parts of a known construction.

The reactive force of spring 524 is transmitted by auxiliary levers 538 and 538*a* on contact carrier lever 537 the transmitted force components being augmented by a wedge-effect between lever arm 530 and the inclined surface 539 of auxiliary lever 538.

In the position of lever 521 shown in dashed and dotted lines, the lever arm 530 rests against inclined surface 539*a* of the second contact lever 538*a* and swings the latter about its fulcrum 540*a*, so that the arm 525 of lever 538*a* abuts against contact carrier 537, thereby jerking the same from the limiting position shown in full lines to the opposite limiting position of the switch.

The lever ratios can be adapted to given conditions by a corresponding dimensioning of the lever arm.

It will be understood that this invention is susceptible to further modifications in order to adapt it to other usages and conditions, and accordingly, it is desired to comprehend such modifications within this invention as may fall within the scope of the appended claims.

What I claim is:

1. A toggle switch system comprising a plurality of contact elements, lever means for making and breaking contact between said elements, spring means exerting an active force on said lever means for effecting the switching of said lever means, and a reactive force in opposite direction to said active force and means for transmitting the reactive force of said spring means to said lever means to increase contact pressure between the latter and said contact elements.

2. A toggle switch system comprising a plurality of contact elements, lever means for making and breaking contact between said elements, spring means exerting an active force on said lever means for effecting the switching of said lever means, and a reactive force in opposite direction to said active force and means for transmitting the reactive force of said spring means to said lever means to increase contact pressure between the latter and said contact elements, and enforce contact break when said contacts tend to stick together.

3. A toggle switch system comprising a plurality of contact elements, lever means for making and breaking contact between said elements, spring means exerting an active force on said lever means for effecting the switching of said lever means, and a reactive force in opposite direction to said active force and means for transmitting the reactive force of said spring means to said lever means to increase contact pressure between the latter and said contact elements, and enforce contact break when said contacts tend to stick together, said means for transmitting reactive force comprising leg means transmitting successively the reactive force of said spring means to increase contact pressure and to enforce contact break depending on the position of the switch.

4. A toggle switch system comprising a plurality of contact elements, lever means for making and breaking contact between said elements, spring means exerting an active force on said lever means for effecting the switching of said lever means, and a reactive force in opposite direction to said active force and means for transmitting the reactive force of said spring means to said lever means to increase contact pressure between the latter and said contact elements, and enforce contact break when said contacts tend to stick together, said lever means comprising a swivel lever having a longer arm and a shorter arm and being pivotally mounted on a fulcrum in such a manner that said reactive spring force attacking at said longer lever arm of said swivel lever causes

said shorter arm of said swivel lever to exert an increased pressure on said contact elements when making contact.

5. A toggle switch system comprising a plurality of contact elements, lever means for making and breaking contact between said elements, spring means exerting an active force on said lever means for effecting the switching of said lever means, and a reactive force in opposite direction to said active force and means for transmitting the reactive force of said spring means to said lever means to increase contact pressure between the latter and said contact elements, and enforce contact break when said contacts tend to stick together, said lever means comprising a swivel lever having a longer arm and a shorter arm and being pivotally mounted on a fulcrum in such a manner that said reactive spring force attacks at said longer lever arm of said swivel lever, thereby causing said shorter arm of said swivel lever to exert an increased pressure on said contact elements when making contact, one of the two swivel lever arms being elongated and in contact with a mechanical control device actuating said swivel lever.

6. A toggle switch system comprising a plurality of contact elements, lever means for making and breaking contact between said elements, spring means exerting an active force on said lever means for effecting the switching of said lever means, and a reactive force in opposite direction to said active force and means for transmitting the reactive force of said spring means to said lever means to increase contact pressure between the latter and said contact elements, and enforce contact break when said contacts tend to stick together, said lever means comprising a swivel lever having a longer arm and a shorter arm and being pivotally mounted on a fulcrum in such a manner that said reactive spring force attacks at said longer arm of said swivel lever, thereby causing said shorter arm of said swivel lever to exert an increased pressure on said contact elements when making contact, said lever means further comprising a second lever for steering said swivel lever past the point of attack of the force of said spring means.

7. A toggle switch system comprising a plurality of contact elements, lever means for making and breaking contact between said elements, spring means exerting an active force on said lever means for effecting the switching of said lever means, and a reactive force in opposite direction to said active force and means for transmitting the reactive force of said spring means to said lever means to increase contact pressure between the latter and said contact elements, and enforce contact break when said contacts tend to stick together, said lever means comprising a swivel lever having a longer arm and a shorter arm and being pivotally mounted on a fulcrum in such a manner that said reactive spring force attacks at said longer arm of said swivel lever, thereby causing said shorter arm of said swivel lever to exert an increased pressure on said contact elements when making contact, a transverse member rigidly connected to said swivel lever, and a pair of pins mounted on said transverse member at a distance from the longitudinal axis of said swivel lever, one pin on each side of the latter, said pins exercising successively pressure on said swivel lever and enforcing contact break.

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