Description

This invention relates to springs and particularly springs which are used in an incubator station of an analyzer to hold down an evaporation cover onto a test element.

In conventional incubators for analyzers, evaporation covers are provided to hold test elements at the stations of the incubator. Such covers are spring-biased downwardly to allow the test elements to be inserted and removed against the bias of the spring.

Although this arrangement has worked satisfactorily, there have been some disadvantages with the springs heretofore provided. In some cases, the springs comprise a simple one-leg leaf element screwed into place to bias the cover downwardly. Such springs are not readily removable, for example, in case of a jam or if cleaning is needed. In other cases, removable leaf springs have been provided, but such springs have been fairly complicated in shape.

EP-A-0396194 and US-A-4 963 333 disclose such a spring which has three legs projecting from a body. Although such a spring works satisfactorily in most instances, it has a disadvantage in that its shape is more complicated, and thus more difficult to manufacture and assemble. Furthermore, its design features an aperture in the longest of the three legs to retain the evaporation cover with respect to the spring. Such an aperture necessarily involves a sloppy fit, which tends to render uncertain the exact location of the cover in the station of the incubator. For best operation of the cover, it is preferred that the cover always be fully withdrawn into the station of the incubator. This did not always occur using such an aperture.

It is therefore an object of the present invention to provide a spring for covers in an incubator which overcomes the above-noted disadvantages.

There is provided, in accordance with one aspect of the present invention, a leaf spring for holding a cover on a test element at a station in an analyzer, the spring comprising:-

a first portion; and

a second portion;

characterized in that the second portion extends from the first portion along a bend line to define an angle alpha between the first portion and the second portion of a value of 150° ± 10°;

and in that the first portion has a lateral extension which exceeds a corresponding lateral extension formed in the second portion, the spring forming the shape of a "J" when viewed from the side.

In accordance with a second aspect of the present invention, an incubator comprising a support for a test element, an evaporation cover for the test element on the support, and a spring for biasing the cover on to the test element, characterized by a spring as described above.

Accordingly, it is an advantageous feature of the present invention that a spring is provided for covers in an incubator which is both simple in construction and provides more positive inward biasing of the cover.

Other advantageous features will become apparent upon reference to the following description of the preferred embodiments, when read in light of the attached drawings in which:-

Figure 1 is a perspective view of a spring constructed in accordance with the present invention;

Figure 2 is a sectioned view taken generally through the plane II-II of Figure 1;

Figure 3 is a fragmentary sectioned elevational view of an incubator station assembled with a spring according to the present invention, the sectioned view being taken through the approximate center of the station;

Figure 4 is a fragmentary exploded perspective view of the station shown in Figure 3, but without element E; and

Figure 5 is a plan view of a spring as it sits on a cover on a test element.

The invention is hereinafter described with respect to a preferred incubator station and preferred covers, for use with preferred test elements. In addition, it is useful regardless of the type of incubator, cover, or test element which is being used, provided the cover needs to be biased in the incubator to cover the test element. Also, the relative dimensions are not critical, except where stated.

As shown in Figure 1, spring 8 has two portions, a first portion 10 and a second portion 20, which together when viewed from the side (or in cross-section as shown in Figure 2) provide the shape of a "J". In particular, portion 10 is substantially longer than portion 20. For example, portion 10 can be 3.5cm long, and portion 20 1.5cm long. Other lengths are also useful. Portion 20 is bent about a bend line 25 such that it forms a bending angle alpha of approximately 150° as shown in Figure 2. This angle can be varied by ± 10°, depending upon the amount of bias which needs to be applied to the cover underneath it, described hereinafter. Bend line 25 is itself not a sharp intersection, but rather a relatively blunt one.

To retain portion 10 and hence the entire spring in the incubator station, an aperture 40 is formed in portion 10. Its dimensions are selected to closely mate with those of a post fixed to the station. The size and shape, therefore, of aperture 40 depends on that of the post. A circular post and aperture are preferred.

Portion 10 has an end 130 which optionally extends out of the plane of the rest of portion 10 by an angle gamma, as shown in Figure 2, which can be any angle from 0° to 45°. This angle makes grasping of the spring, when mounting the analyzer, somewhat easier.

To retain a cover underneath spring 8, retaining means are provided in portion 20. Such means preferably include an aperture 30 formed within bend line 25, sized to receive a shoulder projecting from the cover, described hereinafter. Aperture 30 extends into portion 20 sufficiently to provide an edge 32, as shown in Figure 1, against which the cover shoulder is retained in the presence of forces trying to pull cover 110 out of station 100, as shown in Figure 3. Alternatively, edge 32 can be formed only in the bend line 25 and not extend into portion 20 (not shown).

The retaining means of portion 20 also preferably include a bend 55 formed adjacent to extreme end 50 of portion 20 which is opposite to bend line 25. Bend 55 is formed to project end 50 further away from the plane of portion 10, than is the rest of portion 20. The amount of the bend forms an angle beta, as shown in Figure 2, which is selected to be that amount which provides adequate retention of a post 116 approximately centered in the top of a cover, described below. Beta is a value preferably between 20° and 40° degrees.

Spring 8 is used in combination with a station 100 (Figure 3) of incubator 102 and a cover 110 for a test element E. Portion 10 slips over and clips onto a post 104 of station 100, while portion 20 retains cover 110. Cover 110 has an upwardly projecting shoulder 112 at the rear portion 114 of the cover, which slips into and is held by aperture 30 at bend line 25. A post 116 of the cover engages bend 55 of portion 20, such bend being effective to bias cover 110 backward with a force F_1. The entire spring then acts to bias cover 110 downwardly, with a force which will still allow a test element E to be inserted in the direction of arrow 120.

Cover 110 need only be wide enough to cover spot S of element E which has been wetted. It may cover almost the entire element E (Figure 5) but in any event it sits on top of element E instead of surrounding it.

Any shape can be given to post 116. Most preferably, it has a T-shape, as shown in Figure 4, to best mate with bend 55 to cause the rearward bias of cover 110.

Because of the relative locations of post 104 and post 116 in station 100, distance h from aperture 40 to bend line 25 exceeds the length of spring portion 20, as shown in Figure 2.

The preferred relative sizes of spring 8 and cover 110 are shown in Figure 5. Other relative sizes are also useful.

Both the spring and the cover are readily removed simply by pinching end 130 of portion 10, as shown in Figure 3, towards cover 110, and removing them both.

Claims

1. A leaf spring (8) for holding a cover (110) on a test element (E) at a station (100) in an analyzer, the spring (8) comprising:-
   a first portion (10); and
   a second portion (20);
   characterized in that the second portion (20) extends from the first portion (10) along a bend line (25) to define an angle alpha between the first portion (10) and the second portion (20) of a value of 150° ± 10°;
   and in that the first portion (10) has a lateral extension (130) which exceeds a corresponding lateral extension (50) formed in the second portion (20), the spring (8) forming the shape of a "J" when viewed from the side.

2. A spring according to claim 1, wherein retaining means (40) are provided in the first portion (10) for retaining the spring (8) in relation to an analyzer.

3. A spring according to claim 2, wherein the retaining means (40) of the first portion (10) comprise an aperture sized to receive a post (104) projecting from the analyzer.

4. A spring according to any one of claims 1 to 3, wherein retaining means (30) are provided in the second portion (20) for biasing the cover (110) in the station (100).

5. A spring according to claim 4, wherein the retaining means (30) of the second portion (20) comprise a bend (55) adjacent the lateral extension (50), the bend (55) being at an angle which moves the farthest edge of the lateral extension (50) away from the first portion (10).

6. A spring according to claim 4 or 5, wherein the retaining means (30) of the second portion (20) include an aperture (30) in the bend line (25) sized to receive a shoulder (112) of the cover (110).

7. An incubator comprising a support for a test element (E), an evaporation cover (110) for the test element (E) on the support, and a spring (8) for biasing the cover (110) on to the test element (E),
   characterized by a spring according to any one of claims 1 to 6.

Patentansprüche

1. Biegefeder (8) zum Halten eines Deckels (110) auf einem Testelement (E) in einer Station (100) eines Analysegeräts, wobei die Biegefeder

To retain a cover underneath spring 8, retaining means are provided in portion 20. Such means preferably include an aperture 30 formed within bend line 25, sized to receive a shoulder projecting from the cover, described hereinafter. Aperture 30 extends into portion 20 sufficiently to provide an edge 32, as shown in Figure 1, against which the cover shoulder is retained in the presence of forces trying to pull cover 110 out of station 100, as shown in Figure 3. Alternatively, edge 32 can be formed only in the bend line 25 and not extend into portion 20 (not shown).

The retaining means of portion 20 also preferably include a bend 55 formed adjacent to extreme end 50 of portion 20 which is opposite to bend line 25. Bend 55 is formed to project end 50 further away from the plane of portion 10, than is the rest of portion 20. The amount of the bend forms an angle beta, as shown in Figure 2, which is selected to be that amount which provides adequate retention of a post 116 approximately centered in the top of a cover, described below. Beta is a value preferably between 20° and 40° degrees.

Spring 8 is used in combination with a station 100 (Figure 3) of incubator 102 and a cover 110 for a test element E. Portion 10 slips over and clips onto a post 104 of station 100, while portion 20 retains cover 110. Cover 110 has an upwardly projecting shoulder 112 at the rear portion 114 of the cover, which slips into and is held by aperture 30 at bend line 25. A post 116 of the cover engages bend 55 of portion 20, such bend being effective to bias cover 110 backward with a force F_1. The entire spring then acts to bias cover 110 downwardly, with a force which will still allow a test element E to be inserted in the direction of arrow 120.

Cover 110 need only be wide enough to cover spot S of element E which has been wetted. It may cover almost the entire element E (Figure 5) but in any event it sits on top of element E instead of surrounding it.

Any shape can be given to post 116. Most preferably, it has a T-shape, as shown in Figure 4, to best mate with bend 55 to cause the rearward bias of cover 110.

Because of the relative locations of post 104 and post 116 in station 100, distance h from aperture 40 to bend line 25 exceeds the length of spring portion 20, as shown in Figure 2.

The preferred relative sizes of spring 8 and cover 110 are shown in Figure 5. Other relative sizes are also useful.

Both the spring and the cover are readily removed simply by pinching end 130 of portion 10, as shown in Figure 3, towards cover 110, and removing them both.

Claims

1. A leaf spring (8) for holding a cover (110) on a test element (E) at a station (100) in an analyzer, the spring (8) comprising:-
   a first portion (10); and
   a second portion (20);
   characterized in that the second portion (20) extends from the first portion (10) along a bend line (25) to define an angle alpha between the first portion (10) and the second portion (20) of a value of 150° ± 10°;
   and in that the first portion (10) has a lateral extension (130) which exceeds a corresponding lateral extension (50) formed in the second portion (20), the spring (8) forming the shape of a "J" when viewed from the side.

2. A spring according to claim 1, wherein retaining means (40) are provided in the first portion (10) for retaining the spring (8) in relation to an analyzer.

3. A spring according to claim 2, wherein the retaining means (40) of the first portion (10) comprise an aperture sized to receive a post (104) projecting from the analyzer.

4. A spring according to any one of claims 1 to 3, wherein retaining means (30) are provided in the second portion (20) for biasing the cover (110) in the station (100).

5. A spring according to claim 4, wherein the retaining means (30) of the second portion (20) comprise a bend (55) adjacent the lateral extension (50), the bend (55) being at an angle which moves the farthest edge of the lateral extension (50) away from the first portion (10).

6. A spring according to claim 4 or 5, wherein the retaining means (30) of the second portion (20) include an aperture (30) in the bend line (25) sized to receive a shoulder (112) of the cover (110).

7. An incubator comprising a support for a test element (E), an evaporation cover (110) for the test element (E) on the support, and a spring (8) for biasing the cover (110) on to the test element (E),
   characterized by a spring according to any one of claims 1 to 6.

Patentansprüche

1. Biegefeder (8) zum Halten eines Deckels (110) auf einem Testelement (E) in einer Station (100) eines Analysegeräts, wobei die Biegefeder

einen ersten Abschnitt (10) und
einen zweiten Abschnitt (20) aufweist,
dadurch gekennzeichnet, daß
sich der zweite Abschnitt (20) vom ersten Abschnitt (10) entlang einer Krümmung (25) weg erstreckt und daß der erste (10) und der zweite Abschnitt (20) einen Winkel α von 150° ± 10° bilden, und daß
der erste Abschnitt (10) einen Endabschnitt (130) aufweist, der über einen Endabschnitt (50) des zweiten Abschnitts (20) hinausragt, wobei die Biegefeder (8) einen J-förmigen Querschnitt besitzt.

2. Biegefeder nach Anspruch 1, dadurch gekennzeichnet, daß im ersten Abschnitt (10) Lagesicherungsmittel (40) zur Lagesicherung der Biegefeder (8) an einem Analysegerät vorgesehen sind.

3. Biegefeder nach Anspruch 2, dadurch gekennzeichnet, daß die Lagesicherungsmittel (40) des ersten Abschnitts (10) aus einer Öffnung bestehen, in der ein vom Analysegerät abstehender Zapfen (104) aufnehmbar ist.

4. Biegefeder nach einem der Ansprüche 1 bis 3, dadurch gekennzeichnet, daß im zweiten Abschnitt (20) Mittel (30) vorgesehen sind, die eine auf den Deckel (110) in der Station (100) gerichtete Druckkraft erzeugen.

5. Biegefeder nach Anspruch 4, dadurch gekennzeichnet, daß die Mittel (30) des zweiten Abschnitts (20) eine dem Endabschnitt (50) benachbarte Abwinklung (55) aufweisen, derart, daß sich die äußerste Kante des Endabschnitts (50) vom ersten Abschnitt (10) weg erstreckt.

6. Biegefeder nach Anspruch 4 oder 5, dadurch gekennzeichnet, daß die Mittel (30) des zweiten Abschnitts (20) eine über die Strecke der Krümmung (25) verlaufende Öffnung (30) aufweisen, in der eine Schulter (112) des Deckels (110) aufnehmbar ist.

7. Inkubator mit einer Auflage für ein Testelement (E), einem Verdunstung verhindernden Deckel (110) für das auf der Auflage liegende Testelement (E) und einer den Deckel (110) gegen das Testelement (E) drückenden Biegefeder (8), **gekennzeichnet durch** eine Biegefeder nach einem der Ansprüche 1 bis 6.

Revendications

1. Ressort à lame (8) pour maintenir un couvercle (110) sur un élément de test (E) à un poste (100) dans un analyseur, le ressort (8) comprenant :
une première partie (10), et
une seconde partie (20),
caractérisé en ce que la seconde partie (20) se prolonge à partir de la première partie (10) suivant une ligne de courbure (25) afin de définir un angle alpha entre la première partie (10) et la seconde partie (20) d'une valeur de 150° ± 10°,
et en ce que la première partie (10) présente un prolongement latéral (130) qui dépasse un prolongement latéral correspondant (50) formé dans la seconde partie (20), le ressort (8) ayant la forme d'un "J" lorsqu'observé latéralement.

2. Ressort selon la revendication 1, dans lequel des moyens de maintien (40) sont prévus dans la première partie (10) pour maintenir le ressort (8) en relation avec un analyseur.

3. Ressort selon la revendication 2, dans lequel les moyens de maintien (40) de la première partie (10) comprennent une ouverture dimensionnée pour recevoir un montant (104) dépassant de l'analyseur.

4. Ressort selon l'une quelconque des revendications 1 à 3, dans lequel les moyens de maintien (30) sont prévus dans la seconde partie (20) pour solliciter le couvercle (110) dans le poste (100).

5. Ressort selon la revendication 4, dans lequel des moyens de maintien (30) de la seconde partie (20) comprennent une courbure (55) contiguë au prolongement latéral (50), la courbure (55) étant à un angle qui déplace le bord le plus éloigné du prolongement latéral (50) à l'opposé de la première partie (10).

6. Ressort selon la revendication 4 ou 5, dans lequel les moyens de maintien (30) de la seconde partie (20) comportent une ouverture (30) dans la ligne de courbure (25) dimensionnée pour recevoir un épaulement (112) du couvercle (110),

7. Incubateur comprenant un support pour un élément de test (E), un couvercle d'évaporation (110) pour l'élément de test (E) sur le support et un ressort (8) pour solliciter le couvercle (110) sur l'élément de test (E),
caractérisé par un ressort selon l'une quelconque des revendications 1 à 6.