

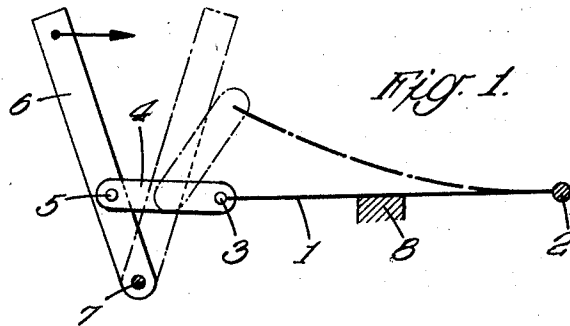
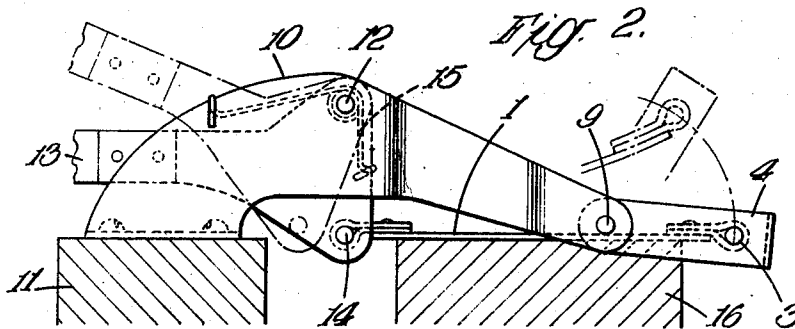
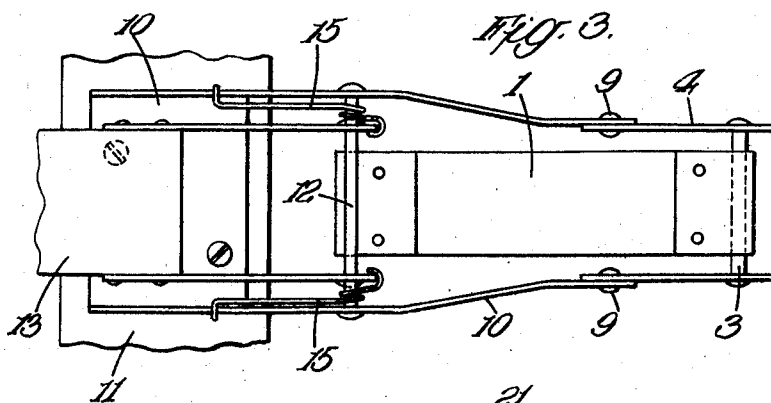
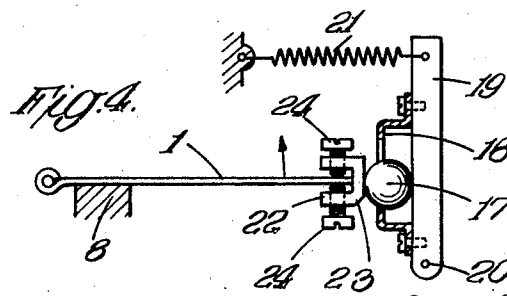
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TEMPERATURE-ACTUATED MECHANISM

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TEMPERATURE-ACTUATED MECHANISM

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14 Claims. (Cl. 74—2)

The present invention relates to temperature-actuated mechanisms wherein the actuating element is constituted by a bi-metallic member which, owing to its inherent construction, is deformed on alteration of temperature. It is well known to use such a device directly to operate a make-and-break contact or for other purposes wherein a small mechanical movement only is required.

It is one of the main objects of the present invention to produce a temperature-actuated mechanism, operation of which results in a movement considerably greater in force and degree than that hitherto secured by the direct use of a bi-metallic strip.

A further object of the invention is the production of temperature-actuated mechanism of simplified construction and of more certain action as compared with any analogous device hitherto proposed.

Another object of the invention is to produce a mechanism wherein a bi-metallic member is employed, on being subjected to temperature variation, to bring a toggle or knuckle joint into such condition that some external force, such as a spring, may become effective in generating an ultimate movement very much greater in extent and force than is feasible by the direct application of the deformation of a bi-metallic strip.

Still another object of the invention is to utilize the ultimate movement of mechanism controlled by temperature variation for the actuation of a knife switch, for operating some mechanical device such, for example, as a belt-shifting mechanism or for any other purpose wherein an action comparable in extent and force is required.

With the above and other objects in view, the invention comprises a temperature-actuated toggle or knuckle joint mechanism wherein either or both of the members constituting the joint is or are of bi-metallic construction, the nature and disposition of the dissimilar metals and the arrangement of the members being such that, on a given alteration of temperature, movement of the members occurs from the set or stable position to an unstable position wherein, by the application of an external force, such as a spring, collapse of the toggle or knuckle mechanism ensues. The temperature of the bi-metallic strip or strips may be governed by that of surrounding air, gas or liquid or of a solid body, by the passage through the strip or strips of an electric current or in any other suitable manner.

The invention will be better understood from

the following description read in connection with the accompanying drawing, wherein:

Figure 1 is a side view of the simplest form of mechanism,

Figures 2 and 3 are respectively side view and plan of a modification wherein the two members of the toggle joint overlap, and

Figure 4 is a side view of a further modified form.

Referring to Figure 1, the bi-metallic member 1 is mounted to swing around a fixed pivot 2 and is jointed by means of a pin 3 to a link 4, the opposite end of which is attached by a pin 5 to a lever 6, hinged on a fixed pivot 7 and constituting means whereby the movement desired on collapse of the toggle or knuckle joint may be transmitted to the device to be operated. It will be observed that the pivot 3 lies slightly to one side of a straight line joining the pivots 2 and 5, the arrangement being such that, on change of temperature in a predetermined direction according to the construction of the bi-metallic member 1, that member is deformed so that the pivot 3 is moved on to and eventually across the line joining the pivots 2 and 5. Under these conditions a force such as that of a spring or weight applied to that end of the lever 6 remote from its pivot 7 is free to act, so that the toggle joint collapses to the position shown in chain-dotted lines, thus allowing the movement of the lever 6 about its pivot 7 indicated. Re-setting of the mechanism is effected by hand or equivalent external agency.

A feature which distinguishes the use of a bi-metallic member in accordance with the present invention from previous applications is the fact that, as it constitutes one of the members of a toggle or knuckle joint, it is pivoted at both ends rather than having one of its ends fixed as has commonly been the case heretofore. Accordingly, means must be taken to constrain the movement of the bi-metallic member 1 relatively to the other members of the mechanism in order to ensure that, on deformation resulting from change of temperature, movement of the pin 3 shall occur rather than merely a displacement of the central portion of the bi-metallic member. In the present example the necessary restraint is effected by the provision of a stop 8 which, when the mechanism is in its set or stable position as shown, abuts against an intermediate point of the bi-metallic member 1. If the mechanism be designed to function on increase of temperature, the bi-metallic member must be so disposed that its surface which tends to become con-

vex on rise of temperature makes contact with the stop. If, however, the mechanism is to function on decrease of temperature, the bi-metallic member must be reversed so that the surface tending to become concave on rise of temperature faces the stop. The normal set position of the toggle or knuckle joint may be determined by contact between one of its elements, or an extension thereof, and some other member. Nevertheless the stop 8 or its equivalent is required, but the design may be such that the bi-metallic member 1 does not bear on it until a certain deviation from the normal temperature has occurred. If desired, the stop may be adjustable, whereby the critical temperature at which the mechanism operates may be varied.

Figures 2 and 3 depict a construction suitable for the control of an electric circuit, this construction being applicable, for example, to the ordinary domestic electric iron for the purpose of disconnecting the heating coil when the temperature rises above a predetermined critical value. In this case the bi-metallic member 1 and the complementary link 4 of the toggle joint overlap, that is to say, the latter member, which, as seen in Figure 3, is of U shape, extends from the pivot 3 in the direction of the bi-metallic member 1. This construction has the advantage of minimising the total length of the mechanism and also results in the bi-metallic member being in a state of tension rather than compression. The complementary link 4 is attached by pivots 9 to two arms of a bent-metal frame 10 mounted on any appropriate fixed member 11. Pivoted on a pin 12 extending through the frame 10 is a lever 13 by means of which the electric switch or other member to be actuated is operated, and to this lever the end of the bi-metallic strip 1 remote from the pin 3 is pivoted at 14, being maintained in tension owing to the action of springs 15 bearing on the frame 10 and lever 13. In this instance the bi-metallic strip is heated by virtue of its contact with a metal block 16, subject to the temperature variation which it is desired shall be effective in determining action of the mechanism. In the above-mentioned application of the device to an electric iron, the block 16 may constitute a portion of the body of the iron itself which is heated by the electrical winding. The presence of this block renders the stop 8 unnecessary, since the block provides the required restraint on the bi-metallic member. It will be observed that in the set or stable position of the device the pivots 9 lie slightly to one side of a straight line joining the pivots 3 and 14, but on temperature variation in the appropriate sense the bi-metallic member becomes curved and, as the above-mentioned straight line passes the centre line of the pivots 9, the toggle joint collapses under the action of the springs 15, assuming the position indicated in chain-dotted lines. Obviously variation of the sensitivity of the device may be effected by adjustment of the position of the pivots 9 relatively to the line joining the pivots 3 and 14. This might be provided for in various ways; for example, the arms of the frame 10, instead of being rigid with the frame, might be hinged to it and adjustable in position by such means as a screw, so that the pivots 9 are movable toward or away from the line joining the pivots 3 and 14.

In the modification illustrated in Figure 4, the link member complementary to the bi-metallic member 1 is replaced by a ball 17 capable of rolling within a guiding frame 18 attached to a lever

19 pivoted at 20 and biased by means of a spring 21 under tension. The bi-metallic member 1 is fitted with a block 22 having a face substantially at right angles to the length of the member and in the set or stable position adapted to bear on the ball 17 as shown. On change of temperature, however, such as to cause the end of the bi-metallic member to move in the direction indicated by an arrow, the ball 17 rolls down an inclined surface 23 on the block 22, thus permitting the lever 19 to be rocked under the action of the spring 21. For the purpose of adjustment of the temperature at which this action shall occur, the block 22 is, as indicated, attached to the bi-metallic member 1 by means of opposing screws 24.

In a mechanism in which both of the toggle or knuckle members are of bi-metallic construction, they would normally be arranged so that their actions on change of temperature tend to reinforce each other. It is conceivable, however, that the case might arise wherein a differential action is desirable.

In the claiming clauses which follow, it is to be understood that the term "toggle joint" includes knuckle joints and all similar mechanisms comprising two members between which there exists a connection of a relatively rotary nature.

What I claim and desire to secure by Letters Patent of the United States is:

1. Temperature-actuated mechanism, comprising a toggle joint consisting in combination of a bi-metallic toggle member, a pivot for said toggle member, a second toggle member, a support for said second toggle member, said second toggle member being movable relatively to said support and said toggle members being in movable cooperative relationship with each other, and a yieldable force-applying member constructed and arranged to effect the collapse of said toggle joint when said bi-metallic member attains a predetermined temperature.

2. Temperature-actuated mechanism, comprising a toggle joint consisting in combination of two toggle members whereof at least one is of bi-metallic construction, a pivotal connection for said members, a supporting pivot for one of said members, a movable support for the other of said members, a pivot connecting said other member with said support and a yieldable force-applying member constructed and arranged to effect the collapse of said toggle joint when said bi-metallic member attains a predetermined temperature.

3. Temperature-actuated mechanism, comprising in combination two toggle joint members whereof at least one is of bi-metallic construction, a pivot connecting said members, a movable support for one of said members, a second pivot connecting one of said members with said support, a third pivot supporting the other of said members, means for adjusting said connecting pivot toward or away from a straight line joining said second and third pivots when the mechanism is in its stable position, and a yieldable force-applying member constructed and arranged to effect the collapse of said toggle joint when said bi-metallic member attains a predetermined temperature.

4. Temperature-actuated mechanism, comprising in combination two toggle joint members whereof at least one is of bi-metallic construction, a pivot connecting said members, a pivoted lever, a pivot connecting said lever with one of said members, a supporting pivot for the other

of said members, and a yieldable force-applying member operatively associated with said lever and constructed and arranged to effect the collapse of said toggle joint when said bi-metallic member attains a predetermined temperature.

5 5. Temperature-actuated mechanism, comprising a toggle joint consisting in combination of a member of bi-metallic construction, a supporting pivot for said member, a ball in cooperative
10 relationship with said member, a movable support for said ball and whereon said ball may roll, and a yieldable force-applying member operatively associated with said movable support and constructed and arranged to effect the collapse of
15 said toggle joint when said bi-metallic member attains a predetermined temperature.

6. Temperature-actuated mechanism, comprising a toggle joint consisting in combination of a member of bi-metallic construction, a supporting
20 pivot for said member, a ball, a movable support for said ball and whereon said ball may roll, a block on said bi-metallic member having a surface on which said ball bears when said mechanism is in the stable position and a second surface
25 inclined to said first-mentioned surface on which said ball bears when said mechanism is in the unstable position and a yieldable force-applying member operatively associated with said movable support and constructed and arranged to effect the collapse of said toggle joint when said bi-
30 metallic member attains a predetermined temperature.

7. A mechanism as in claim 2, wherein the members of said toggle joint extend in an approximately straight line the one with the other
35 when the mechanism is in its stable position.

8. A mechanism as in claim 2, wherein the members of said toggle joint overlap each other when the mechanism is in its stable position.

9. A mechanism as in claim 2, including a stop
40 abutting against an intermediate point of said bi-metallic member.

10. A mechanism as in claim 2, including a stop
45 abutting against an intermediate point of said bi-metallic member, said stop being adjustable toward and away from said bi-metallic member.

11. Temperature-actuated mechanism as in claim 6, wherein said block is adjustable rela-

tively to said bi-metallic member in a direction parallel to said first-mentioned surface.

12. Temperature-actuated mechanism, comprising a pivoted lever, a toggle element connected with the lever for movement relative
5 thereto, a second toggle element coupled with the first element, a pivot for said second element, one of said elements being of bi-metallic construction, a fulcrum body engaged by the bi-
10 metallic element to cause movement of the latter element in a desired direction when the latter element attains a predetermined temperature, and force-applying means coupled with said lever to
15 urge the same in a desired direction on a predetermined degree of movement of the bi-metallic element.

13. Temperature-actuated mechanism, comprising a frame, a lever pivoted thereto, a bi-
metallic strip pivoted at one end to the lever below the pivot for the lever, a toggle member
20 pivoted to the frame, a pivotal connection between the other end of said strip and said member, the pivot of the toggle member to the frame lying between the pivoted ends of the strip and
25 offset from the line of said ends when the mechanism is in stable position, and yieldable force-applying means connected with said lever to effect oscillation of the toggle member and lever when said strip attains a predetermined tem-
30 perature.

14. Temperature-actuated mechanism, comprising a frame, a lever pivoted thereto, a bi-
metallic strip pivoted at one end to the lever below the pivot for the lever, a toggle member
35 pivoted to the frame, a pivotal connection between the other end of said strip and said member, the pivot of the toggle member to the frame lying between the pivoted ends of the strip and
40 offset from the line of said ends when the mechanism is in stable position, a fixed body engaged by said strip to form a bearing therefor against which the strip presses upon flexure, and
45 yieldable force applying means connected with said lever to effect oscillation of the toggle member and lever when said strip attains a predetermined temperature.

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