Sept. 15, 1964 L. S. SUOZZO 3,148,870

SPRING SUPPORT DEVICE

Filed July 22, 1963

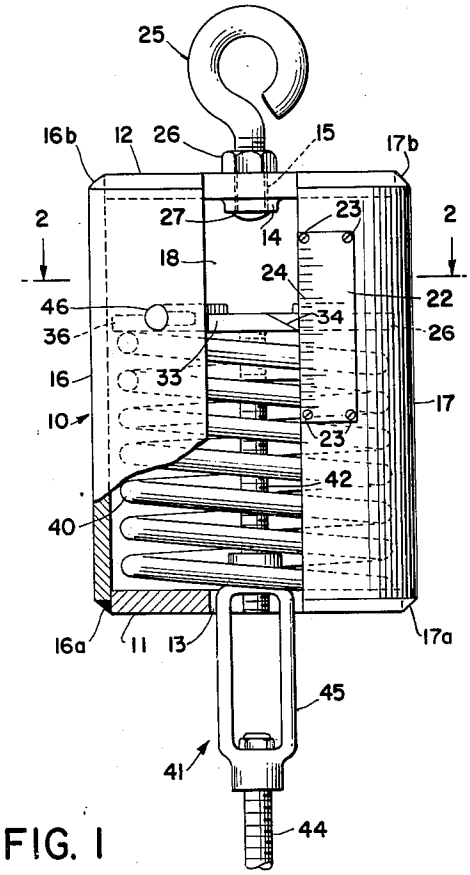


FIG. 1

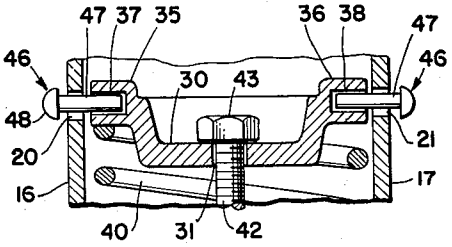


FIG. 3

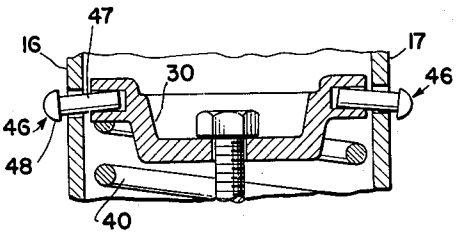


FIG. 4

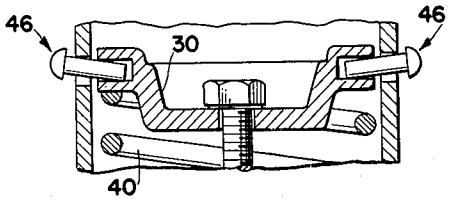


FIG. 5

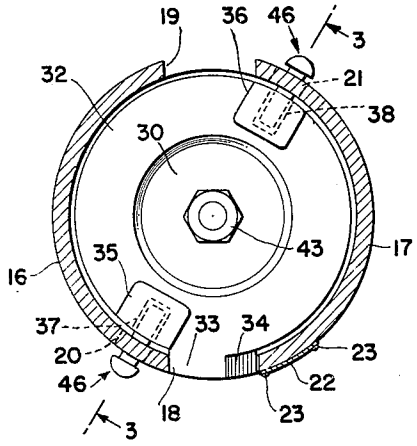


FIG. 2

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SPRING SUPPORT DEVICE

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This invention relates to the art of supports and, more particularly, to a spring device for supporting piping and similar loads that are subjected to generally vertical movement in use. The invention pertains, in one of its more specific aspects, to a variable spring support device having improved and simplified means for readily and conveniently converting the device into a rigid support unit for hydrostatic test and other purposes and for reconverting the device into a yielding support, as desired.

The present invention may be employed in various locales. It is especially useful in power plants and other places for supporting piping while permitting movement of the piping as a result of expansion or contraction thereof due to temperature changes in the material of the piping.

Variable spring supports have been used for many years to support piping loads. Such devices usually comprise a housing having lower and upper walls and side walls extending between and secured to the lower and upper walls. Positioned within the housing is a movable spring backing plate that is connected to a load rod which extends through the lower wall. A compression spring is positioned between and engages the lower housing wall and the backing plate.

It is frequently desirable to precompress the spring and temporarily secure the backing plate against movement in either direction away from its designed "cold load" position at the time the device is assembled and prior to installation. This facilitates installation and reduces the possibility of subjecting the device to excessive overloading at the time of installation.

It is known to the art to secure the backing plate, with the spring in precompressed condition, with the aid of various arrangements. One such arrangement contemplates affixing a pair of nuts to and above the backing plate and engaging the nuts by means of corresponding bolts which extend through openings in the housing side wall. This arrangement is unsatisfactory and objectionable for several reasons: firstly, it is usually tedious and time-consuming to align the bolts with the taps in the nuts; secondly, the nuts, by virtue of their projecting above the movable plate, necessitate increasing the height of the device, thereby calling for taller devices and consuming valuable headroom which is frequently very limited; thirdly, the arrangement does not in any way indicate whether the loading on the device, after installation and prior to removal of the bolts, is in balance, overloaded or underloaded; fourthly, tools are required in applying the bolts to the device at the time of assembly and in removing the bolts from the device at the time of installation; and fifthly, the bolts constitute hazards which may result in damage to equipment or injury to workmen at the time they are removed from the device, depending on whether the device is underloaded or overloads.

The spring support device of this invention successfully overcomes the above-mentioned objections in that it includes improved and simplified means for readily and conveniently converting the device into a rigid support at any time prior to installation and into a yielding support at the time of installation. In accordance with the present invention, the spring backing plate is preferably formed with a pair of circumferentially spaced blind openings which extend inwardly from its

periphery. Each blind opening is adapted to receive a corresponding pin connector which extends through a corresponding opening in the side wall of the housing. The openings in the backing plate and in the side wall of the housing are larger than the cross sectional areas of corresponding pins, thereby facilitating insertion and removal of the pins, as desired, without the use of tools and without increasing the height of the device to accommodate additional internal parts. Also, the parts of the device are so configured and arranged that the exposed portions of the pins, i.e. the portions thereof exterior the housing, serve as visual indicators, at the time of installation and prior to removal, of whether the device is overloaded, underloaded or substantially in balance with the load.

It is the primary object of this invention to provide a spring support device with improved and simplified means for readily and conveniently converting the device into a rigid support and for reconverting the device into a yielding support, as desired.

Another object of this invention is to provide a spring support device, having a movable backing plate, with removable connector means for maintaining the backing plate in a selected, substantially fixed position relative to other parts, the connector means being so constructed and arranged as to indicate visually whether the device is overloaded, underloaded or substantially in balance with a load carried by the device.

A further object of this invention is to provide a means of the character indicated which is simple and compact in design; which is reasonable in manufacturing cost; which may be readily placed into and out of active service, without the use of tools; and which is adapted to perform its intended functions in a dependable manner.

The enumerated objects and other objects, together with the advantages of this invention, will be readily understood by persons trained in the art from the following detailed description and the annexed drawing which respectively describe and illustrate a recommended form of spring support device of this invention.

In the drawing, wherein like reference numerals denote corresponding parts throughout the several views:

FIG. 1 is a view in elevation of a spring support device constructed in accordance with this invention, partly broken away and partly in cross section for better illustration;

FIG. 2 is a view taken along line 2—2 of FIG. 1.

FIG. 3 is a view taken along line 3—3 of FIG. 2 and illustrates the relative position of certain parts when a load is evenly supported by the spring support device, i.e., the load and the force exerted by the device are in balance;

FIG. 4 corresponds to FIG. 3 and illustrates the relative position of the parts when a load is oversupported by the spring support device; and

FIG. 5 also corresponds to FIG. 3 and illustrates the relative position of the parts when a load is undersupported by the spring support device.

Referring initially to FIGS. 1 and 2 of the drawing, a housing, which is generally denoted by numeral **10**, includes circular and parallel lower and upper walls **11** and **12**, respectively. The lower wall has a circular, central, through opening **13**. The upper wall is formed with an integral depending boss **14** and is provided with a central through tap **15**. The housing also includes a pair of vertical side walls **16** and **17** which are spaced apart, as indicated at **18** and **19**. Side wall **16** has a through opening **20** (FIG. 3) which is adjacent space **18** and side wall **17** has a like opening **21** which is adjacent space **19**. Openings **20** and **21** are preferably diametrically opposite each other and are equidistant from the housing lower wall. These openings are preferably circular in the inter-

est of manufacturing economy but may, if desired, be oval, square or any other suitable configuration. Side wall **16** is welded to the lower and upper walls, as indicated at **16***a* and **16***b*, respectively, while side wall **17** is similarly welded to the lower and upper walls, as indicated at **17***a* and **17***b*, respectively, to obtain a sturdy and durable housing construction. As is best shown in FIG. 2, the side walls are arcuate in transverse cross section.

An indicator plate **22** is mounted along a vertical edge of side wall **17** by means of screws **23**. This plate is provided with a scale having a series of graduations **24** for indicating the weight of the load carried by the device and/or the distance traveled by the load.

Housing **10** is equipped with an eye bolt **25** which engages the threads of tap **15** and which is provided with a lock nut **26**. If desired, the eye bolt may be permanently secured to the housing upper wall by a weldment **27**. Eye bolt **25** serves as a means for suspending the housing and the parts carried thereby from an overhead structural member, such as a building beam (not shown).

Positioned within the housing is a spring backing plate **30**. This plate is in the form of a dish, having a central through opening **31** and formed with a continuous flange **32**. Integral with flange **32** is a lateral extension **33** which projects into space **18** and which is formed with a beveled edge portion **34** that constitutes an indicator which cooperates with graduations **24** to indicate load weight and/or load travel.

Diametrically opposed portions **35** and **36** of flange **32** are thickened, as shown in several views, and are provided with blind openings **37** and **38**, respectively. These openings extend inwardly from the periphery of the flange. As in the case of openings **20** and **21**, openings **37** and **38** are preferably circular in transverse configuration but may be of any other desired configuration. It will be observed from an examination of FIG. 3 that openings **37** and **38** are adapted to be aligned with openings **20** and **21**, respectively.

A helical compression spring **40** is interposed between and bears against housing lower wall **11** and backing plate **30**.

A load-carrying unit **41** (FIG. 1) includes a threaded upper rod **42**, which extends through backing plate opening **31** and which has a head **43** that bears against the upper surface of the backing plate. The load-carrying unit also includes a threaded lower rod **44** and a turnbuckle **45** which engages the lower end portion of rod **42** and the upper end portion of rod **44**. Rod **44** is adapted to be connected to a piping or other load (not shown). The turnbuckle serves as a means for varying the effected length of the load-carrying unit.

The device is equipped with a pair of connectors **46** for releasably coupling backing plate **30** to the housing whereby to maintain the backing plate in a predetermined position with respect to the housing against the action of spring **40**. Each connector **46** is in the form of a pin consisting of a rectilinear shank **47** and a head **48**. Each shank **47** is smaller in cross section than the transverse area of corresponding openings **20**, **21**, **37** and **38**.

It will be noted from an examination of FIGS. 2 through 5 that one of connectors **46** extends through opening **20** in housing side wall **16** and projects into opening **37** of plate member **30** and the other connector extends through opening **21** in housing side wall **17** and projects into opening **38** of the plate member. Inasmuch as the shanks of the connectors are smaller than the corresponding openings in the housing and in the plate member, the connectors may be readily inserted in or removed from their openings when the parts of the device are substantially properly aligned, as illustrated in FIG. 3, by hand and without the use of tools.

In practice, the device is assembled and, at any time prior to installation, the parts are disposed in "cold" load position, as shown in FIG. 1. This is accomplished by exerting a pulling action on load-carrying unit **41**, thereby moving backing plate **30** downwardly against the action of spring **40** until openings **20** and **21** are respectively in alignment with openings **37** and **38** (FIG. 3) at which time connectors **46** are inserted into the corresponding openings.

The device is installed by connecting eye bolt **25** to an overhead support, such as a beam (not shown), and by connecting rod **44** of the load-carried unit to a piping load (also not shown). Connector pins **46** indicate visually whether the loading on the device is in balance or whether the device is overloaded or underloaded. When the loading is in balance, the pins assume a substantially horizontal position, as shown in FIG. 3. When the load is oversupported, the pins assume the relative position shown in FIG. 4 and are tilted in corresponding downward and outward directions. Such tilting serves as a visual indication that the load is oversupported and that the device is underloaded.

When the load is undersupported, the pins assume the relative position shown in FIG. 5 and are tilted in corresponding upward and outward directions, thereby indicating visually that the device is overloaded.

When the parts are in the relative position shown in either of FIGS. 4 and 5, they may be relatively adjusted by turning turnbuckle **45** to thereby decrease or increase the effective length of the load-carrying unit and move backing plate **30** until the parts are in the relative position shown in FIG. 3. With the parts in this position, connector pins **46** may be readily withdrawn by hand. This completes the installation and the device affords a yielding support to the load.

From the foregoing, it is believed that the objects, advantages, construction and operation of my present invention will be readily comprehended by persons skilled in the art without further description. Although the invention has been herein shown and described in a simple and practicable form, it is recognized that certain parts thereof are representative of other parts which may be used in substantially the same manner to accomplish substantially the same results. Therefore, it is to be understood that the invention is not to be limited to the exact details described herein, but is to be accorded the full scope and protection of the appended claims.

I claim:

1. In a spring support device, a housing comprising a lower wall, an upper wall spaced from the lower wall and side wall means connected to the lower and upper walls, said side wall means having at least one through opening formed therein, a backing plate within the housing and movable in the space between the lower and upper walls, said backing plate having at least one opening formed therein, compression spring means within the housing and bearing against the lower wall and the backing plate, a load-carrying unit connected to the backing plate and extending through the spring means and through an aperture in the lower wall, and a removable connector including a substantially rectilinear shank which extends through the opening in the side wall means and projects into the opening in the backing plate, the cross sectional area of the shank being sufficiently smaller than the transverse area of either of said openings to permit tilting of the connector depending on the loading on the compression spring.

2. A spring support device according to claim 1 wherein the opening in the backing plate extends inwardly from the periphery thereof.

3. In a spring support device, a housing comprising a lower wall, an upper wall spaced from the lower wall and side wall means connected to the lower and upper walls, said side wall means having at least one through opening formed therein, a backing plate within the housing and movable in the space between the lower and upper walls, said backing plate having at least one blind opening extending inwardly from its periphery, compression spring means within the housing and bearing against

the lower wall and the backing plate, a load-carrying unit connected to the backing plate and extending through the spring means and through an aperture in the lower wall, and a removable connector including a substantially rectilinear shank which extends through the opening in the side wall means and projects into the opening in the backing plate, the cross sectional area of the shank being sufficiently smaller than the transverse area of either of said openings to permit tilting of the connector depending on the loading on the compression spring.

4. A spring support device according to claim 3 wherein the shank is substantially longer than the distance from the outer end of the through opening to the inner end of the blind opening whereby a substantial portion of the shank is positioned exterior of the housing.

5. A spring support device according to claim 3 wherein the connector also includes a head at one end of the shank and positioned exterior of the housing side wall means, and wherein the shank is substantially longer than the distances from the outer end of the through opening to the inner end of the blind opening, whereby the head of the connector is spaced from the outer surface of the housing.

6. In a spring support device, a housing comprising a lower wall, an upper wall spaced from the lower wall and side wall means connected to the lower and upper walls, said side wall means having a pair of through openings formed therein, said openings being angularly spaced about a vertical axis through the center of the lower wall, a backing plate within the housing and movable in the space between the lower and upper walls, compression spring means within the housing and bearing against the lower wall and the backing plate, said backing plate being generally parallel to the lower wall and having a pair of spaced blind openings extending inwardly from its periphery, each blind opening being in general alignment with a corresponding through opening, a pair of removable connectors, each connector including a substantially rectilinear shank which extends through a through opening and projects into a corresponding blind opening, the cross sectional area of the

shank of each connector being sufficiently smaller than the transverse area of the corresponding through opening and of the corresponding blind opening to permit tilting of the connectors depending on the loading on the compression spring, and a load-carrying unit connected to the backing plate and extending through the spring means and through an aperture in the lower wall.

7. A spring support device according to claim 6 wherein said through openings are substantially coaxial and equi-distant from the lower wall.

8. A spring support device according to claim 6 wherein each shank is substantially longer than the distance from the outer end of the corresponding through opening and the inner end of the corresponding blind opening whereby a substantial portion of each shank is positioned exterior of the housing.

9. A spring support device according to claim 6 wherein each connector also includes a head at one end of the shank and positioned exterior of the housing side wall means, and wherein each shank is substantially longer than the distance from the outer end of the corresponding through opening and the inner end of the corresponding blind opening whereby each head is spaced from the outer surface of the housing.

10. A spring support device according to claim 6 wherein said through openings are substantially coaxial and equi-distant from the lower wall, wherein each connector also includes a head at one end of the shank and positioned exterior of the housing side wall means, and wherein each shank is substantially longer than the distance from the outer end of the corresponding through opening and the inner end of the corresponding blind opening whereby each head is spaced from the outer surface of the housing.

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