United States Patent

Suozzo

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[54] **THERMO-ELECTROMECHANICAL MULTI-FUNCTION SUPPORT DEVICE**

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[52] **U.S. Cl.** **248/59**

[51] **Int. Cl.** **F16l 3/20**

[58] **Field of Search** ..... 248/54 CS, 54 R, 58, 59

[56] **References Cited**

UNITED STATES PATENTS

3,905,415	9/1959	Sundahl	248/54 R
3,033,506	5/1962	Suozzo	248/58
2,945,656	7/1960	Sherburne	248/58

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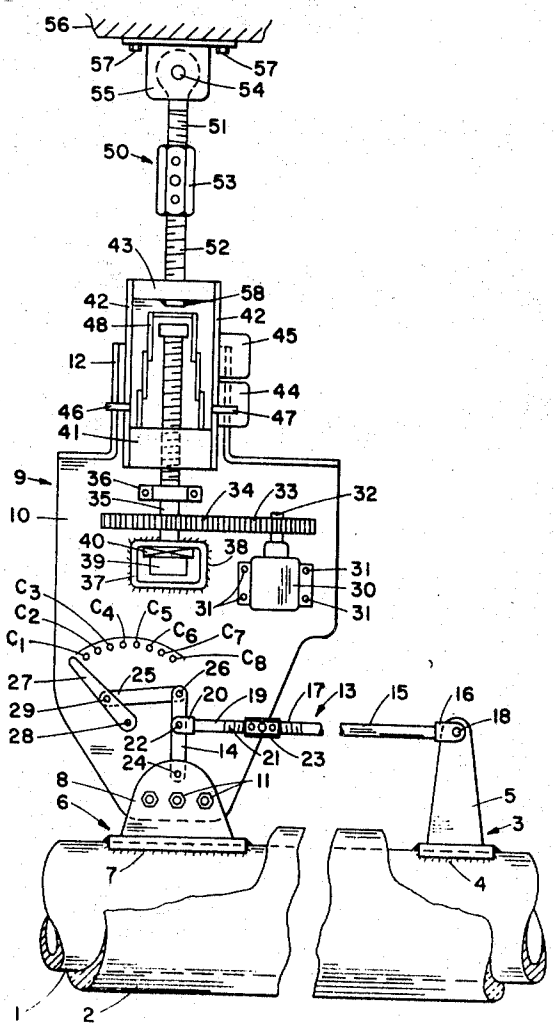
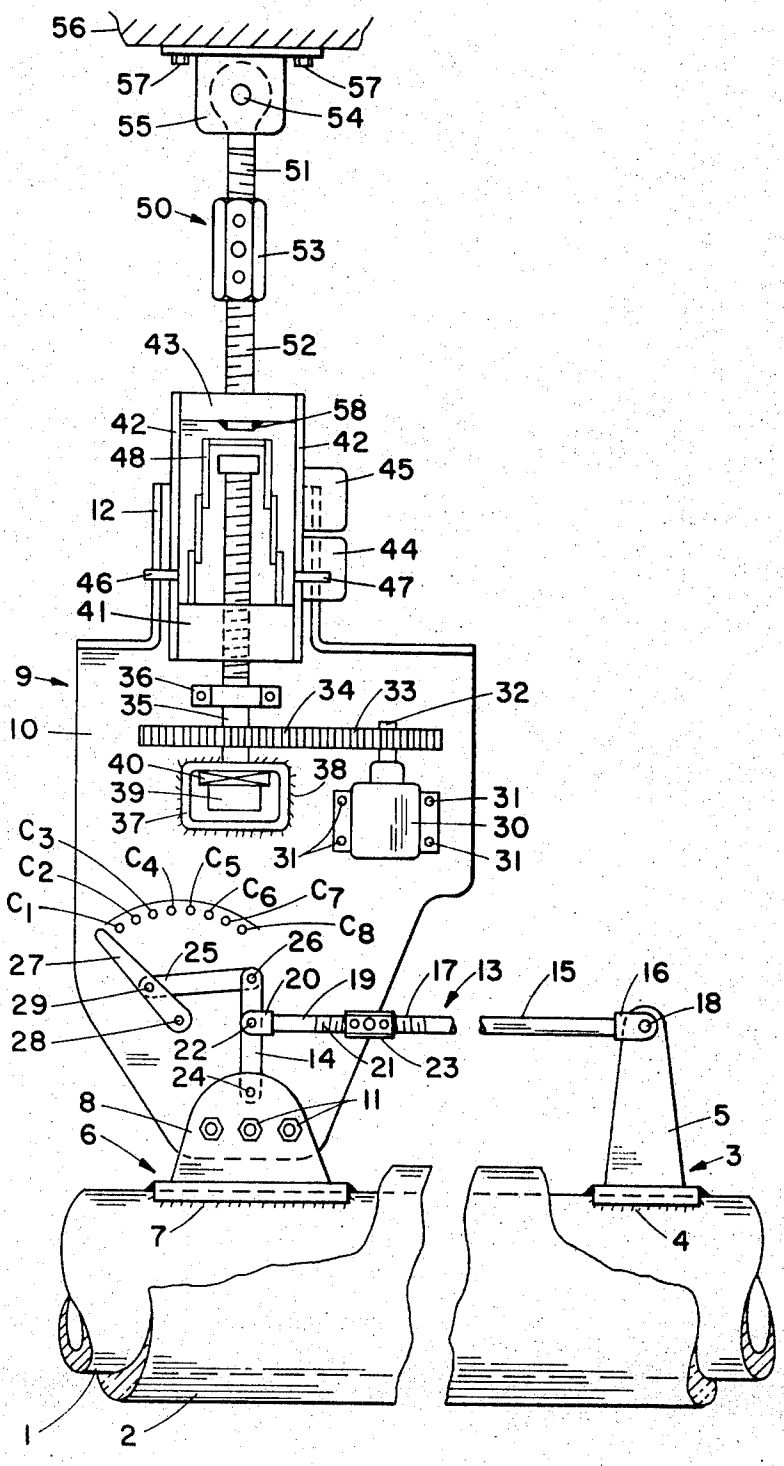
[57] **ABSTRACT**

A device for use with piping or other equipment that is subject to changes in position due to variations in its thermal condition. The device comprises actuating means, which is secured to the piping at spaced first and second locations and is movable relative to the piping in response and in direct proportion to expansion or contraction resulting from said variations in thermal condition, and coupling means. The actuating means includes a rigid member connected at one end to the piping at the first location and a lever pivotally connected to the piping at the second location and to the other end of the rigid member. The coupling means is variable in effective length and is connected at one end to the lever and at its other end to a stationary support. The coupling means includes an electric motor which is cooperatively associated with the lever. The parts are so constructed and arranged that increments of movement of the actuating means cause corresponding variations in the effective length of the coupling means.

3 Claims, 1 Drawing Figure





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THERMO-ELECTROMECHANICAL MULTI-FUNCTION SUPPORT DEVICE

This application is a continuation-in-part of my pending patent application Ser. No. 807,048, filed Mar. 13, 1969 now U.S. Pat. No. 3,539,136 dated Nov. 10, 1970.

BACKGROUND OF THE INVENTION

This invention relates in general to a device for properly and effectively supporting and/or controlling movement of piping or other equipment that is subject to changes in position due to variations in its thermal condition.

As in the case of the support device of my said pending application, the subject device is multi-functional in that it may beneficially serve in a wide variety of capacities, depending on specific applications, and may be advantageously employed, by way of example, as:

1. A shock and sway arrestor;
2. A springless constant support;
3. An assist to known spring supports to render them truly constant; and/or
4. A positioner for piping.

SUMMARY OF THE INVENTION

The device of this invention is intended for use with piping or other equipment that is subject to changes in position due to variations in thermal condition.

The device comprises two basic means, namely actuating means, adapted to be secured to the piping at spaced first and second locations and to move relative to the piping in response and in direct proportion to said variations in thermal condition, and coupling means connected to the actuating means and adapted to be connected to a stationary support. The actuating means includes a rigid member, which is adapted to be pivotally connected to the piping at said first location, and a lever, which is pivotally connected to the rigid member and is adapted to be pivotally connected to the piping at said second location. The coupling means is adjustable in length and is connected at one end to the lever and is adapted to be connected at its other end to a stationary support. The coupling means includes an electric motor which is cooperatively associated with the lever.

The objects of this invention include those enumerated in my said pending application, Ser. No. 807,048.

This invention has for a further object the provision of a device of the character indicated having its parts so constructed and arranged that increments of movement of the actuating means produce corresponding, but greatly increased, changes in the effective length of the coupling means.

A still further object of this invention is to provide a device of the character indicated that is capable of properly supporting and/or positioning very heavy piping loads.

The objects and advantages of this invention will be apparent and manifest to persons trained in the art from the ensuing detailed description and the accompanying drawing which describe and illustrate a preferred embodiment of the invention.

BRIEF DESCRIPTION OF THE DRAWING

The drawing contains a single view in side elevation of a device of this invention cooperatively associated with piping.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawing, the therein illustrated embodiment of the invention is shown in operative association with a section of piping **1** which is encased in a suitable heat insulating sheath **2**. For the purposes of this disclosure, it is assumed that piping section **1** is part of a piping system employed in a high temperature power plant. It is not uncommon in modern power plants to utilize piping systems to transmit steam at temperatures in excess of 1,000° F and at pressures greater than 1,500 pounds per square inch. Such systems require adequate support to allow and compensate for movement of the piping due to normal expansion and contraction of the metal thereof.

The inventive device includes a bracket **3** which is secured at a first location to piping section **1** by a weldment **4**. The bracket has an upstanding arm **5**. A second bracket **6** is secured to the piping section at a second location, which is spaced from bracket **3**, by a like weldment **7**. This bracket also has an upstanding arm **8**.

A housing unit **9** includes a rear wall **10** that is attached to bracket arm **8** by bolts **11**. The housing unit also includes side and front walls (not shown) and is provided at the top with a tubular, upwardly projecting extension, a portion of which is indicated at **12**.

The device also includes actuating means that is comprised of a rigid member **13** and a lever **14**. The rigid member includes a first rod **15** which is provided at one end with a clevis **16** and which is threaded at its other end, as indicated at **17**. The clevis is connected to the upper end of bracket arm **5** by a pivot pin **18**. The rigid member also includes a second rod **19** which is provided with a clevis **20** at one end and is threaded, as indicated at **21**, at its other end. Clevis **20** is joined to lever **14** by a pivot pin **22**. A turnbuckle **23** engages the threaded ends **17** and **21** of the rods and serves to adjust the overall length of rigid member **13**, as required at the time of installation. Lever **14** is pivoted at its lower end to bracket arm **8** by a pivot pin **24** and at its upper end to a link **25** by a pivot pin **26**.

A switch arm **27** is pivotal relative to housing wall **10**, as indicated at **28**. This arm is connected intermediate its ends to the other end of link **25** by a pivot pin **29**.

Switch arm **27** is an element of an arrangement of electrical devices which include a reversible electric motor **30** that is affixed to housing wall **10** by bolts or the like **31**. The motor includes a rotary shaft **32** which carries a pinion **33**. The electrical devices also include a plurality of switch contacts C_1 through C_8 that are equi-spaced and arranged along an arc of a circle. Each switch contact is connected to the motor and is adapted to successively make and break electric contact with switch arm **27**, depending on the angular position of the switch arm. When the parts are in the illustrated relative position, switch arm **27** is out of contact with the switch contacts and is at a position to the left of contact C_1. As a result, motor **30** is out of active service. When arm **27** makes contact with an individual switch con-

tact, the motor is activated. The arrangement of electrical devices is such that the motor is activated so that its shaft **32** turns a predetermined number of revolutions each time arm **27** engages a switch contact. Motor shaft **32** rotates in one direction in response to pivotal movement of arm **27** in a clockwise direction and in a reverse direction in response to pivotal movement of arm **27** in a counter-clockwise direction.

Pinion **33** meshes with a gear **34** which is carried by and is rotatable with a screw member **35**. The screw member is supported for rotation in a bearing **36** and extends through a wall of a tubular casing **37** that is welded to housing wall **10** as indicated at **38**. Positioned within the casing is a support block **39**. A thrust bearing **40** is interposed between the lower end of screw member **35** and block **39**. The screw member is operatively associated with a nut member **41**. Screw member **35** and nut member **41** are elements of a motion converting mechanism.

Secured to the sides member **41**, preferably by welding, is a pair of oppositely disposed, upwardly projecting, arcuate members **42**. A plate **43** is positioned between and welded to the upper ends of members **42**. The tubular extension is equipped with a pair of switches **44** and **45** which are connected to motor **30**. Members **42** carry a pair of oppositely projecting lateral pins **46** and **47** which register with corresponding vertical slots in portion **12** of the tubular extension. These pins serve the multiple functions of indicating vertical travel of the piping section and preventing rotational movement of nut member **41** relative to screw member **35** while permitting movement of the nut member along the screw member. Pin **47** serves the additional function of actuating switches **44** and **45** to closed condition, depending on the position of this pin at a particular time. Nut member **41**, members **42** and plate **43** are in the nature of a "cage." A telescopic cover **48** is mounted on nut member **41** and protectively envelopes the upper portion of screw member **35**.

The device further includes connector means, generally indicated by numeral **50**, which comprises a pair of rods **51** and **52** that are threaded, as shown, and are interconnected by a turnbuckle **53** for adjusting its length at the time of installation. Rod **51** is pivotally connected by a pin **54** to a bracket **55** which is anchored to a stationary overhead support, such as a beam **56**, by bolts or the like **57**. Rod **52** extends through a tap (not shown) in plate **43** and is secured thereto by a weldment **58**.

For the purpose of outlining the operation of the above-described embodiment of the invention, it is assumed that the device has been installed and that the parts are in the relative position shown in the drawing. It is also assumed that switch arm **27** is to the left of switch contact C_1, as shown, and that motor **30** is out of active service. It will be evident that piping **1** is being directly supported by the device. It is further assumed that the piping system is initially in "cold condition," the temperature of the piping being substantially the same as that of the ambient atmosphere, for example, 70° F.

When the piping system is placed in service, steam generated by the power plant is transmitted therethrough and the temperature of the piping gradually increases to a maximum predetermined level, for example, 1,070° F. As a consequence of this temperature increase, the piping system gradually expands or elongates and its position is changed. The elongation of the portion of piping **1** between brackets **3** and **6**, due to the temperature increase, causes rigid member **13** to move toward the right and lever **14** and switch arm **27** to swing clockwise about respective pivot pins **24** and **28**. This causes switch arm **27** to successively make and break contact with switch contacts C_1 through C_8. When each such contact is made, motor **30** is automatically placed in active service causing its shaft **32** to rotate a predetermined number of revolutions. This, in turn, causes nut member **41** and the piping to move downwardly because of the interconnection of gear **34**, screw member **35**, connector means **50** and associated devices. The illustrated construction effects lowering of the piping by increments of distances corresponding to, but greater than, increments of elongation of the piping between brackets **3** and **6**. The parts are so designed and arranged that the piping is moved the calculated or actual distance it would normally move due to temperature increase from "cold condition" to "hot condition." It will be manifest that the device both supports the piping and causes it to move to its calculated or actual normal position in response to variations in the temperature of the piping.

At such time as the power plant is shut down, the temperature of the piping gradually reduces from 1,070° F to the ambient temperature of about 70° F and the piping contracts. Such contraction of the piping causes the device to operate in a reverse manner, thereby causing the piping to assume its calculated or normal position at all times during cooling.

As stated, motor **30** is reversible and the arrangement of electrical devices is such that the motor rotates in one direction during heating of the piping and in a reverse direction during cooling thereof. Switch **44** is actuated by pin **47** to place the motor out of service when the piping reaches and so long as the piping is at its lower travel limit. Switch **45** is actuated by pin **47** to likewise place the motor out of service when the piping reaches and so long as it is at its upper travel limit.

Based on the foregoing, it is believed that the construction, operation, objects and advantages of my present invention will be readily comprehended by persons skilled in the art, without further description. It is to be clearly understood, however, that various changes in the construction described above and illustrated in the drawing may be made without departing from the scope of the invention, it being intended that all matter contained in the description or shown in the drawing shall be interpreted as illustrative only and not in a limiting sense.

I claim:

1. A device for use with equipment, such as piping, that is subject to changes in position resulting from expansion or contraction due to variations in its thermal condition comprising:

a. actuating means adapted to be secured to the piping at spaced first and second locations and to move relative to the piping as the piping expands or contracts in response and in direct proportion to said variations in thermal condition, said actuating means comprising:

1. a rigid member adapted to be pivotally connected to the piping at said first location; and

2. a lever pivotally connected to the rigid member and adapted to be pivotally connected to the piping at said second location, said lever being operatively associated with the means for placing the motor into and out of active service; and

b. coupling means operably connected to the actuating means and adapted to be connected to a stationary support, said coupling means including:

1. connector means adapted to be connected to the stationary support; and

2. electric motor means interposed between and coacting with the actuating means and the connector means, said electric motor means comprising:

i. a reversible motor; and

ii. means for placing the motor into and out of active service in response to predetermined increments of movement of the actuating means.

2. A device according to claim 1 wherein the means for placing the motor into and out of active service comprises:

a. a switch member connected to the lever and pivotal relative thereto; and

b. a plurality of spaced switch contacts successively engageable by the switch member.

3. A device for use with equipment, such as piping, that is subject to changes in position resulting from expansion or contraction due to variations in its thermal condition comprising:

a. actuating means adapted to be secured to the piping at spaced first and second locations and to move relative to the piping as the piping expands or contracts in response and in direction proportion to said variations in thermal condition; and

b. coupling means operably connected to the actuating means and adapted to be connected to a stationary support, said coupling means including:

1. connector means adapted to be connected to the stationary support;

2. a reversible electric motor interposed between and coacting with the actuating means and the connector means; and

3. means for replacing the motor into and out of active service in response to predetermined increments of movement of the actuating means, said means for placing the motor into and out of active service comprising:

i. a switch member movable in response to corresponding movement of the actuating means; and

a plurality of spaced switch contacts successively engageable by the switch member.

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