United States Patent [19]

LeBoeuf

[11] **3,724,178**

[45] **Apr. 3, 1973**

[54] **SPRING HANGER**

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[21] Appl. No.: **154,909**

[52] **U.S. Cl.** .....**55/341,** 24/261 B, 55/378

[51] **Int. Cl.** **B01d 46/02**

[58] **Field of Search** .....55/341, 378–379; 24/73 C, 73 HL, 73 HH, 73 TH, 73 HR, 237, 242, 261 R, 261 A, 261 B, 261 C; 248/317

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Primary Examiner—Frank W. Lutter
Assistant Examiner—Vincent Gifford
Attorney—Jerry B. Peterson et al.

[57] **ABSTRACT**

A wire hanger particularly designed for hanging a bag filter is of substantially triangular configuration with two overlapping loops extending beyond the apex of the triangle. The overlapping loops define an eye by which the hanger is supported. Each loop is slideable on the other so that the hanger also functions as a tension spring.

2 Claims, 6 Drawing Figures

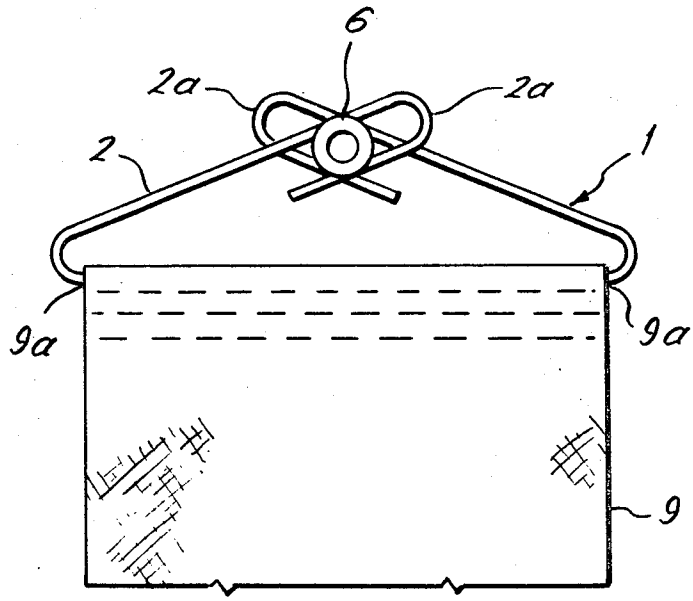


Fig. 1

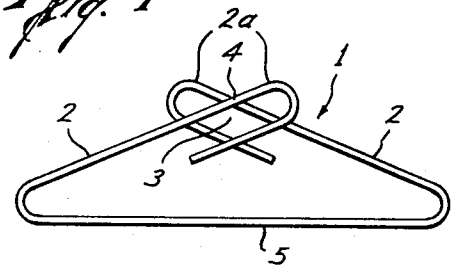


Fig. 2

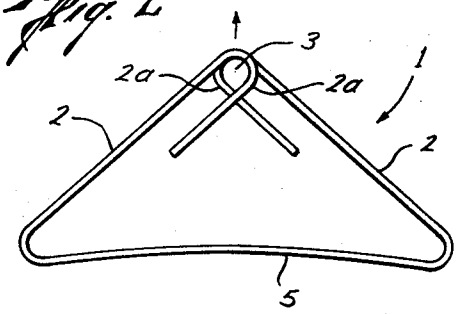


Fig. 3

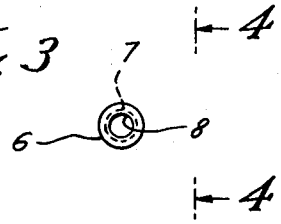


Fig. 4

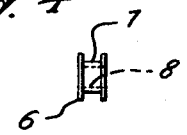


Fig. 5

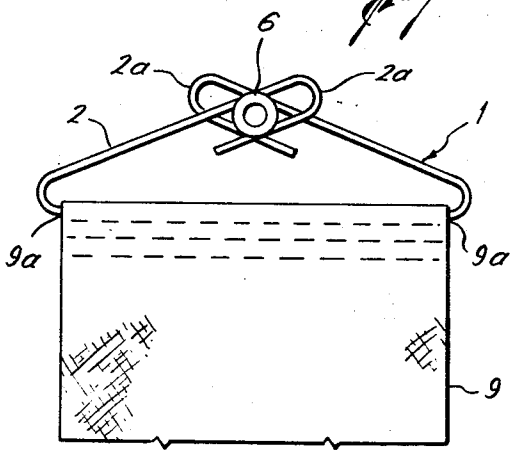
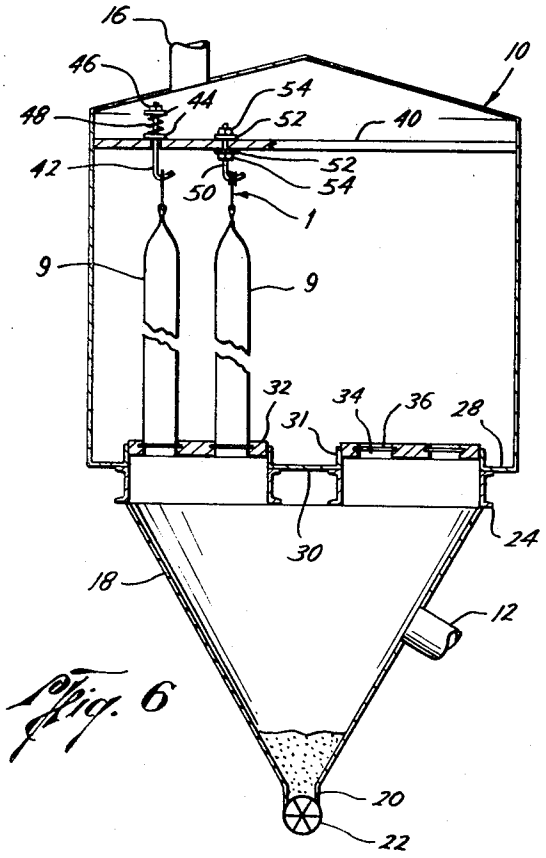


Fig. 6



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SPRING HANGER

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention is a spring hanger device useful particularly for hanging filter bags under tension.

Filter bags are commonly used to separate finely-divided solids from gases, as for example in carbon black and cement manufacturing. Use of filter bags will also be of increasing importance in the elimination of particulate emissions in other plants such as power plants, foundries and the like. It is desirable that the bags be under tension during operation. This invention is a simple device which can function not only as a filter bag hanger, but also as a spring for applying tension to the bag.

2. Description of the Prior Art

The prior art springs are generally helical coil springs which are separate from the hanger and are usually compression springs mounted above the member supporting the filter bags somewhat as shown in FIG. 3 of U.S. Pat. No. 3,396,516. The difficulty with these prior systems is that when the springs fail (due to high temperature and/or corrosive conditions), normally the entire assemblies of springs, hooks or J-bolts, washers, and nuts have to be replaced, which is costly in terms of labor and materials, particularly inasmuch as there are normally many bags in each filter compartment.

The prior art hangers are described below.

OBJECTS OF THE INVENTION

An object of this invention is to provide a simple device which serves not only as a hanger for a filter bag or other article but also as a spring for applying tension to the bag during its use. Other objects will become apparent from reading the description with follows.

SUMMARY OF THE INVENTION

One aspect of the invention is a hanger comprising a single piece of wire formed into a substantially triangular configuration with the ends extending beyond the apex of the triangle, the ends being bent back to form two open-ended loops overlapping one another, the closed curved positions of such loops extending beyond the apex of the triangle and the open ends of the loops crossing one another and terminating within the boundaries of the triangle, whereby the loops define an eye immediately below said apex.

Another aspect of the invention is the combination of said spring hanger with a bag filter hung on the portion of the hanger opposite the apex.

Still another aspect of the invention is the above-mentioned combination in further combination with a bag filter housing with the spring hanger and bag filter being supported from the top of the housing by a hook or other means passing through the eye of the hanger and from the bottom in such manner as to place the spring hanger and flter bag under tension.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side view of a preferred embodiment of the spring hanger itself in a relaxed state;

FIG. 2 is a side elevation of the preferred embodiment of the spring hanger itself in the condition of maximum pull or tension;

FIG. 3 is a side view of the grommet which is preferably inserted within the eye of the spring hanger;

FIG. 4 is a view taken along line 4—4 of FIG. 3;

FIG. 5 is a side view of the spring hanger with a filter bag hung and sewed thereon;

FIG. 6 is a side view of a bag filter apparatus or compartment, showing hanging means of both the prior art and the present invention in cross section except as to the bag filters and Supporting means. The prior art is shown on the left.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. 1, the preferred embodiment of the spring hanger 1 is of substantially triangular configuration consisting of sides 2 and base 5. It is preferably made of a single piece of tempered steel wire, the diameter of which will depend upon the amount of tension desired. Each end of the wire is bent back as shown to form two overlapping extended loops 2*a* defining an eye 3 immediately below the apex 4. Each loop is slideable with reference to the other so that the hanger also functions as a tension spring.

FIG. 2 shows the hanger in a position of maximum pull or tension. Due to the configuration of the device, the base member 5 will actually be bowed upwardly in the center as shown.

Although the hanger is operative as shown in FIGS. 1–2, it is preferable to insert a grommet 6 in the eye 3. The use of the grommet in this invention was later suggested by Edward A. Paulino, so no claim thereto is made in this application. FIGS. 3 and 4 show a preferred form of grommet having a recessed portion or channel 7 which carries the loops 2*a* and a hole 8 to support the hanger on a hook, J-bolt or other supporting means. The grommet serves to prevent twisting of the hanger on its supporting means. It is within the scope of this invention to use the spring hanger with or without the grommet.

FIG. 5 shows the spring hanger with a filter bag 9 hung and sewed thereon.

FIG. 6 is a simplified drawing of one type of bag filter housing 10 suitable for filtering finely-divided particles (such as carbon black or cement) from gases. The gases containing finely-divided solids are introduced into the housing through conduit 12 and pass up into the filters 9 in which the solids are retained within the filters. The gases pass on through the filters and exit the housing via conduit 16. The finely-divided solids settle to the bottom of hopper 18 communicating with conduit 20 and valve 22.

Frame 24 supports a network of peripheral plate members 28 about the interior wall of the housing and a central plate member 30. These plate members 28 and 30 are adapted to have grid support member 31 affixed thereto and modular grid member 32 mounted and supported thereon. The modular grid member or plurality of said members are set in place and affixed to the support members 31 to provide a sealed divider between the hopper 18 and the housing 10 of the bag filter apparatus; that is, sealed except for apertures 34 extending through the modular grid member 32.

The bag filters 9 are elongated tubular bags made of gas permeable material that is capable of withstanding the temperature pressures existing within the bag filter apparatus.

Supporting member **40** may be any suitable structure such as channel iron or a tubular member with support bars attached thereto. For purposes of comparison, the bag shown on the left in FIG. **6** is suspended from supporting member **40** by the prior art means including J-bolt **42**, washers **44**, nut **46**, and helical coil spring **48**. The prior art hangerS are constructed substantially as shown in FIG. **2** (except that loops **2***a* are nearly closed to form circles rather than open loops), rather than as shown in FIG. **1**, so that these prior hangers function only as hangers and not also as springs. In other words, tension was applied to the bags by means of helical coil spring **48** in accordance with the prior art method. The bag **9** on the right as shown in FIG. **6** includes the spring hanger **1** of this invention so that there is no need for the helical coil spring to suspend the bag from supporting member **40**. Therefore, the bag including the spring hanger of this invention is suspended by means of hook or J-bolt **50** affixed to supporting member **40** by means of washers **52** and nuts **54**.

The bag **9** is first hung by means of eye **3** (or grommet **6**) on hook or J-bolt **50**. Then tension is applied through spring hanger **1** when the bottom of the bag is secured to aperture **34**.

As mentioned above, one advantage of this invention is that there is no need for helical coil springs, as a result of which there is a saving in materials and the labor required to replace such springs when they fail. In some processes, for example in carbon black manufacturing, these springs fail quite frequently because of the high temperatures and corrosive atmosphere within the bag filter housing. When replacing the coil springs, it was also necessary to replace the complete assembly of the J-hook, washer and nuts, because they were so corroded that they could not be reused. On the other hand, with the use of the spring hangers of this invention, there will be no need to replace the J-bolts at frequent intervals, and the spring hangers are simply replaced along with the filter bags as a complete assembly when it is necessary to replace the filter bags themselves.

Another advantage inherent in this invention is that when the spring hanger is under tension, as shown in FIG. **2**, the center portion of the base member **5** becomes bowed upward slightly as shown, thus distributing the load more evenly throughout the filter bag. When using the prior art spring hangers, the load tended to be concentrated at the outer edges **9***a* of the bag (see FIG. **5**), thus tending to cause the bags to fail prematurely at those points. The base member of these prior art hangers tended to bow downwardly in the center portion.

Another advantage of this invention is that if it is desired to change the tension on the bags, it is not necessary to go to the trouble and expense of changing the helical coil springs. Instead, the wire size of the spring hanger can be changed when it is time to order new filter bags.

Taking carbon black filter bag spring hangers as an example, suitable approximate dimensions can be as follows:

Length of base member **5**:	5-¾″
Width of filter bag:	4-⅞″
Length of sides **2** (to end of loop **2***a*):	4-⅝″
Width of loops **2***a*:	½″
End of loop **2***a* to center of eye:	1-½″
Angle between base member **5** and sides **2**:	30°
Diameter of wire:	⅛″

While I have thus described the preferred embodiments of the present invention, many variations will be suggested to those skilled in the art. The foregoing description and examples should therefore not be considered limitative; and all such variations and modifications as are in accord with the principles described are meant to fall within the scope of the appended claims.

I claim:

1. A bag filter assembly comprising in combination: a housing, a grid having at least one aperture, a supporting member, at least one elongated tubular bag secured at one end to said at least one aperture, said bag further secured at its other end to said supporting member by a spring hanger device, said spring hanger device comprising a wire formed into a substantially triangular configuration with a base and two sides, the ends of said sides extending beyond the apex of the triangle, the ends being bent back to form two open-ended loops overlapping one another and the curved portions of such ends of the loops crossing one another and terminating within the boundaries of the triangle, whereby the loops define a closed eye immediately below said apex, said eye being attached to said support, and said bag being attached to said base whereby said bag and said hanger are placed under tension.

2. The bag filter assembly of claim **1** wherein said hanger is formed of a single piece of tempered steel wire.

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