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# United States Patent [19]

**Farrington et al.**

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[54] **WIRE SPACER FOR A SHAFT IN AN ELECTRICAL APPLIANCE**

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[73] Assignee: **Black & Decker Inc.**, Newark, Del.

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[51] **Int. Cl.**[6] ..... **D06F 75/26**; H01H 3/10

[52] **U.S. Cl.** ..... **38/77.7**; 219/252; 337/333

[58] **Field of Search** ..... 38/77.7, 77.83, 38/88; 219/251, 252, 253; 403/354, 357; 337/359, 333, 374, 375, 141

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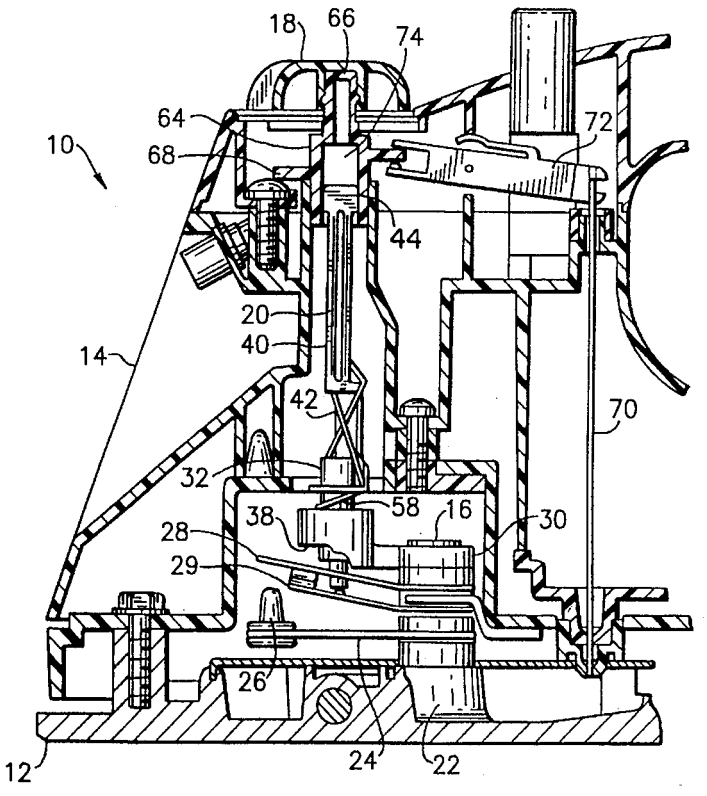
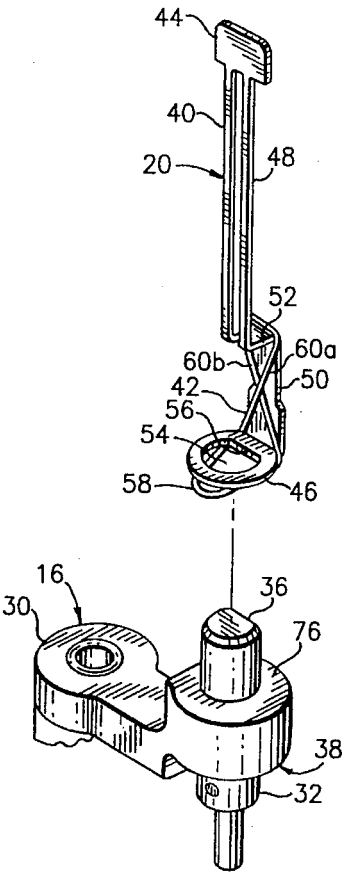
*Primary Examiner*—Ismael Izaguirre
*Attorney, Agent, or Firm*—Barry E. Deutsch

[57] **ABSTRACT**

An electrical steam iron having a soleplate, a housing, a thermostat and a temperature control knob connected to a shaft of the thermostat by an adapter. A spring is directly mounted to the adapter and has a deflectable portion between the adapter and the thermostat. The spring is a single wire that has a U-shaped center and crisscrossed L-shaped legs.

**18 Claims, 3 Drawing Sheets**



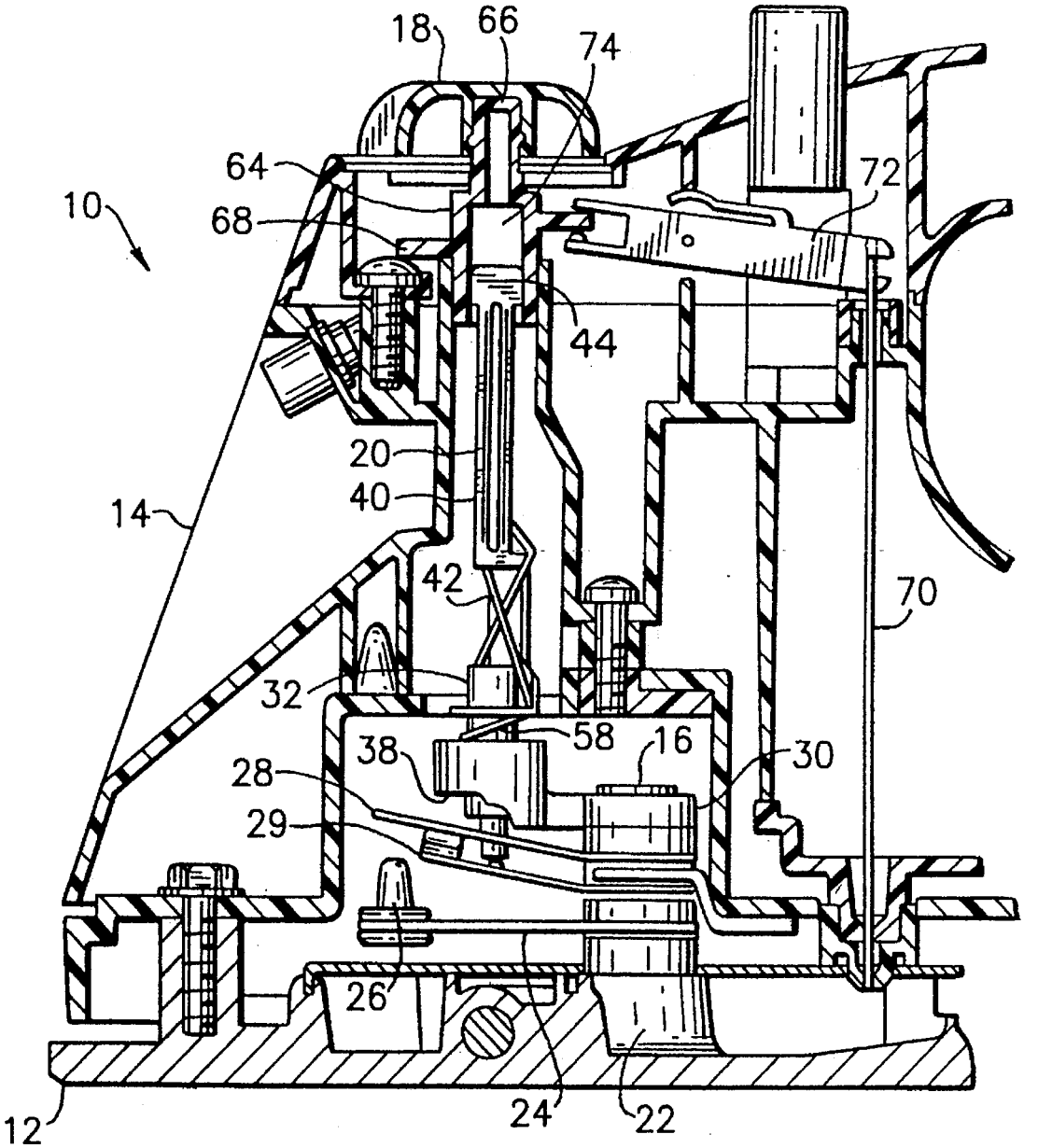



FIG. 1

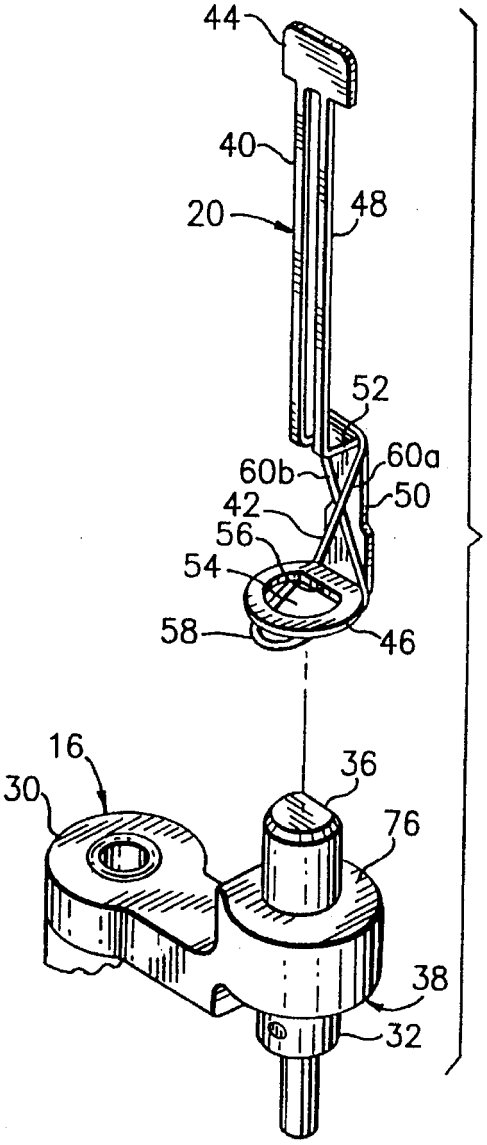

44
40
20
48
52
60b
60a
50
42
56
54
58
46
16
30
36
76
38
32

FIG. 2

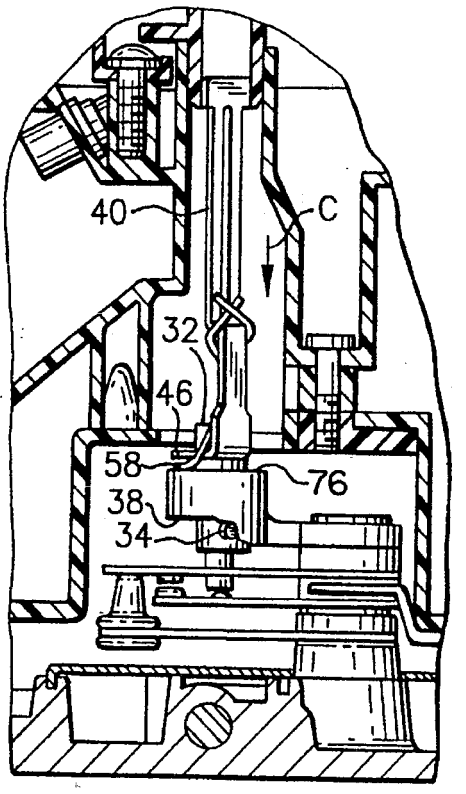

40
C
32
46
58
76
38
34

FIG. 4

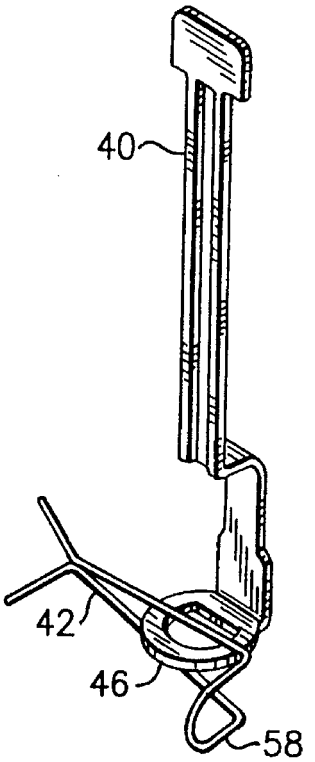



FIG. 3A

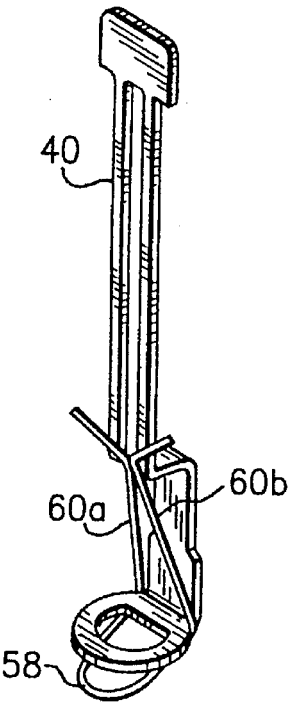



FIG. 3B

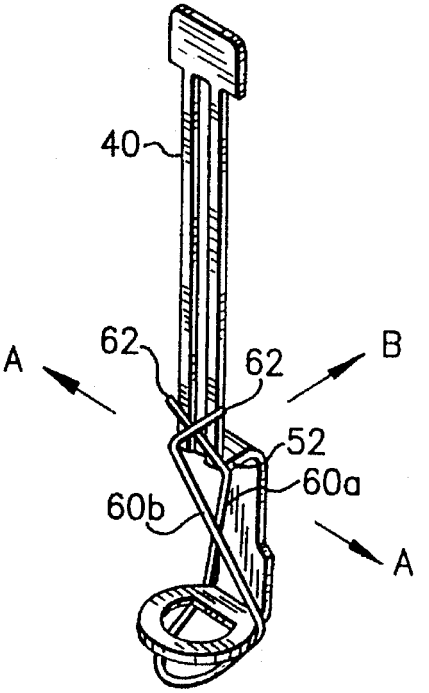



FIG. 3C

# WIRE SPACER FOR A SHAFT IN AN ELECTRICAL APPLIANCE

## BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to electrical appliances and, more particularly, to a shaft and spring assembly used in an electrical appliance.

2. Prior Art

U.S. Pat. No. 4,109,136 discloses an iron having a rod with an offset position at its end that is mounted on a thermostat cap at an angle. U.S. Pat. No. 2,441,586 discloses a leaf spring that biases a lever and a cam downwardly. The stem of the thermostat passes through a hole in the spring. U.S. Pat. 3,041,757 discloses use of coiled springs around a valve stem in an iron.

## SUMMARY OF THE INVENTION

In accordance with one embodiment of the present invention, in an electric steam iron having a soleplate, a housing, a thermostat, and a temperature control knob connected to a shaft of the thermostat by an adapter, the improvement comprises a spring directly mounted to the adapter. The spring has a deflectable portion between the adapter and the thermostat.

In accordance with another embodiment of the present invention, an electric steam iron is provided comprising a soleplate, a thermostat, a control, and a spring. The thermostat is mounted to the soleplate. The control is a user actuatable control that is connected to the thermostat by an adapter. The spring is directly mounted on the adapter and has a first section located between an end of the adapter and a portion of the thermostat.

In accordance with another embodiment of the present invention, a shaft and spring assembly for an electrical appliance is provided comprising a shaft and a spring. The shaft has an end with a keying aperture therein and an offset length that is offset from a center axis of the shaft. The spring is directly mounted to the shaft. The spring has a first deflectable section at the end of the shaft and a second section with two crisscrossed L-shaped portions mounted to the offset length.

## BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing aspects and other features of the invention are explained in the following description, taken in connection with the accompanying drawings, wherein:

FIG. **1** is a cross-sectional view of the front of an electric steam iron incorporating features of the present invention;

FIG. **2** is an exploded perspective view of the adapter shaft and spring assembly and the top of the thermostat shown in FIG. **1**;

FIG. **3**A is a perspective view of the adapter shaft shown in FIG. **2** and the spring at a first position during mounting of the spring to the adapter shaft;

FIG. **3**B is a perspective view of the adapter shaft as in FIG. **3**A showing the spring at a second position during mounting of the spring to the adapter shaft;

FIG. **3**C is a perspective view of the adapter shaft as in FIG. **3**B showing the spring at a third position during mounting of the spring to the adapter shaft; and



FIG. **4** is a partial cross sectional view of the front of the iron shown in FIG. **1** with the adapter shaft and spring assembly rotated to a second position.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. **1**, there is shown a cross-sectional view of the front of an electric steam iron **10** incorporating features of the present invention. Although the present invention will be described with reference to single embodiment shown in the drawings, it should be understood that features of the present invention can be embodied in many alternative forms of alternate embodiments. In addition, the shaft and spring assembly of the present invention can be used in any suitable type of electric iron or appliance. The various alternative embodiments may also have any suitable size, shape or type of elements or materials.

The iron **10** generally comprises a soleplate **12**, a housing **14**, a thermostat **16**, a temperature control knob **18**, and an adapter shaft and spring assembly **20**. The thermostat **16** is mounted to a boss **22** of the soleplate **12**. The thermostat **16** is a flat stacked thermostat with a bi-metal blade **24**, an insulated post **26**, two electrical contact blades **28**, **29**, a frame **30**, a shaft **32**, and a cam member **34** (see FIG. **4**). Referring also to FIG. **2**, a side of the top of the shaft **32** has a flat surface **36** that is provided as an interlock key. The frame **30** has a cam surface **38**. The cam member **34** is attached to the shaft **32** and rides along the cam surface **38** as the shaft **32** is axially rotated. The shaft **32** is biased in an upward direction by the lower contact blade **29**. FIG. **1** shows the shaft **32** at an up position with the thermostat at a high temperature setting. FIG. **4** shows the shaft **32** at a down position with the thermostat at an OFF setting.

The cam member **34**, cam surface **38** and lower contact blade **29** cooperate to move the shaft **32** up and down based upon axial rotation or position of the shaft **32**.

In order to axially rotate the thermostat shaft **32** the adapter shaft and spring assembly **20** is connected to the top of the shaft **32**. The assembly **20** has an adapter **40** and a spring **42**. The adapter **40** is a one-piece flat deformed metal member that is cut and stamped to form the shaft as shown. The adapter **40** has a top end **44**, a bottom end **46**, a center shaft section **48** and an offset length section **50**. A step **52** is provided to offset the offset section **50** from the center shaft section **48**. The bottom end **46** extends from the bottom of the offset section **50** and includes an aperture **54**. The aperture **54** matches the cross-sectional shape of the top of the thermostat shaft **32** with a flat section **56** to key the adapter with the shaft **32**.

The spring **42** is a one-piece wire member with a general U-shaped or looped middle section **58** and two L-shaped sections or legs **60***a*, **60***b*. The U-shaped section **58** is located below the bottom of the adapter **40**. The U-shaped section **58** is angled relative to the flat bottom end **46** of the adapter. The two L-shaped sections **60***a*, **60***b* extend up along the inside surface of the offset section **50**, crisscrossing each other, lapping over the step **52** and crisscrossing each other again above the step **52**. This directly mounts the spring **42** to the adapter **40**. Referring to FIGS. **3**A–**3**C attachment of the spring **42** to the adapter will be described. The spring **42** is first slipped over the bottom end **46** as seen in FIG. **3**A. The spring **42** is then rotated into place as shown by FIG. **3**B. The L-shaped sections **60***a*, **60***b* are then moved in opposite directions as shown by arrows A in FIG. **3**C. When the ends **62** of the sections **60***a*, **60***b* are sufficiently spaced from each

other, they are moved in direction B until they are over the step **52** and released to form the assembly shown in FIG. **2**. In alternate embodiments, the section of the spring located below the bottom end **46** of the adapter could have any suitable shape so long as it is deflectable. In addition, the upper legs of the spring could have any suitable shape to facilitate their connection to the adapter. The adapter could also have any suitable shape.

Referring to FIG. **1**, the temperature control knob **18** is connected to the top end **44** of the adapter **40** by a steam valve cam member **64**. The knob **18** is snap lock mounted to a top post **66** of the cam member **64**. A cam rib **68** is connected to a steam valve stem **70** by a rocker **72**. The cam member **64** has an aperture in its bottom forming an interior channel **74**. The top end **44** of the adapter **40** is longitudinally slidably located in the channel **74**. However, the top end **44** is rotationally interlocked with the member **64** such that when the member **64** is axially rotated, the adapter **40** is also axially rotated. The U-shaped section **58** of the spring **42** is located between the bottom end **46** of the adapter **40** and the top surface **76** (see FIG. **2**) of the thermostat frame **30**. The U-shaped section **58** partially surrounds the top of the thermostat shaft **32**.

As noted above, FIG. **1** shows the thermostat at a high temperature position with the shaft **32** in an up position. The U-shaped section **58** of the spring biases the adapter **40** to a spaced distance from the top surface **76** of the thermostat frame **30**. As the control knob **18** is rotated by a user to the OFF position shown in FIG. **4**, frictional forces between the adapter **40** in the aperture **54** and the thermostat shaft **32** cause the adapter **40** to be pulled down with the shaft **32** as indicated by arrow C. The U-shaped section **58** is able to deflect between the bottom end **46** of the adapter **40** and the top surface **76** of the frame **30**. However, after the shaft **32** reaches the OFF position shown in FIG. **4**, the frictional forces between the shaft **32** and adapter **40** diminish and the U-shaped section **58** deflects back to its normal state moving the adapter **40**, in a direction opposite to direction C, back to a raised position relative to the thermostat frame **30**.

It is desirable to be able to turn the shaft **32** of the thermostat **16** without applying any downward force. Such downward force can adversely affect the temperature calibration of the thermostat. In the past, one type of design had an adapter ride up and down with the thermostat shaft. However, this caused the adverse effect on the temperature calibration of the thermostat from the downward force mentioned above. Another type of design had an adapter ride on the top surface of the thermostat frame. However, this caused binding problems because the thermostat shaft tries to move the adapter down with the shaft when the shaft is moved down. The present invention allows the shaft adapter and spring assembly **20** to rest on the top surface **76** of the frame **30**, but also allows the adapter to move downward without binding problems. Thus, the present invention avoids both temperature calibration problems, by avoiding application of downward forces to the thermostat shaft, and prevents binding problems between the frame **30** and adapter **40**.

The present invention directly attaches the spring **42** to the adapter **40** before they are mounted to the thermostat. This is done for an important reason. Although a separate coiled spring might be used instead of the spring **42**, there is a risk that during assembly an assembler could accidentally drop such a separate spring into the skirt/soleplate assembly. A loose metal part, such as a coiled spring in the skirt/soleplate assembly is not desirable because it could cause an electrical short across electrical current carrying parts. The present invention, by directly mounting the spring **42** to the adapter **40**, prevents the spring **42** from accidentally falling into the skirt/soleplate assembly.

It should be understood that the foregoing description is only illustrative of the invention. Various alternatives and modifications can be devised by those skilled in the art without departing from the spirit of the invention. Accordingly, the present invention is intended to embrace all such alternatives, modifications and variances which fall within the scope of the appended claims.

What is claimed is:

**1**. In an electric steam iron having a soleplate, a housing, a thermostat, and a temperature control knob connected to a shaft of the thermostat by an adapter, wherein the improvement comprises:

a spring directly mounted to the adapter and having a deflectable portion between the adapter and the thermostat.

**2**. An iron as in claim **1** wherein the thermostat comprises a cam member connected to the shaft.

**3**. An iron as in claim **2** wherein the adapter has a keying aperture that has a keyed portion of the shaft located therein.

**4**. An iron as in claim **3** wherein the adapter has a flat bottom end with the aperture therein and a length of the adapter is offset from a center axis of the adapter and extends from the bottom end, the spring being mounted on the offset length.

**5**. An iron as in claim **4** wherein the spring comprises a single wire member.

**6**. An iron as in claim **5** wherein the deflectable portion of the spring has a loop located between a top plate of the thermostat and the bottom end of the adapter.

**7**. An iron as in claim **6** wherein the spring has two L-shaped sections extending from the loop that crisscross each other.

**8**. An iron as in claim **1** wherein, when the adapter is rotated to rotate the shaft in a first direction, the shaft pulls the adapter in a second direction with the spring being deflected between the adapter and the thermostat and, when the adapter is rotated to rotate the shaft in a third direction opposite to the first direction, the spring moves the adapter in a fourth direction opposite to the second direction.

**9**. An electrical steam iron comprising:

a soleplate;

a thermostat mounted to the soleplate;

a user actuatable control connected to the thermostat by an adapter; and

a spring directly mounted on the adapter having a first section located between an end of the adapter and a portion of the thermostat.

**10**. An iron as in claim **9** wherein the end of the adapter has a keying aperture and a keyed portion of a shaft of the thermostat is located therein.

**11**. An iron as in claim **9** wherein a length of the adapter is offset from a center axis of the adapter, the spring being mounted on the offset length.

**12**. An iron as in claim **9** wherein the spring comprises a single wire member.

**13**. An iron as in claim **9** wherein the first section of the spring is a single U-shaped loop.

**14**. An iron as in claim **9** wherein the spring has two L-shaped sections extending from the first section that crisscross each other.

**15**. An iron as in claim **9** wherein, when the adapter is rotated to rotate a shaft of the thermostat in a first direction, the shaft pulls the adapter in a second direction with the first

section of the spring being deflected between the adapter and the thermostat and, when the adapter is rotated to rotate the shaft in a third direction opposite to the first direction, the spring moves the adapter in a fourth direction opposite to the second direction.

**16**. A shaft and spring assembly for an electrical appliance, the assembly comprising:

a shaft having an end with a keying aperture therein and an offset length that is offset from a center axis of the shaft; and

a spring directly mounted to the shaft, the spring having a first deflectable section at the end of the shaft and a second section with two crisscrossed L-shaped portions mounted to the offset length.

**17**. An assembly as in claim **16** wherein the spring is a single wire.

**18**. An assembly as in claim **17** wherein the first section comprised a generally U-shaped middle of the single wire.

* * * * *