

June 22, 1965

K. KESL
TORSION SPRING ACTUATED SNAP-ACTION CIRCUIT BREAKER
WITH FREE RELEASE LATCH

3,190,983

Filed April 12, 1963

7 Sheets-Sheet 1

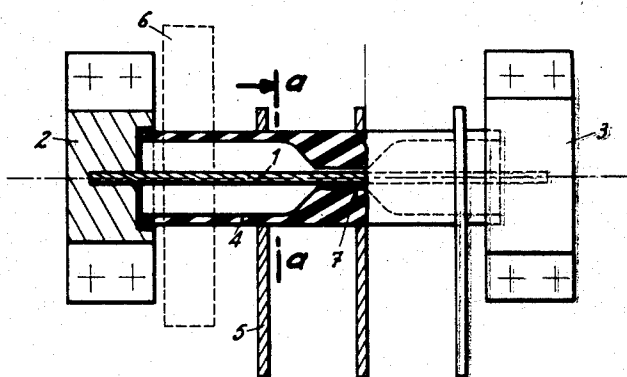


Fig. 1

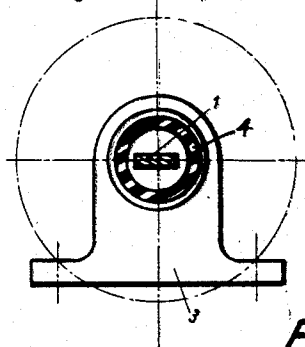


Fig. 2

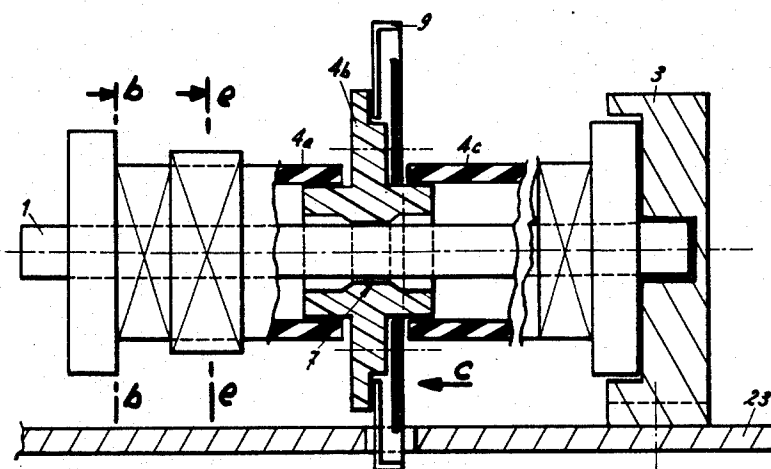


Fig. 3

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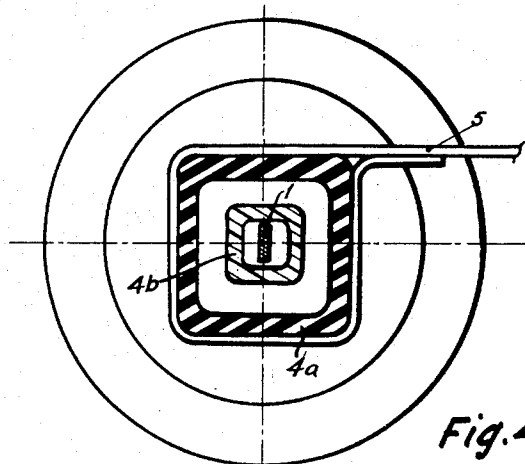


Fig. 4

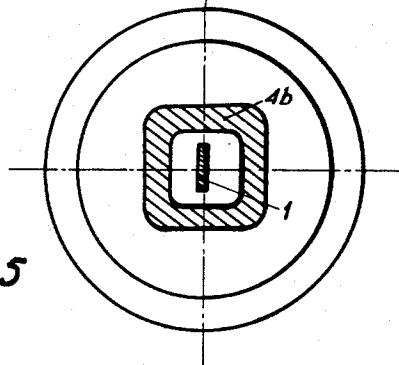


Fig. 5

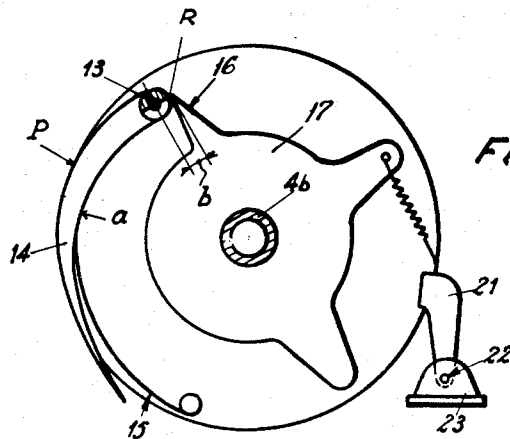


Fig. 12

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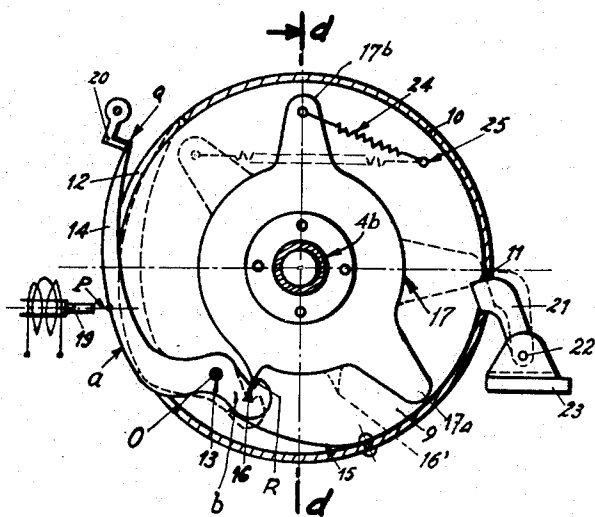


Fig. 6

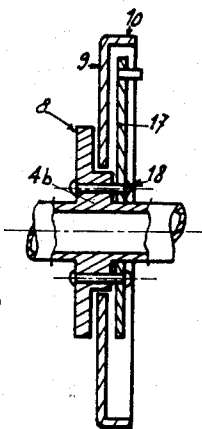


Fig. 7

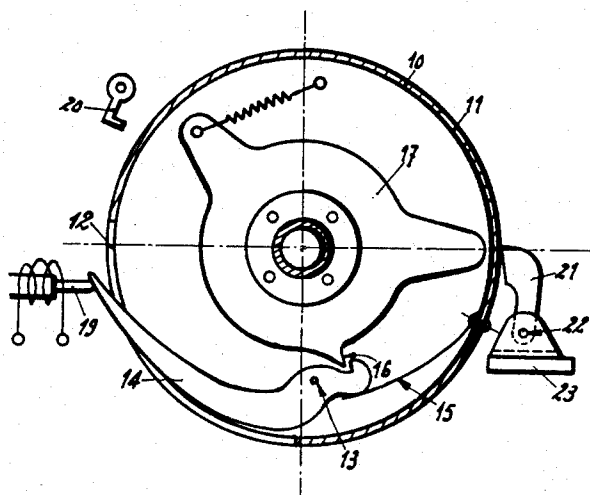


Fig. 8

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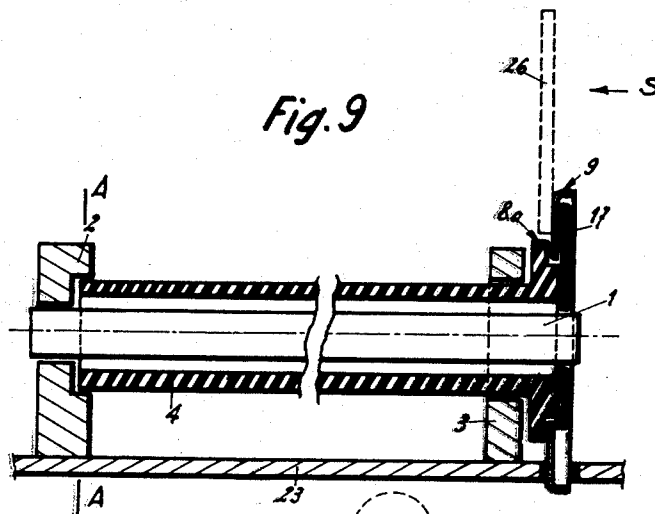
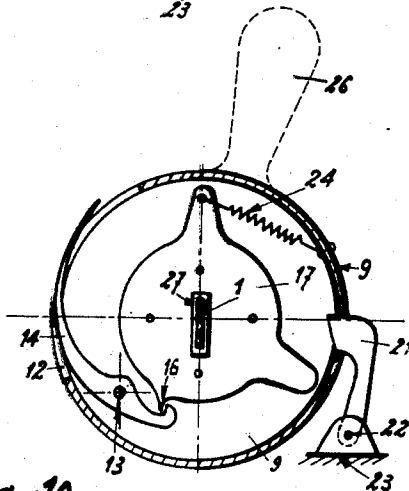
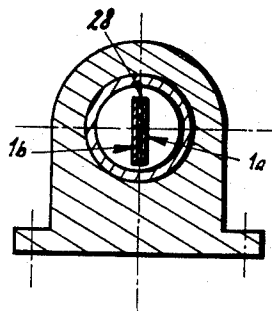
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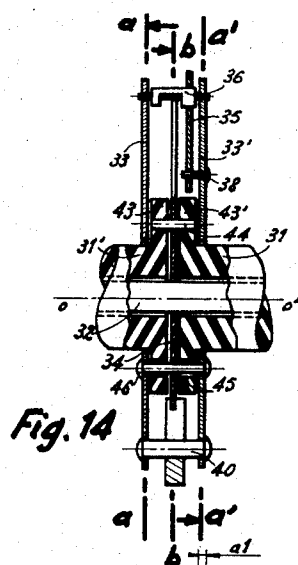


Fig. 14

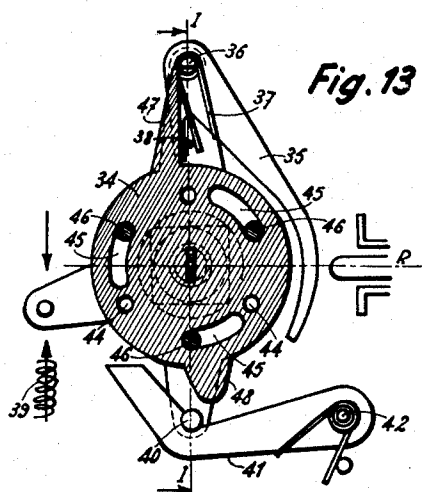


Fig. 13

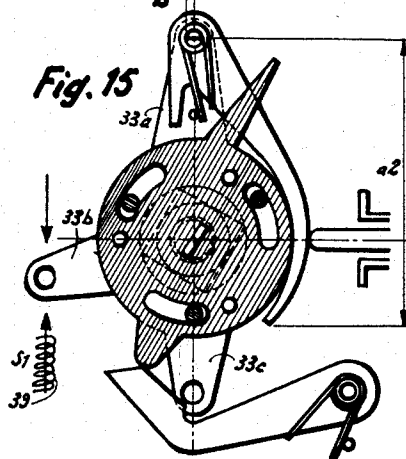


Fig. 15

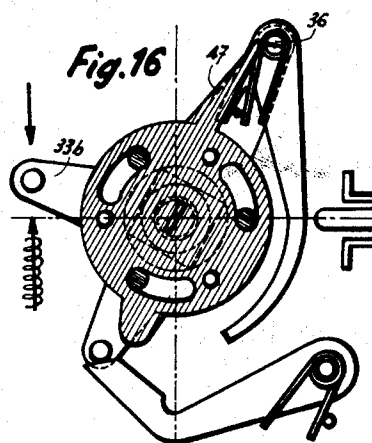


Fig. 16

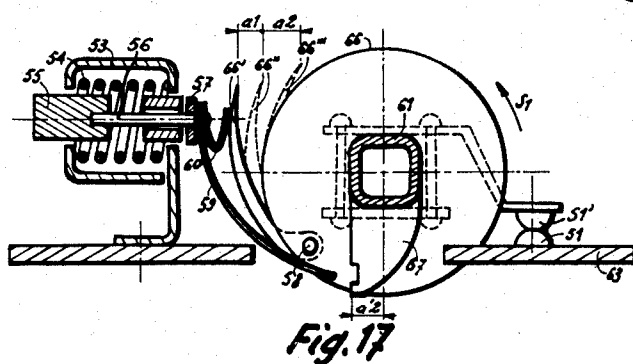


Fig. 17

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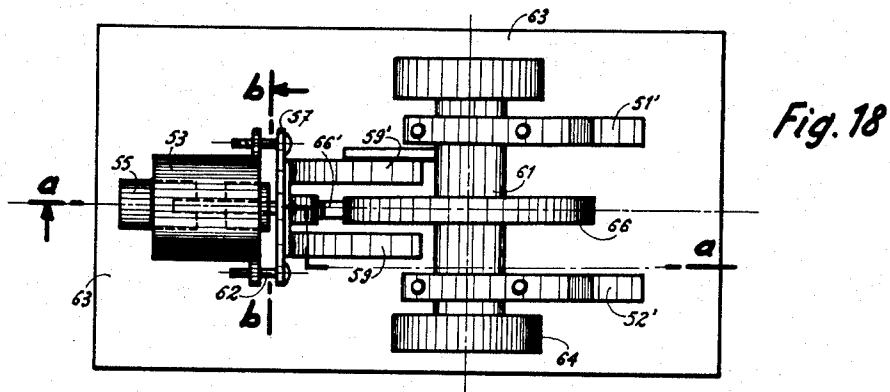


Fig. 18

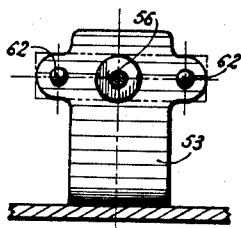


Fig. 19

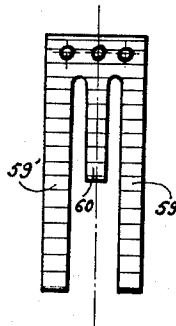


Fig. 20

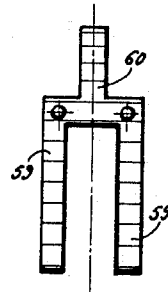


Fig. 21

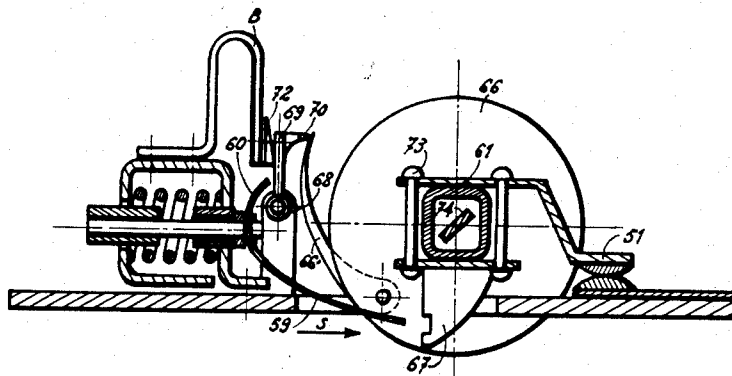


Fig. 22

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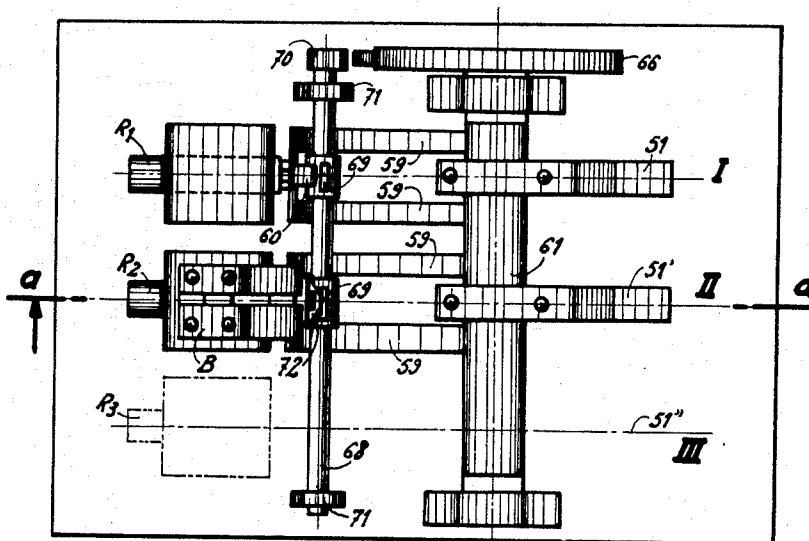


Fig. 23

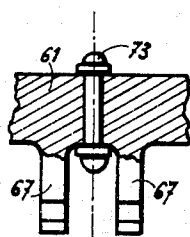


Fig. 24

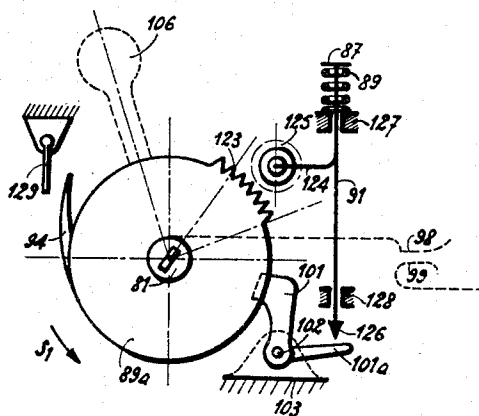


Fig. 25

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TORSION SPRING ACTUATED SNAP-ACTION CIRCUIT BREAKER WITH FREE RELEASE LATCH

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16 Claims. (Cl. 200—70)

The present invention relates to fast making and breaking mechanisms for electrical contacts, more particularly of the type wherein the actuation of a circuit breaker is achieved by the sudden release of a spring.

A primary object of the invention is to provide a mechanism of this type which is adapted to impart a substantial acceleration to the movable contacts, mainly at the start of the breaking action, by means of one or a plurality of torsion blades.

It is another object of the invention to provide a circuit breaker actuating mechanism which comprises at least one torsion leaf extending along the axis of a cylindrical sheath, to which are secured one or a plurality of movable contact members.

It is yet another object of the invention to provide a circuit breaker actuating mechanism of the above mentioned type, comprising, in addition, an actuating lock unit of the free release type arranged in coaxial relationship with the sheath and adapted to drive the latter.

Finally, the invention also contemplates the provision of free release lock unit which is particularly adapted to a quick breaking actuation.

The subject matter which is regarded as this invention is particularly pointed out and distinctly claimed in this specification. The invention however, as to its organization and operation, together with further objects and advantages thereof, will be best understood by reference to the following description and appended drawings, wherein:

FIG. 1 is a front view, partially in cross-section, of the actuating mechanism as applied to a multiple circuit breaker.

FIG. 2 is a cross-section along line *a—**a* of FIG. 1.

FIG. 3 is an elevational, partly cross-sectional view, of the details of a preferred embodiment of the mechanism illustrated in FIG. 1, incorporated in a circuit breaker adapted for breaking currents of comparatively high intensities.

FIG. 4 is a cross-sectional view, along line *b—**b* of FIG. 3, of the mechanism shown therein.

FIG. 5 illustrates a plan view of said mechanism as viewed in the direction of the arrow *C* of FIG. 3.

FIG. 6 is a plan view, partly in cross-section, of a lock unit adapted to be used with the mechanism of FIGS. 1, 3 or 9.

FIG. 7 is a cross-section along line *d—**d* of FIG. 6.

FIG. 8 illustrates the device in FIG. 6 at a different instant of its operation.

FIG. 9 is a cross-sectional view of a similar mechanism, especially adapted to circuit breakers for breaking comparatively low current intensities;

FIG. 10 is a top view of the same mechanism.

FIG. 11 is a top view of an alternative embodiment of such a mechanism, comprising two stacked torsion leaves.

FIG. 12 shows another embodiment of the lock unit.

FIGS. 13 to 16 represent still another embodiment of the lock unit.

FIGURE 13 shows the lock unit in the cocked position, i.e. with the movable contacts engaged.

FIGURE 14 is a cross-section along axis *I—I* of FIGURE 13.

FIGURE 15 illustrates the lock unit in its first, engagement step.

FIGURE 16 illustrates the lock unit in the disengaged position.

FIGURE 17 is a front view, in cross-section along plane

*a—**a* of FIGURE 18, of the accelerating device for the disconnection of a circuit-breaker.

FIGURE 18 is a plan view of a two-pole circuit-breaker, provided with such an accelerating or relay device.

FIGURES 19, 20 and 21 show details of the accelerating device.

FIGURE 22 is a longitudinal cross-sectional view, along plane *a—**a* of FIGURE 23, of an alternative embodiment of the accelerating device for use with polyphase circuit-breakers.

FIGURE 23 is a plan view of a three-pole circuit-breaker fitted with three accelerating relays acting on a common axis carrying the movable contacts.

FIGURE 24 is a side view, as seen in the direction of arrow *S*, of FIGURE 22, of a portion of the axis carrying the movable contacts of the circuit-breaker.

FIGURE 25 is a high-speed disconnecting circuit-breaker according to the invention, fitted with an additional device for delaying the opening of the contacts for the rated intensities.

Referring to the drawings, the mechanism shown in the various figures essentially comprises: a torsion blade or leaf 1 both ends of which are inserted into grooves or slots formed in two coaxially mounted bearings 2 and 3, respectively, a cylindrical sheath 4 with movable contact members thereon, such as 5, and a lock structure 6 adapted to cause said sheath 4 to be rotated about its axis, in said bearings 2 and 3.

Briefly stated, the actuating lock 6 normally maintains sheath 4 in a position such that the return spring or leaf 1 integral therewith is in a state of torsion, whereby the movable contacts 5 are closed over corresponding stationary contacts (not illustrated), or are opened, accordingly as the snap-action of the switch breaks or makes a circuit. The unlocking of the latch trip 6 is effective to release the return spring which then suddenly drives the sheath back to a position such that the contacts are switched.

A primary advantage of a mechanism of this type lies in the fact that a torsion leaf is capable of undergoing a torsion which is defined by a comparatively large angle (corresponding, for instance, to a movement of the contacts of the order of, say, a few centimeters), while, when released, the spring leaf is returned in a much shorter time than any other types of springs generally used with such devices.

On the other hand, the use of a contact supporting sheath allows these contacts to be distributed over the whole length of the torsion leaf, while maintaining a uniform movement, which would not be possible if the contacts were directly secured to said leaf.

These features are of particular interest in order to provide high-speed multipolar circuit-breakers of comparatively small size.

The return speed of the torsion leaf is further increased by the fact that all the members to be returned and particularly the sheath which acts as the supporting shaft of the movable contacts and the lock structure, are located in coaxial relationship with the torsion leaf. As will be seen later in this description, the lock structure is moreover specially designed to assist in achieving a sudden release action.

In certain applications, the sheath 4 is preferably made of an insulating material, in order to improve the electrical insulation between the torsion leaf and the energized pieces of the device.

A detailed description of various illustrative embodiments will now be given.

In the embodiment illustrated in FIGS. 1 and 2, three movable contacts have been secured to the sheath 4, in a known manner, the latter carrying, in its middle part, a portion 7 having its inner section narrowed up so as to

grip leaf 1. The latter will thus be secured at both its ends and at its middle portion, in such a manner that it is equivalent to two torsion leaves of half its length. The maximum torsion angle is thus smaller than for a leaf which would not be secured in its middle portion, but the return force is multiplied by two, which is of advantage when it is desired to provide circuit breakers adapted to break comparatively high currents.

The lock structure 6 is illustrated in FIGS. 1 and 2 very diagrammatically: in practice, it may be, for instance, of the type shown in FIGS. 6 to 8.

FIGURES 3 to 5 show, in detail, an actuating mechanism similar to that represented in FIGS. 1 and 2, wherein, in order to prevent a substantial effort from being applied to the insulating sheath, the latter is formed with three portions 4a, 4b and 4c, only the central portion 4b which is integral with leaf 1, thus gripping the latter in its center, denoted by reference numeral 7.

This central portion, which bears the effort applied to the torsion leaf, may consist of a light metal or of plastic material, whereas portions 4a and 4c are made of an insulating material.

It is apparent that, although the metallic portion of the insulating sheath has a square section, as illustrated in FIGS. 4 and 5, the ends thereof are circular and may roll inside the bearings 2 and 3, of which only the latter is shown in the drawing.

The movable contacts will be secured for instance as shown in FIG. 4.

The actuating lock structure, shown in more detail in FIGS. 6 to 8, is built as follows:

On the middle-portion 4b, formed with an annular flange 8, is mounted for free oscillation a cup-shaped element 9, in the rim 10 of which are cut-out two recesses 11 and 12. On said member 9 is secured an axis 13, about which a releasing lever 14 is caused to pivot. This lever is maintained in its normal position by means of a flat spring 15.

Lever 14 has a short arm provided with a hook which normally blocks a tooth 16 of a cam 17, which is mounted integral with the axis of member 4b by means of rivets, such as 18. Lever 14, extending partially outside recess 12, will be actuated for instance, on one hand, by a high-speed electromagnetic relay 19 acting on its point P, and, on the other hand, by a member 20, which may be a thermal-sensitive device, responsive to allow slowly developing overload, and acting on point Q.

Cam 17 carries two bosses 17a and 17b, the first being adapted to push back a hook or pawl 21 pivoted at 22 on a piece integral with the base 23 of the unit. This pawl engages recess 11. A spring 24, fixed to boss 17b, has its other end secured to a pin 25 integral with member 9.

In the normal position, member 9 is locked by pawl 21; cam 17 is, in turn, locked by lever 14. Therefore, the middle portion 4b of the sheath, together with portions 4a and 4c which are mechanically tied to it, is maintained in such a position that the contacts are closed.

The lock structure operates as follows: one of the members 19 or 20 abuts against the release lever arm 14, pivoting it around the axis 13 thereof, so as to come in the position shown in dotted lines. At this instant, tooth 16 is released and, thus, cam 17 is urged by a return spring (not shown), and will rotate to take up the position illustrated in dotted lines in FIG. 6: this will cause the opening of the contacts to be achieved.

Spring 24 spans and takes up the position shown in dotted lines in FIG. 6, pulling member 9 counterclockwise. Said member 9 may move when released by pawl 21, pushed back by boss 17a, and will thus take up the position illustrated in dotted lines in FIG. 6.

In this position, the hook of lever 14 will block again tooth 16. In order to completely recock the lock mechanism, member 9 is caused to rotate clockwise by means of any type of control member (not shown) integral with said member, until the pawl 21 engages again the recess 11.

It should be noted that the comparatively low-speed relays acting at point Q are generally of the type developing a low mechanical force whereas those acting at point P develop a substantially higher force. The ratio of the lever arms OP/OR or OQ/OR is set accordingly.

In order for the action of the relay acting at P to be transmitted as quick as possible, it is necessary that the lever arm OR should be as small as possible; the shape of the lever which has been illustrated in the modification shown in FIG. 12 is particularly adapted to this effect.

In this modified embodiment, the shortest arm of lever 14 has been substituted by a cylindrical recessed axis 13. Axis 13 normally blocks tooth 16, but the latter will be freed across the recess when lever 14 will have rotated clockwise under the action of member 19 or 20 (not shown in FIG. 12).

It should be noted that the actuation of the lock unit illustrated in FIG. 6 or 12 is achieved by the action of this single lever and by the rotation of one piece only, namely cam 17. The latter may be of light weight, and on account of its co-axial relationship with the torsion leaf, its inertial moment will be as low as possible, which is highly advantageous for obtaining a very rapid actuation.

The movement of the other elements of the lock structure takes place only in the recocking step of the operation, which may be less rapid.

In the alternative embodiment illustrated in FIGS. 9 and 10, there is shown a similar type of free release lock structure which will not be described in detail.

It will be noted, however, that a reset control member integral with member 9 has been shown in dotted lines at 26.

On the other hand, in this modified embodiment, the torsion leaf 1 is secured only at both its ends (leaf 1 is secured at one end in a slot provided in bearing 2 and, at its opposite end, in a slot provided in cam 17). This enables a sufficient torsion angle to be obtained with a blade as short as possible. This arrangement is particularly adapted to the design of small three- or four-pole switches and circuit-breakers.

The sheath 4, in this case, consists of a single piece of uniform section, except at one of its ends, which is formed with an annular flange 8a. This flange plays the same part as the annular flange 8 in FIGS. 6 and 7, namely, that the cup-shaped member 9 may freely rotate thereabout and the cam 17 is secured thereto.

In FIG. 11, a top view of a similar mechanism has been shown, wherein the torsion spring is formed by stacking for instance two torsion leaves 1a and 1b separated from each other by a blade 28 of plastic material. The latter is provided for reducing friction between the torsion leaves, which are secured by their ends in the manner already described hereinabove.

In the embodiment shown in FIGURES 13 to 16, the free release lock unit is located intermediate the movable contacts (not illustrated), on an insulating sheath consisting of two half-members 31, 31', joined together, said sheath containing a flat torsion-stressed spring member 32.

The lock unit comprises three main flat elements 33 (33'), 34, and 35, arranged along planes a—A, A'—a', and b—b, in perpendicular relationship to the axis of symmetry O—O' of sheath 31, 31', namely: an intermediate element 33 (33'), adapted to oscillate freely around sheath 31—31', a driving element 34 integral with sheath 31—31' and an element 35, integral with a hollow axis 36, adapted to oscillate between the intermediate elements 33 (33').

A spring, 37, preferably consisting of a steel cord, abutting against a pin 38, urges an unlocking lever 35 in the position illustrated in FIGURE 13.

It is seen that the intermediate elements 33—33' are in the shape of a disc fitted with three arms 33a, 33b, 33c, arm 33a carrying the unlocking lever 35 with its

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hollowed axis 36, arm 33b urged by spring 39 in the direction of arrow S₁ serving to re-cock the lock-unit and to the stabilization thereof by means of arm 33c, the latter including, for instance, a cylindrical body 40 engaging in the recess of a hook 41. This recess oscillates about an axis 42 integral with the base-plate of the device. As long as the intermediate element 33—33' rotates freely about the sheath 31—31', the driving member 34 is integral therewith. This driving member 34 is clamped between the edges 43—43' of the sheath 31—31' by rivets 44. Besides, circumferential recesses 45 are formed on the edges 43 of sheath 41—41', as well as in the driving member 34, so as to enable pins 46 integral with the intermediate elements 33 (33') to slide therein.

The driving element is formed with an end 47 bearing, in normal operation, against a hollow axis 36, a boss 48 being adapted to drive off hook 41 at the instant of tripping.

The unlocking lever 35, with its hollow axis 36, comprises two arms a₁, a₂ (FIG. 14), arm a₁ being substantially shorter than arm a₂. Preferably, a₂ is selected to be about 15 times arm a₁.

The lock unit just described operates as follows:

In the "cocked" position (the movable contacts being closed), the intermediate element 33 (33') carrying the unlocking lever 35 is blocked through its cylindrical body 40 engaged under the hook 41. End portion 47 of the driving element 34 is bearing against the hollow axis 36.

In order to cause the lock to be disengaged, the unlocking lever 35 is actuated through relay R.

At this instant, the hollow axis 36, integral with lever 35, rotates into the direction of arrow S₂, thus freeing the end portion 47 of the driving member. The latter, urged by the action of the return spring 32, rotates into the same direction S₂, together with the sheath 31—31' and the movable contacts of the device. During the rotation, boss 48 knocks against hook 31 (FIG. 14) thus freeing the intermediate element 33 (33'). The latter, urged by spring S₁, moves in turn to the position as shown in FIGURE 15. It is seen that the end portion 47 automatically engages under the hollow axis 36. It is possible to return the lock unit in the "cocked" position shown in FIG. 13.

It is known that the disconnecting capacity of a circuit breaker may be substantially increased by reducing its mechanical time constant, i.e. by reducing the interval between the occurrence of a sudden overload and the beginning of the separation of the movable contacts.

Besides, the reduction of said time constant substantially reduces the welding risk of the contacts, in particular at the instant of resetting the same on a violent short-circuit. Normally a high-speed circuit-breaker does not require contacts made of rare metal alloys, such as silver-tungsten, silver-graphite or silver-cadmium, for instance. The contacts made of red electrolytic copper are quite satisfactory in this case.

It is known to fit circuit-breakers with an electromagnetic or electrodynamic device with accelerated breaking, in order to minimize their mechanical time constant. This device consists of an electromagnetic overload relay, through which flows the current to be controlled, and the movable armature of which strikes violently the resilient arms of the movable contacts (at the instant of a short-circuit) to accelerate the opening thereof. At the same time, said movable armature releases the tripping lock of the circuit-breaker.

FIGURES 17 to 24 represent the accelerating breaking device according to the invention.

As shown in FIGURES 17 to 20, the circuit breaker comprises a shaft 61 adapted to rotate in bearings 63, 64 and carrying movable contacts 51', 52' (FIGURE 18) bearing against stationary contacts 51, 52.

The free-tripping lock unit 66, shown diagrammatically, and by way of example only, is located in coaxial relationship with the axis of shaft 61. Its release lever

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66', oscillating around pivot 58, serves to unlock the lock unit, i.e. to release axis 61 so as to be able to rotate in the direction of arrow S₁, under the action of the return spring (not shown in FIGURE 17).

The accelerating device itself comprises, for instance, a stationary magnetic circuit 53, a plunger 55 integral with a non magnetic rod 56 on which is secured a plate 57 carrying, according to the invention, two parallel, resilient arms 59, 59', preferably in the shape of a fork, and a bent-over arm 60. According to the embodiment illustrated in FIGURES 17 and 18, the arm 60 is bent upwards (as shown in detail in FIGURE 20), the two metallic arms 59, 59' striking the arms 67 integral with axis 61 (FIGS. 17 and 23) whereas the bent-over arm 60 actuates the release lever 66' of lock 66.

Plate 57 may be guided by studs 62 which engage in openings formed in the stationary magnetic circuit 53 (FIG. 19).

The accelerating device just described operates as follows:

When a very strong overload current flows in the energizing coil 54, the plunger 55 is suddenly attracted inside said coil. During the first period of its motion a₁, the bent-over arm 60 causes the release lever 66' of lock 66 to be moved and to bring it in the position 66'', to unlock the latter; at the end of the stroke a₁, arms 59—59', which are preferably flexible, strike arm 67 (FIGS. 17 and 23) integral with axis 61 by moving them suddenly into position 66'' (stroke a₂ of FIGURE 17), corresponding to the opening of contacts 51—51' and 52—52', the gap between the opened contacts being of the order of 0.4 to 3 mm.

The return spring 74 (FIGURE 22) of axis 61 then completes the opening of movable contacts 51', 52', etc.

FIGURES 22 and 23 represent diagrammatically a three-pole circuit-breaker provided with three accelerating relays acting, with their arms 59, 59' on main shaft 61 carrying 3 movable contacts 51—51'—51'' and an intermediate shaft 63 serving to unlock lock unit 66 through member 60 (FIGURE 21), on one hand, and end through thermal elements B (or other delayed tripping devices, such as a dash-pot relay or a delayed plunger), on the other hand.

FIGURE 22 is a longitudinal cross-section along plane a—*a*, FIGURE 23, of the circuit-breaker with its accelerating device. The plan view on pole I is illustrated without thermal or delay relays.

As shown in FIGURE 23, the 3 poles I—II—III of the circuit breaker are fitted with three accelerating devices R1, R2, R3, acting through their arms 60 on members 69 integral with the intermediate axis 68. The latter may oscillate in bearing 71 and end in a hammer striking the unlocking latch 66' of the coaxial lock 66.

On the same members 69 are acting bimetal strips B, which end, for instance, in a disk 72 adapted to adjust the intensity of a slow-developing overload.

At least one metal arm 59, preferably of steel, drives one or a plurality of arms 67 integral with the main shaft 61 carrying the movable contacts 51, 51', 51''.

FIGURE 20 shows in more detail the bifurcated member 59—60—59 of FIG. 23.

Portion 60 thereof drives an intermediate shaft 68 (FIG. 23), whereas arms 59—59 strike arms 67—67 of the main shaft 61 (FIGS. 22 and 24).

For a better understanding of the operation of the accelerating device, the intermediate axis 68 has been substantially spaced apart from the main axis 61; moreover consequently, the length of the arms 59 has been exaggerated.

The speed of separation of the circuit-breaker contacts operating at high overload intensities, more particularly those adapted to function as current limiters, should be comparatively high (for instance from 5 to 10 m./sec.), whereas the fast breaking of the rated current intensities, and especially those not exceeding 200 A., at a maximum

voltage level of 500 volts (ohmic load) is undesirable, since it causes an unnecessary extension of the length of the arc, and hence, an increase in the breaking work and a fast wear of the contacts.

Systematic tests, and corresponding theoretical considerations have shown that it is possible to break, at a first passage through zero of the give-wave current intensity and under comparatively high operating voltages (380–500 v.), current intensities of the order of 100/125 A., even under a $\cos \phi = 0.5$, and less, under a slow separation speed of the movable contacts, of the order of as little as 3–10 cm./sec. only.

Besides the reduction of the wear of the contacts (by minimizing the cut-off work), which open at a low speed, the small length of the arcs enables, by imparting the contacts a convenient shape, to advantageously use the phenomenon of self-recovery of the contact material dispersed by the arc. This results in an additional reduction of the wear of the contacts.

Considering that in the switches and circuit-breakers the minimum gap between the contacts is substantially wider than that required for breaking at a low speed inductive currents of the order of 100 A. (and even of 200 A. for a non inductive load), and up to 500 v., on one hand, and that the breaking of a short-circuit current requires, on the contrary, a comparatively high separation speed of the movable contacts, a novel design, based on a particular feature of the invention, is disclosed, providing switches and circuit-breakers adapted more particularly to rated current intensities up to 100 A. and 500 v., approximately, in A.C. currents. According to this feature, the cut-off of rated current intensities takes place between the contacts temporarily separated at a small distance (of the order of 0.5 to 2 mm.), and at a comparatively low speed, whereas, when an overload occurs, the cut-off speed of said contacts, as well as their opening gap is substantially increased. This means that the contacts of a circuit-breaker tripped manually or by remote control, will normally open during a time interval equal to or higher than one hundredth of a second, the gap being of the order of 0.5 to 2 mm., whereas, under the action of a relay controlling the inadmissible overloads, the separation speed of the movable contacts will instantaneously reach the optimum value, for instance 5–8 m./sec., required for cutting off the short-circuit currents, their final opening corresponding to a gap substantially wider than the temporary separation, the width of said gap depending on the blowing devices which we provided for cutting-off high current intensities, or else on the rules in force.

FIGURE 25 represents a casing 89a containing the free release mechanism of the lock unit proper, said lock unit is released through the action of overload relays 129 by means of a lever 94 which cooperates with a cam in a way similar to that which is illustrated in FIG. 12, while the rated intensities are cut-off manually means of a tripping member 87. The latter is, for instance, a push-button which acts directly on the temporarily secured hook 101 of a lock unit 101–102–103–101a. This lock unit operates in a way similar to that which is illustrated in FIG. 12 (lock unit 21–22–23).

The characteristic feature of the device of FIG. 25, with respect to that of FIG. 12, is the following: when pushed down, the rod 91 of the control push-button 87 will engage, through the intermediary of a gear 125 supported by said rod through an arm 124, a toothed segment 123 which is formed on the casing 89a of the lock unit. Cooperation of the teeth of members 123 and 125 (or of any equivalent friction-type speed reducer means) has the effect of slowing down, during the first stage of cutting off the rated currents and during a short path of the motion of the contacts, the separation speed of the said contacts.

It is to be understood that many variations and modi-

fications may be carried out, without departing from the spirit and scope of the invention, as defined in the appended claims.

What I claim is:

1. In a circuit breaker: a sheath having an axis of revolution and movable contact members mounted in fixed relationship with respect to said sheath for rotation about the said axis; means for rotatively supporting said sheath; at least one torsion blade extending along said axis and secured in fixed relationship with respect to said supporting means and to said sheath; and free release locking means coaxially mounted on said sheath.

2. In a circuit breaker: an insulating sheath having an axis of revolution and contact members secured to said sheath and movable around said axis in a plane normal thereto; first and second bearings rotatively supporting said sheath at the respective ends thereof; a torsion blade extending along said axis, the respective ends of said torsion blade being secured to said sheath; and a locking unit connected to said sheath normally to maintain the blade in a state of torsion, said locking unit comprising means for causing the sheath to rotate about its axis, whereby the blade is released.

3. In a circuit breaker: an insulating sheath having an axis of revolution and contact members secured to said sheath and movable in a plane normal thereto; first and second bearings rotatively supporting said sheath at the respective ends thereof; a torsion blade extending along said axis, the respective ends of said torsion blade being secured in the respective bearings, said torsion blade further being secured to said sheath; and a locking unit connected to said sheath and coaxial thereto, normally to maintain the blade in a state of torsion, said locking unit comprising means for causing the sheath to rotate about its axis, whereby the blade is released.

4. In a circuit breaker; an insulating sheath having an axis of revolution and contact members secured to said sheath and movable in a plane normal thereto; first and second bearings rotatively supporting said sheath at the respective ends thereof; a torsion blade extending along said axis, and the respective ends of said torsion blade being secured in the respective bearings, said torsion blade further being secured to said sheath in the middle portion thereof; and a locking unit comprising means for causing the sheath to rotate about its axis, whereby the blade is released.

5. In a circuit breaker: an insulating sheath having an axis of revolution and contact members secured to said sheath and movable in a plane normal thereto; first and second bearings rotatively supporting said sheath at the respective ends thereof; a torsion blade extending along said axis, the respective ends of said torsion blade being secured in the respective bearings; the sheath having a middle portion the inner section of which is narrowed up and grips said torsion leaf substantially at the center thereof; and a locking unit comprising means for causing the sheath to rotate about its axis, whereby the blade is released.

6. In a circuit breaker: a sheath having an axis of revolution and contact members secured to said sheath and movable in a plane normal thereto; first and second bearings rotatively supporting said sheath at the respective ends thereof; a torsion blade extending along said axis, the respective ends of said torsion blade being secured in the respective bearings; the sheath comprising two insulating portions on which said contact members are connected and a middle portion, mechanically connected to the end portions, and the inner section of which is narrowed up and grips said torsion leaf substantially at the center thereof; and a locking unit comprising means for causing the sheath to rotate about its axis, whereby the blade is released.

7. In a circuit breaker: an insulating sheath having an axis revolution and contact members secured to said sheath and movable in a plane normal thereto; first and

second bearings rotatively supporting said sheath at the respective ends thereof; a torsion blade extending along said axis, the respective ends of said torsion blade being secured in the respective bearings, said torsion blade further being secured to said sheath; and a locking unit comprising: a cup-shaped member having a rim portion and first and second recesses cut-out in said rim, said cup-shaped member being mounted for free oscillation about said sheath; a releasing lever having first and second arms and an axis, said axis being secured to said cup-shaped member and said second arm having a hook portion; a spring having one end connected to said rim portion and another end which engages said second arm; a cam mounted in a fixed relationship with respect to said sheath and adapted to rotate about the axis thereof, said cam having first, second and third protruding portions; a pivoting member adapted to engage said first recess and to be disengaged therefrom by said first protruding portion; a further spring having one end connected to said cup-shaped member and another end connected to said second protruding portion; said third protruding portion normally being engaged in said hook portion of the releasing lever; and means for pivoting said releasing lever about its axis whereby said third protruding portion of the cam is released.

8. In a circuit breaker: an insulating sheath having an axis of revolution and contact members secured to said sheath and movable in a plane normal thereto; first and second bearings rotatively supporting said sheath at the respective ends thereof; a torsion blade extending along said axis; the respective ends of said torsion blade being secured in the respective bearings, said torsion blade further being secured to said sheath and a locking unit comprising: a cup-shaped member having a rim portion and first and second recesses cut-out in said rim, said cup-shaped member being mounted for free oscillation about said sheath; a releasing lever having first and second arms and an axis, said axis being secured to said cup-shaped member and said second arm having a hook portion; a spring having one end connected to said rim portion and another end which engages said second arm; a cam mounted in a fixed relationship with respect to said sheath and adapted to rotate about the axis thereof; said cam having first, second and third protruding portions; a pivoting member adapted to engage said first recess and to be disengaged therefrom by said first protruding portion; a further spring having one end connected to said cup-shaped member and another end connected to said second protruding portion; said third protruding portion normally being engaged in said hook portion of the releasing lever; and means for pivoting said releasing lever about its axis whereby said third protruding portion of the cam is released, said means comprising a quick responsive relay means adapted to engage said first arm at a first point thereof and slow responsive relay means adapted to engage said first arm at a second point thereof, said first point being nearer from said axis than said second point.

9. In a circuit breaker: an insulating sheath having an axis of revolution and contact members secured to said sheath and movable in a plane normal thereto; first and second bearings rotatively supporting said sheath; a torsion blade extending along said axis and having one end secured in said first bearing; and a locking unit comprising: a cup-shaped member having a rim portion and first and second recesses cut-out in said rim, said cup-shaped member being mounted for free oscillation about said sheath; a releasing lever having first and second arms and an axis, said axis being secured to said cup-shaped member and said second arm having a hook portion; a spring having one end connected to said rim portion and another end which engages said second arm; a cam mounted in a fixed relationship with respect to said sheath and adapted to rotate about the axis thereof, said cam having first, second and third protruding portions; a pivot-

ing member adapted to engage said first recess and to be disengaged therefrom by said first protruding portion; a further spring being engaged in said hook portion of the releasing lever; and means for pivoting said releasing lever about its axis whereby said third protruding portion of the cam is released, said means comprising a quick responsive relay means adapted to engage said first arm at a second point thereof, said first point being nearer from said axis than said second point; said opposite end of said torsion blade being secured in said cam.

10. In a circuit breaker: a sheath having an axis of revolution and movable contact members secured in fixed relationship with respect to said sheath; means for rotatively supporting said sheath; a plurality of stacked torsion blades and alternated parting blades extending along said axis and secured in fixed relationship with respect to said supporting means and to said sheath; and locking means connected to said sheath.

11. In a circuit breaker: an insulating sheath having an axis of revolution and contact members secured to said sheath and movable in a plane normal thereto; first and second bearings rotatively supporting said sheath at the respective ends thereof; a torsion blade extending along said axis, the respective ends of said torsion blade being secured in the respective bearings, said torsion blade further being secured to said sheath and a locking unit comprising: a cup-shaped member having a rim portion and first and second recesses cut-out in said rim, said cup-shaped member being mounted for free oscillation about said sheath; a releasing lever having an arm and an axis secured to said cup-shaped member and provided with a recessed portion, a spring having one end connected to said rim portion and another end which engages said arms; a cam mounted in a fixed relationship with respect to said sheath and adapted to rotate about the axis thereof, said cam having first, second and third protruding portions; a pivoting member adapted to engage said first recess and to be disengaged therefrom by said first protruding portion; a further spring having one end connected to said cup-shaped member and another end connected to said second protruding portion; said third protruding portion normally being engaged in said recessed portion of the releasing lever; and means for pivoting said releasing lever about its axis, whereby said third protruding portion of the cam is released.

12. In a circuit breaker: a sheath having an axis of revolution and movable contact members mounted in fixed relationship with respect to said sheath for rotation about the said axis; means for rotatively supporting said sheath; at least one torsion blade extending along said axis and secured in fixed relationship with respect to said supporting means and to said sheath; and free release locking means coaxially mounted on said sheath, said locking means including a first member integrally connected to said sheath; a second member mounted for free oscillation about said axis; a latch member acting normally to prevent movement of said second member; a releasing member acting normally to prevent movement of said first member; means for controlling said releasing member for allowing movement of said first member.

13. In a circuit breaker having at least one pair of normally closed contacts and release means for opening said contacts, the improvement which comprises means for accelerating the period of elapsed time while said contacts are being opened by reason of a circuit overload, said accelerating means comprising a stationary magnetic circuit in operative relationship with a source of electrical power, a plunger within said circuit, and a contact member connected to said plunger and abutable with said release means.

14. A device as described in claim 13, wherein said contact member includes a fork-shaped portion and an intervening bent-over portion, said bent-over portion being abutable with said release means.

15. In a circuit breaker having at least one pair of

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normally closed contacts and manually actuated release means for opening said contacts, the improvement which comprises means for decelerating the period of opening of said contacts, said means comprising a manually operated member and a pair of coacting speed-reducing members in operative relationship therewith.

16. In a circuit breaker mechanism; a sheath having an axis of revolution and movable contact members mounted in fixed relationship with respect to said sheath for rotation about the said axis; means for rotatively supporting said sheath; at least one torsion blade extending along said axis and secured in fixed relationship with respect to said supporting means and to said sheath; and free release locking means coaxially mounted on said sheath, said locking means including a first member integrally connected to said sheath; a second member mounted for free oscil-

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lation about said axis, said second member comprising a pair of spaced discs; a latch member disposed between said discs acting normally to prevent movement of said second member; a releasing member acting normally to prevent movement of said first member; means for controlling said releasing member for allowing movement of said first member.

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