United States Patent [19]

Lewis

[11] **3,902,716**

[45] **Sept. 2, 1975**

[54] **SHEET CONVEYOR ROLL JAM UP SENSING APPARATUS**

[75] Inventor: **Jeffrey G. Lewis**, Portland, Oreg.

[73] Assignee: **Machine Controls Company**, Portland, Oreg.

[22] Filed: **Oct. 15, 1973**

[21] Appl. No.: **406,332**

[52] **U.S. Cl.** **271/263**; 192/127

[51] **Int. Cl.** **B65h 7/06**

[58] **Field of Search** 271/263, 262; 340/259; 192/127; 270/56

[56] **References Cited**

UNITED STATES PATENTS

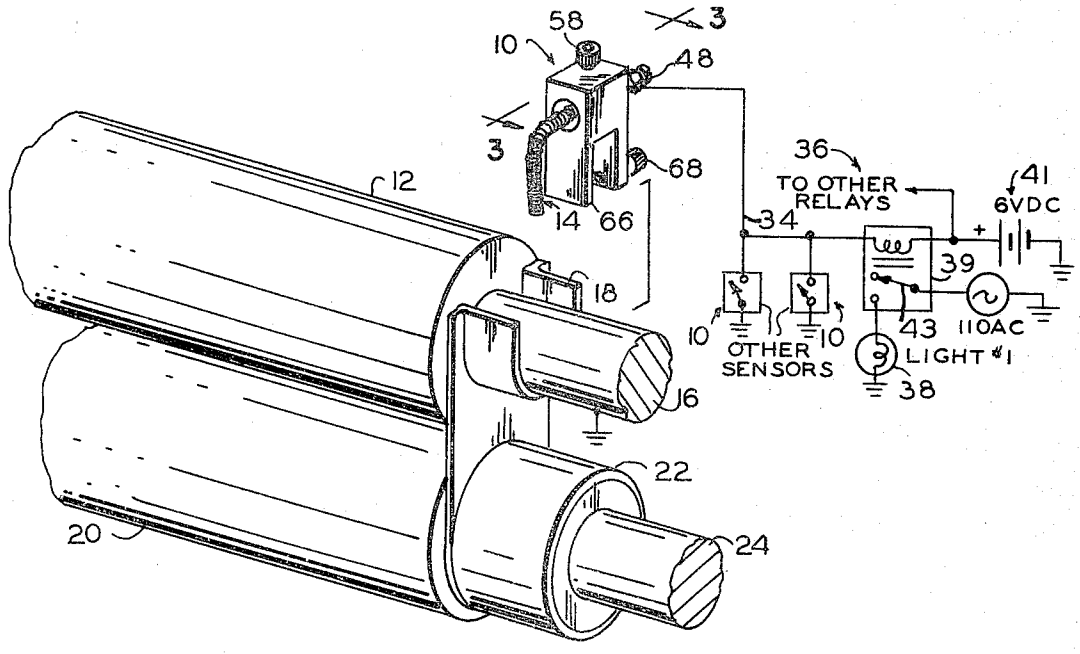
869,324	10/1907	Obert	192/127 X
1,864,231	6/1932	Canning	192/127
3,316,760	5/1967	Ward	340/259 X
3,385,593	5/1968	Snellman	271/263 X

Primary Examiner—Richard A. Schacher
Assistant Examiner—Bruce H. Stoner, Jr.
Attorney, Agent, or Firm—Klarquist, Sparkman, Campbell, Leigh, Hall & Whinston

[57] **ABSTRACT**

A roll jam-up sensing apparatus is described which may be used on sheet conveyor rolls, such as the pairs of upper and lower rolls used in a veneer dryer, such rolls being mounted in support brackets which enable upward movement of the upper rolls when a jam-up occurs. A plurality of sensing devices each including a resilient actuator member, which is preferably in the form of a coil spring, are mounted on such support brackets so that the free end of the actuator spring contacts the upper roll or its shaft during such upward movement and thereby actuates a jam-up indicating means. The sensing devices are preferably electrical sensors each having an electrical terminal member which is connected to the fixed end of the actuator spring, and the free end of such spring is grounded upon engagement with the roll shaft to actuate a relay and associated signal light in the indicating means. The electrical terminal member is preferably a bolt threaded into the coil spring and supported within an aperture in a mounting plate by an electrical insulator sleeve releasably held by a set screw in such aperture.

15 Claims, 4 Drawing Figures



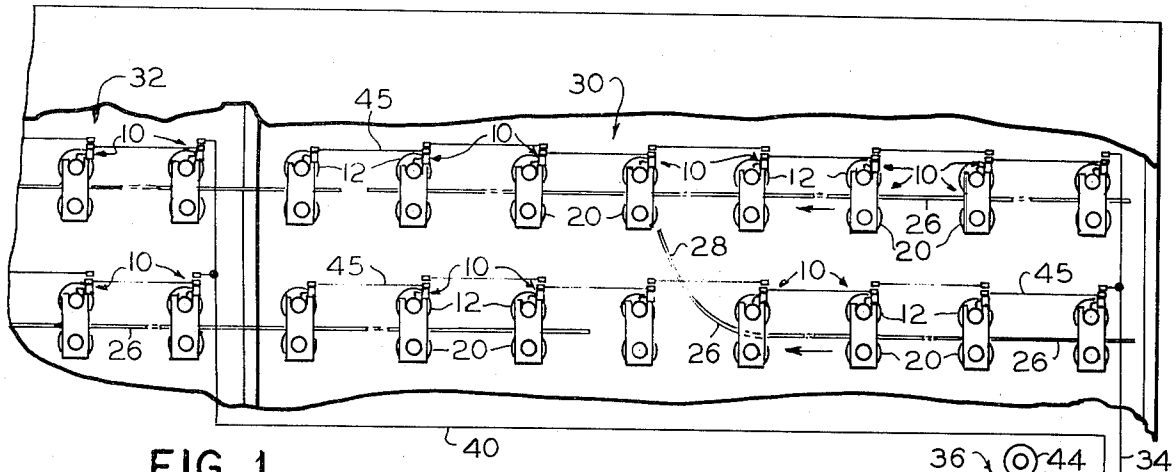


FIG. 1

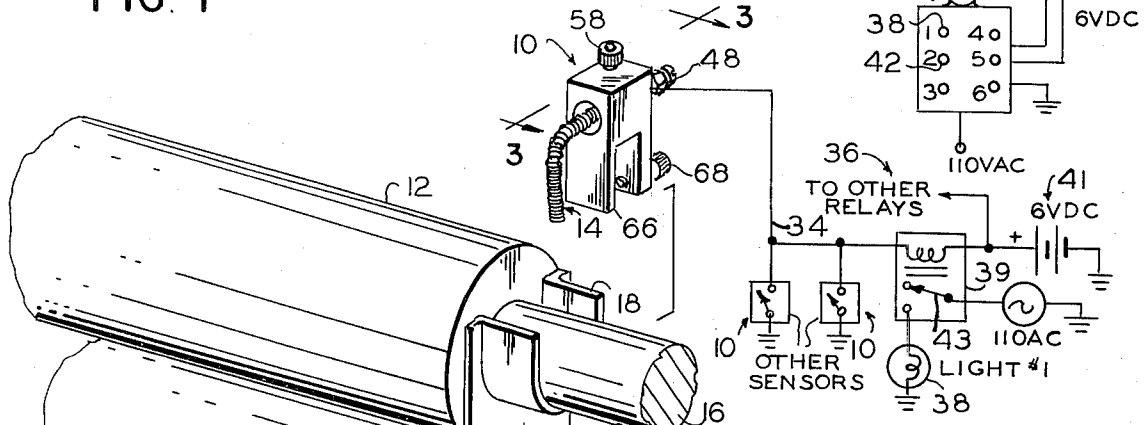


FIG. 2

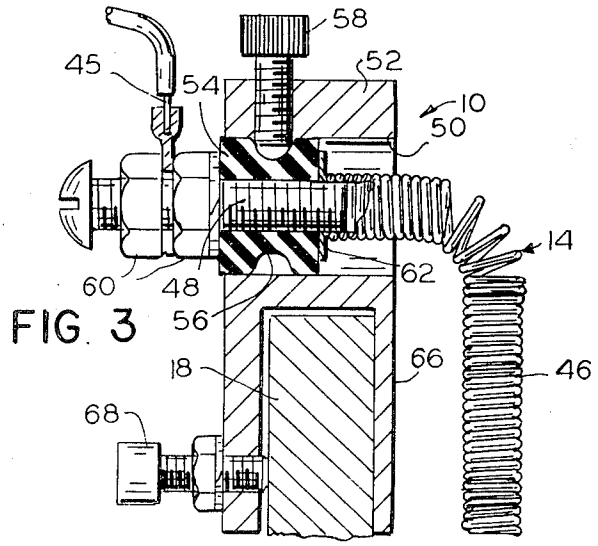


FIG. 3

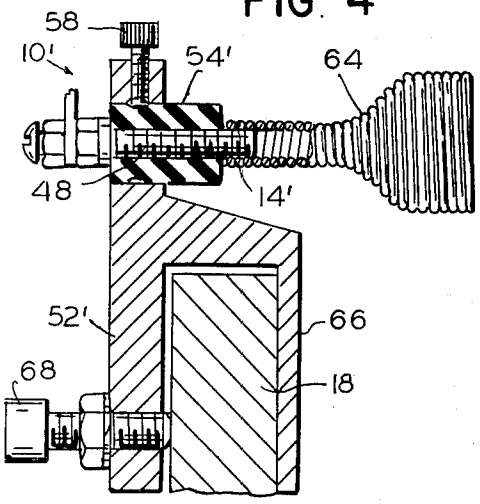


FIG. 4

SHEET CONVEYOR ROLL JAM UP SENSING APPARATUS

BACKGROUND OF THE INVENTION

The subject matter of the present invention relates generally to roll jam-up sensing apparatus and in particular to jam-up sensing apparatus for sheet conveyor rolls, such as the rows of pairs of upper and lower rolls used in wood veneer dryers. The sensing apparatus includes a plurality of sensing devices having resilient actuator members, preferably coil springs, which engage the roll or roll shaft upon upward movement of such roll when a jam-up occurs. In a veneer dryer the roll jam-up is caused by a sheet of wood veneer curving up or down into an adjacent row of rollers out of the row of rollers attempting to convey such veneer horizontally through the dryer.

Previously, roll jam-up sensing apparatus for veneer dryers have employed a plurality of long electrical wires which each extend across the ends of a plurality of veneer conveyor rolls forming a horizontal row or tier of rolls. This detector wire type of sensing device has several disadvantages. Thus, such detector wire cannot be adjusted to compensate for different spacing or positions of each roll. Also, it must be completely removed or bent up out of the way in order for the operator to clear the jam or to change a dryer roll for other purposes. Removal and replacement of the wire take too long a time, while after such bending, the wire is not in the proper position to operate effectively. Furthermore, this prior sensing apparatus is of low sensitivity because such detector wires are held in straight lines above the top of the rolls, spaced from such rolls sufficiently to prevent engagement of any upper rolls except during jam-up with the result that they must be positioned above the highest roll so that they are spaced a greater distance from the lower rolls in the tier of upper rolls.

The roll jam-up sensing apparatus of the present invention overcomes these disadvantages by employing individual sensing devices for each roll which may be mounted on the support brackets of each roll shaft. The spacings between the sensing devices and the rolls may be individually adjusted which results in greater sensitivity for the sensing apparatus. This increased sensitivity enables the present sensing apparatus to sense upward movement of the rolls before severe jam-up conditions exist and enable the operator to avoid many jam-ups which would otherwise occur. Furthermore, by using a resilient actuator member, the present sensing apparatus does not restrict upward movement of the rolls or interfere with the removal of dryer rolls, such as when the operator is unjamming the veneer dryer by removal of the jammed wood veneer.

SUMMARY OF THE INVENTION

It is, therefore, one object of the present invention to provide an improved roll jam-up sensing apparatus of high sensitivity and simple trouble-free operation which senses lateral movement of the rolls when a jam-up occurs.

A further object of the invention is to provide such a sensing apparatus which enables easier roll maintenance including removal of the rolls without removal or damage to the sensing apparatus.

Another object of the invention is to provide such a sensing apparatus for sheet conveyor rolls, such as are used in a veneer dryer, including a plurality of individually adjustable sensing devices which are mounted in position to sense upward movement of the dryer rolls without restricting such upward movement.

A still further object of the present invention is to provide such a sensing apparatus in which the sensing devices are of simple and economical construction and each include a resilient actuator member, such as a coil spring, which is not damaged by upward movement of the roll shaft which it engages.

Still another object of the invention is to provide such sensing devices in the form of electrical detectors in which the coil spring actuator member is attached at its free end to an electrical terminal and makes electrical contact with its free end to the roll or roll shaft to actuate an electrical indicating apparatus.

Still another object of the invention is to provide such a sensing device in which the spacing between the free end of the coil spring and roll or roll shaft is adjustable for earlier detection of upward movement of such roll shaft in order to prevent severe jam-ups.

BRIEF DESCRIPTION OF DRAWINGS

Other objects and advantages of the present invention will be apparent from the following detailed description of certain preferred embodiments thereof and from the attached drawings of which:

FIG. 1 is a side elevation view of a veneer dryer employing the jam-up sensing apparatus of the present invention, with parts broken away for clarity;

FIG. 2 is an exploded enlarged view of one embodiment of a sensing device and associated pair of conveyor rolls used in FIG. 1, together with a schematic diagram of the electrical circuit actuated by such sensing device;

FIG. 3 is an enlarged section view taken along the line 3—3 of FIG. 2, showing the sensing device mounted on the roll support bracket; and

FIG. 4 is an enlarged section view similar to that of FIG. 3 showing another embodiment of the sensing device.

DESCRIPTION OF PREFERRED EMBODIMENTS

As shown in FIGS. 1 and 2, the sheet conveyor roll jam-up sensing apparatus of the present invention includes a plurality of sensing devices **10** which are mounted adjacent to the ends of upper conveyor rolls **12**. Each of the sensing devices includes a resilient actuator member **14** which senses the upward or other lateral movement of the upper roll **12**, such as by engagement with the roll or its shaft **16** during a jam-up. The upper roll **12** is rotationally mounted on shaft **16** in a U-shaped support bracket **18** which enables upward movement of the roll shaft as well as rotation thereof. A plurality of lower conveyor rolls **20** are mounted beneath the upper rolls **12** to provide a plurality of roll pairs which convey the sheet material between such upper and lower rolls. The lower rolls are each rotationally mounted in annular bearings provided in support brackets **22** which enables rotational movement of their shafts **24** but prevents upward or any other lateral movement of such lower rolls. The lower roll shafts **24** are all coupled to a common drive motor (not shown) in a conventional manner such as by a chain drive for rotating the lower roll **20**, while the top roll shafts **16** are loosely coupled to such lower

shafts by star wheel gearing (not shown) which enables upward movement of the top shafts.

The roll pairs 12 and 20 are positioned in horizontal rows of different levels in a veneer dryer and wood veneer 26 is fed along such horizontal rows between the upper and lower rollers. Thus, the upper rolls 10 are spaced from the lower rolls 20 by the thickness of the veneer 26 which will vary, and this variation is accommodated by lateral movement of the upper rolls in the U-shaped support bracket 18. The upper roll shaft 16 moves upward slightly in response to variations in thickness of the sheet material 26 and also when two sheets overlap. However, the sensing devices 10 are positioned so that their actuator springs 14 do not engage the upper roll shafts 16 under these normal operating conditions, but only engage such roll shafts under jam-up conditions. Typically such a jam-up occurs when the veneer 26 curls up or down into the next adjacent horizontal row or tier of rollers, as shown in FIG. 1 by the curved leading edge 38 on one veneer sheet. This causes the upper roller 12 immediately in front of the curved veneer section 28 to be raised upward by such veneer section as it is driven forward by the previous rollers. Such upward movement of the roller 12 is sensed by the resilient actuator member 14 of the sensing device engaging the shaft 16 of such upper roller and the sensing device 10 then operates a jam-up indicating means 36 as hereafter described.

As shown in FIG. 1, the veneer dryer has a plurality of separate dryer chambers including a first chamber 30 and a second chamber 32 set at different temperatures which can be as high as 550° F. The veneer sheet material is fed from one dryer chamber 30 to the next to gradually dry the veneer to the proper moisture content before discharge from the dryer. The veneer dryer apparatus will not be described in detail because it is conventional except for the presence of the jam-up sensing devices 10 and their associated electrical circuit. All of the sensing devices 10 in the first chamber 30 are connected through their actuators 14 to a common control wire 34 which applies a suitable voltage of about 6 volts D.C. to such devices and connects these devices to the indicator means 36 to illuminate a first signal light 38 when the actuator 14 of one of such sensing devices contacts an upper roll shaft 16. In a similar manner all of the sensing devices 10 in the second dryer chamber 32 are connected by their actuators 14 to another control wire 40 which applies 6 volts D.C. thereto and operates a second signal light 42 on the indicator means 36.

As shown in FIG. 2 the indicator means 36 contains a plurality of relays and associated signal lights each connected to one of the control wires 34, 40, etc. For example when one of the sensing devices 10 in the first chamber 30 is operated by its actuator spring 14 contacting the grounded roll shaft 16, current flows through the winding of a relay 39 connected in a series between a D.C. voltage source 41 and all of the sensing devices in chamber 30. This actuates the relay 39 and causes its movable switch contact 43 to connect the signal light 38 to a source of energizing current such as the 110 volts A.C. power line shown. As a result of illumination of the signal light 38, 42, etc., the operator knows in which chamber of the dryer the jam-up situation is occurring, so that he can correct the jam-up condition more quickly. An audible indicating device 44, such as a horn, may be provided on the indicating means 36 and connected between the 110 volts source and all the relays for warning the operator of a jam-up when he is away from the indicator means. Alternatively, an automatic shut-off switch can be employed in place of horn 44 for de-energizing the drive motor connected to the rollers 20 of the dryer when a jam-up is sensed.

Jumper wires 45 are connected between each of the sensing devices 10 in a horizontal row or tier and also connect such devices to one of the control wires 34 or 40. Thus, the sensing devices 10 are connected in parallel through a control wire to the D.C. voltage energizing source. It should be noted that the upper roll shafts 16 are grounded to the machine frame through bracket 18 and their star gear coupling to the lower roll shafts 24.

As shown in FIG. 3, one embodiment of the present sensing device 10 provides a resilient actuator member 14 in the form of a coil spring 46 of substantially uniform diameter having one end fixed to an electrical terminal 48 in the form of a bolt which is threaded into the fixed end of such spring. The electrical terminal member 48 extends through an aperture 50 in a mounting plate 52 of aluminum or other metal and is electrically insulated therefrom by an insulator sleeve 54 of a suitable high melting point synthetic plastic such as polytetraflouroethylene, known as "Teflon," or a ceramic material. The annular sleeve is provided with an annular groove 56 on its outer surface, and a set screw 58 extends through a threaded hole in the top of the mounting plate 52 into engagement with the groove 56 surface. Thus, the set screw releasably holds the spacer sleeve 54 and the electrical terminal member 48 within the aperture 50 of the mounting plate 52. It should be noted that the set screw is positioned so that its axis does not pass through the axis of the insulator sleeve 54 to prevent it from breaking a ceramic sleeve while clamping it against the side of the aperture 50. A pair of lock nuts 60 are provided between the head of the electrical terminal bolt 48 and the insulator 54 in order to attach such bolt to connection wires 45, such connection wires being provided with spade-shaped end terminals of conventional type. A metal washer 62 is provided over the other end of the electrical terminal bolt 48 and engages the end of the coil spring 46 in order to clamp such bolt onto the insulator spacer 54 between such washer and the inner nut 60 and its associated washer.

It should be noted that the spacing of the free end of the coil spring 46 from the roll shaft 16 may be varied, either by clipping off a portion of such free end with wire cutters, or by rotating the bolt 48 and the coil spring to move such free end toward and away from the shaft. Thus, the free end can either extend substantially perpendicular to the roll shaft 16 or may be in some other lateral position extending at an acute angle to the axis of such shaft. Also, it is possible to rotate the bolt 48 clockwise 90° from the position in FIG. 2 so that the free end of the coil spring will be engaged by the top of the roller 12 upon upward movement of such roller.

Another embodiment of the invention is shown in FIG. 4 and is similar to that previously described, except that the sensing device 10 includes a modified actuator member 14' consisting of a coil spring 64 having a small diameter end threaded onto the electrical terminal bolt 48 and having a free end of larger diameter. The axis of the free end of spring 64 is substantially co-

axial with the axis of the free end, and extends at least partially across the opening in the top of the support bracket **18**. In addition, a modified mounting bracket **52'** is used and the spacer sleeve **54** extends completely through such mounting bracket.

In the embodiment of FIG. **3**, the spacer sleeve does not extend completely through the mounting bracket aperture **50**, but terminates about in the middle of such aperture so that the bolt **48** is spaced from the right side surface of the mounting bracket **52**. As a result, the coil spring **46** is not pressed against the edge of the aperture **50** by upward movement of the roller shaft **16** which otherwise might cut or damage the spring.

Both the mounting bracket **52** of FIG. **3** and the mounting bracket **52'** of FIG. **4** are attached to the top edge of the roll support bracket **18** by a channeled bracket portion **66** having a channel width equal to the thickness of the support bracket **18**. In both cases, the mounting bracket is removably attached to the support bracket **18** by a clamping screw **68** threaded through an opening in the outer side of the mounting bracket.

It will be obvious to those having ordinary skill in the art that many changes may be made in the details of the above-described preferred embodiments of the present invention without departing from the spirit of the invention. For example, rather than electrical detectors, the sensing elements may be mechanical switches in which case the resilient actuating member **14** would operate the switch in the manner of a limit switch. Of course such a mechanical switch would have to be provided with high temperature insulating material to operate in the environment of a veneer dryer, and would be somewhat more expensive than the simple electrical sensing device **10**. Therefore, the scope of the present invention should only be determined by the following claims.

I claim:

1. Jam-up sensing apparatus for a sheet conveyor comprising:

a plurality of sheet conveyor rolls having their normally rotating shafts rotatably mounted in support brackets which enable upward movement of said rolls when a jam-up occurs;

a plurality of sensing devices each including a movable electrical contact sensing member;

electrically actuable indicator means connected to said sensing devices for indicating when said jam-up occurs; and

a plurality of separate mounting means for separately attaching said sensing devices to said support brackets with said movable electrical contacts of said sensing devices normally spaced from but in position to electrically contact a portion of said rolls upon upward movement of said rolls to complete an electrical circuit between said indicator means and electrical ground through one of said movable electrical contact sensing members and one of said rolls and thereby electrically actuate said indicator means in response to the upward movement of one of said rolls without restricting said upward movement.

2. Apparatus in accordance with claim **1** in which said movable electrical contact is insulated from said mounting means by electrical insulation means.

3. Apparatus in accordance with claim **1** in which said movable electrical contact is a resilient electrical contact which is insulated from said mounting means by electrical insulation means.

4. Apparatus in accordance with claim **3** in which the resilient electrical contact is a coil spring.

5. Apparatus in accordance with claim **3** in which the contact is a coil spring having a free end which is normally spaced from the roll shaft but engages said shaft during said upward movement and having a fixed end connected to an electrical terminal.

6. Apparatus in accordance with claim **5** in which said support brackets have upwardly open ends for enabling said upward movement of said rolls and the free end of said coil spring extends partially into the open end of said support bracket lateral to said shaft.

7. Apparatus in accordance with claim **5** in which said support brackets have upwardly open ends for enabling said upward movement of said rolls and the free end of said coil spring extends at least partially across the open end of said support bracket substantially parallel to said shaft.

8. Apparatus in accordance with claim **1** in which the rolls are dryer rolls supported in a wood veneer dryer, said movable electrical contact is a resilient electrical contact, each of the mounting means includes a mounting bracket releasably attached to the support bracket supporting such dryer rolls and having an aperture through which said electrical contact extends, and electrical insulation means of high melting temperature being provided between the wall of said aperture and said contact.

9. Apparatus in accordance with claim **8** in which the insulation means is an annular sleeve of electrical insulating material which is releasably held in said aperture by a set screw.

10. A roll jam-up sensing device comprising:

a resilient electrical contact sensing member;

an electrical terminal connected to said sensing member and extending coaxial with at least a portion of said sensing member;

mounting means for mounting said device adjacent to said roll with said sensing member normally spaced above the normally rotating shaft of said roll so that said sensing member is electrically actuated by electrical contact with said shaft to complete an electrical circuit between said electrical terminal and electrical ground through said sensing member and said roll in response to lateral movement of said roll during a jam-up without restricting said lateral movement; and

insulation means for electrically insulating said mounting means from said electrical terminal and said sensing member.

11. A device in accordance with claim **10** in which the resilient sensing member is a coil spring having a free end adapted to engage the shaft of said roll and having a fixed end connected to said electrical terminal.

12. A device in accordance with claim **11** in which said free end extends laterally to the axis of said fixed end.

13. A device in accordance with claim **11** in which said free end is substantially coaxial with said fixed end.

14. A device in accordance with claim **11** in which said free end extends out of an aperture in a mounting bracket and said fixed end is attached to the electrical terminal within said aperture, and said insulation means is an insulator sleeve provided in said aperture around said terminal to support said terminal in insulated relationship on said mounting bracket.

15. A device in accordance with claim **14** in which said electrical terminal is a bolt having a threaded end screwed into the fixed end of said coil spring.

* * * * *