Oct. 24, 1967 F. KRAISSL, JR 3,348,689

CONCENTRIC FILTER ELEMENTS HAVING ASSEMBLING AND LOCKING MEANS

Filed June 29, 1965 2 Sheets-Sheet 1

FIG. 1

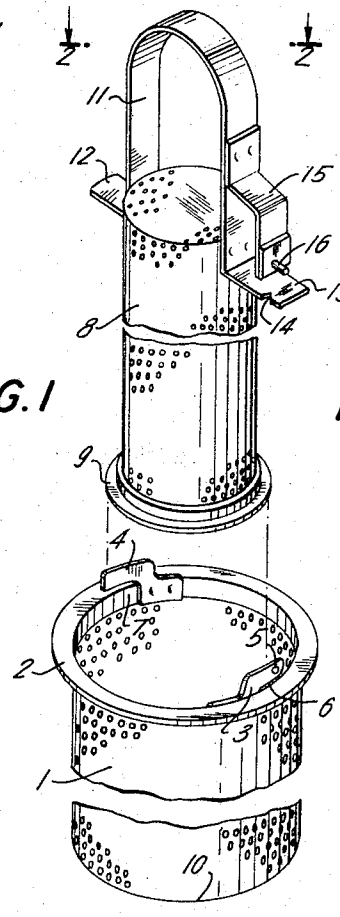


FIG. 4

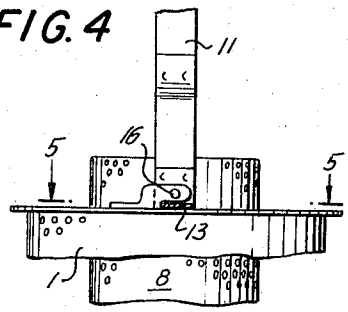


FIG. 5

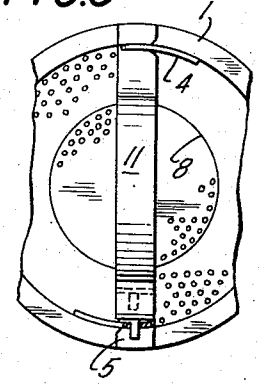


FIG. 6

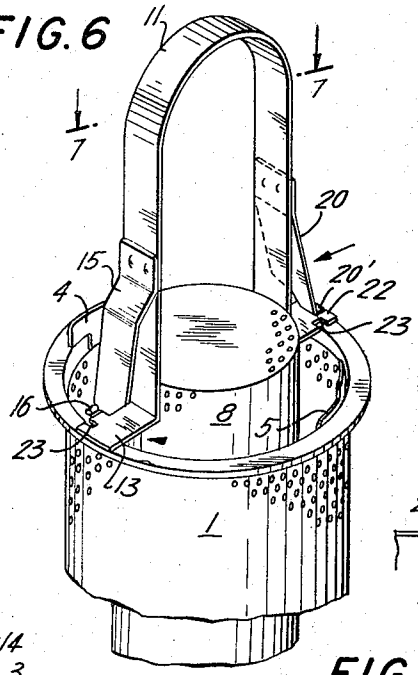


FIG. 8

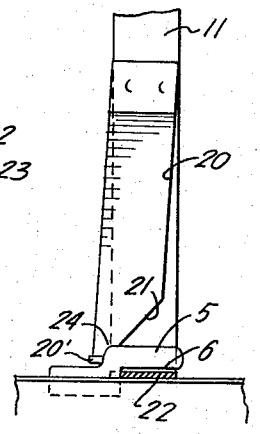


FIG. 2

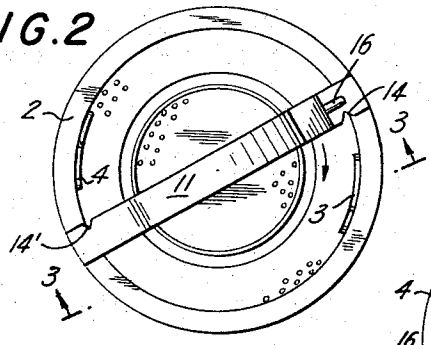


FIG. 9

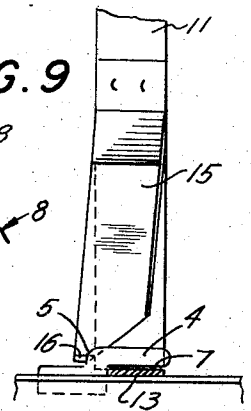


FIG. 3

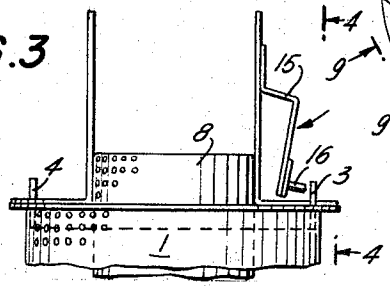
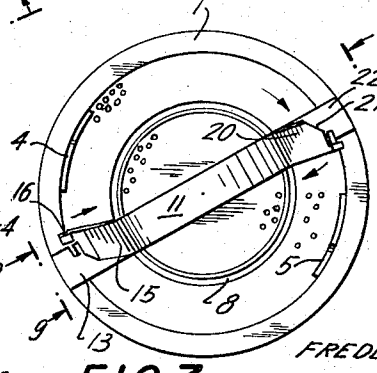


FIG. 7



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FIG.10

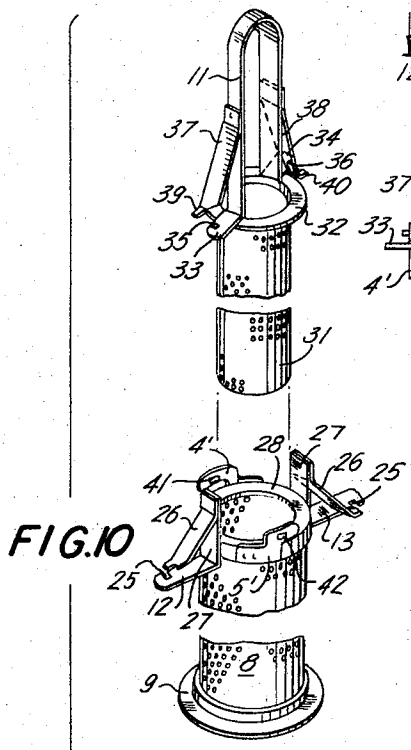


FIG.11

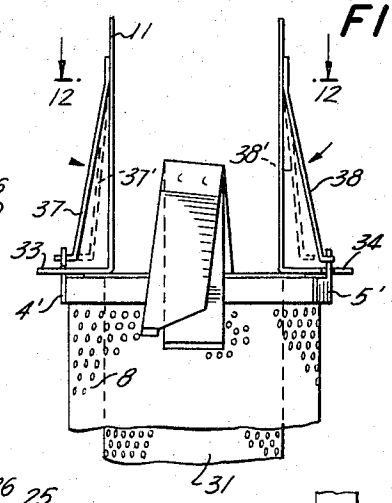


FIG.12

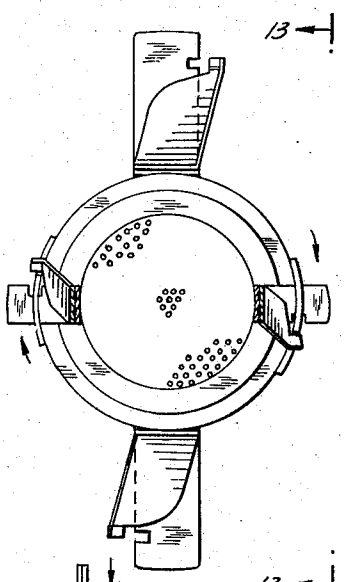
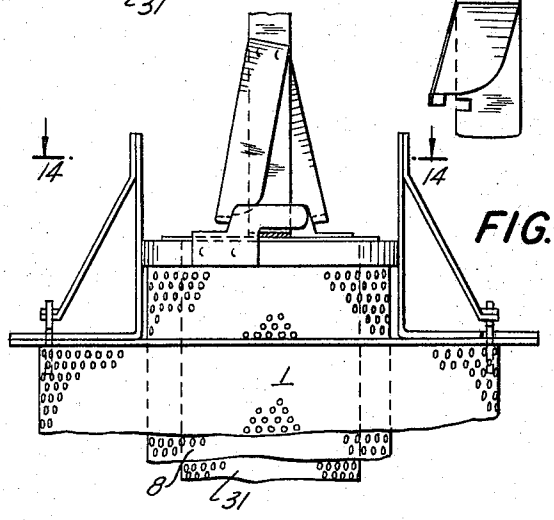
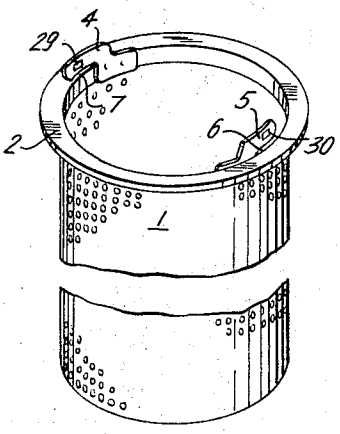


FIG.13





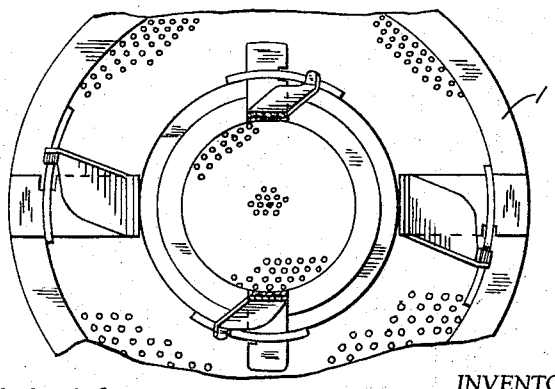


FIG.14

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CONCENTRIC FILTER ELEMENTS HAVING ASSEMBLING AND LOCKING MEANS

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Filed June 29, 1965, Ser. No. 467,872
16 Claims. (Cl. 210—238)

ABSTRACT OF THE DISCLOSURE

Multiple concentric filter elements, an inner element having a handle with a horizontal latch extending radially outwardly therefrom and a plate-type spring extending downwardly and outwardly therefrom, an outer filter element having an upstanding open-ended keeper extending upwardly therefrom, one of said keeper and spring having a pin thereon and the other having a hole therein, so that upon relative rotation of said elements with said spring depressed, the latch enters the keeper to secure the elements together and the pin enters the hole upon release of the spring to lock the elements together.

The present invention is directed to multi-element filter-separators for removing foreign matter from fluids and more particularly to structures wherein two or more filters are nested together and held in a suitable casing.

In my copending application Serial No. 395,157, filed September 9, 1964 and entitled, "Fluid Filter Strainer or Separator," I have described an arrangement wherein an outer filter is provided at its upper end with one element of a latch, and an inner filter is provided with the cooperating element whereby, when the filters are nested and are twisted relatively to each other, the latch elements hold the two filters together so that they may be handled as a unit. Such arrangement has been found to be quite satisfactory in practice. However, under some operating conditions, particularly where severe vibration is encountered, the elements of the latch may disengage and the filters may become separated. It also occurs at times that the operator, through carelessness or oversight may not engage the latch elements completely or firmly, in which case the filters may become loosened from each other.

The present invention is intended and adapted to overcome the deficiencies in prior devices of the above type, it being among the objects of the invention to improve the structures of such devices so as to eliminate the possibility of accidental separation of nested filters.

It is also among the objects to provide a relatively simple device, easy to install, which is strong and reliable, and which results in a positive locking together of said filters and, at the same time, the device is readily accessible for separating the filters for cleaning, repair or replacement.

In practicing the invention, there is provided on the inner of said filters a laterally extending tongue having means for interlocking with a cooperating element on the outer filter. The latter has an upstanding projection with which is associated a slot, opening or shoulder which cooperates with an additional element. The latter may be a pin carried by a spring, which is biased so that when the filters are nested and the tension on the spring is released, the pin will enter a keeper and positively lock the filters in position. To separate the filters, the spring is again placed under tension to draw the pin from the keeper, whereby the inner filter may be separated from the outer filter.

The invention is more fully described in connection with the accompanying drawings constituting a part hereof, in which like reference characters indicate like parts, and in which

FIG. 1 is an exploded view of one form of the invention;

FIG. 2 is a top plan view thereof;

FIG. 3 is a fragmentary view along line 3—3 of FIG. 2;

FIG. 4 is a similar view showing the locked position;

FIG. 5 is a perspective view of a modified form;

FIG. 6 is a top plan view of the embodiment of FIG. 5;

FIGS. 7, 8 and 9 are enlarged, fragmentary views showing certain details of the construction;

FIG. 10 is an exploded view of a three-filter arrangement;

FIG. 11 is a top plan view of the assembled structure shown in FIG. 10;

FIGS. 12 and 13 are enlarged fragmentary views illustrating details of the structure of FIG. 10; and

FIG. 14 is a cross-sectional view taken along line 14—14 of FIG. 13.

Referring to FIGS. 1–4, there is provided an outer filter **1** having a rim **2** having upstanding projections constituting opposed latches **3** and **4**. An opening or hole **5** is formed in latch **3**. Spaces **6** and **7** constitute slots forming latches. Inner filter **8** has a lower rim **9** of a diameter to fit into filter **1** at the bottom **10** thereof. An arcuate handle **11** is secured to the top of filter **8** and has a lateral tongue **12** adapted to enter slot **7**. An opposite tongue **13** has notch **14** adapted to fit into slot **6**. Spring **15** of angular shape has a laterally extending pin **16**.

In the nesting of filters **1** and **8**, spring **15** is compressed, filter **8** is lowered into filter **1** until the tongues rest on rim **2**. Filter **8** is then rotated until tongues **12** and **13** have been seated in slots **7** and **6** respectively. The spring **15** is released causing pin **16** to enter hole **5**. The filters are thus securely locked against accidental displacement.

In FIGS. 5–9 there is shown a modified form of locking arrangement in which there are two locks and the locks do not fit into holes but are held against shoulders on or notches in said projections. Handle **11** has on one side spring **15** and pin **16**, and projection **4** has shoulder **5'** instead of hole **5** against which pin **16** is held. Opposite spring **15** is spring **20** having a lateral flange **20'**. Tongue **22** as well as tongue **13**, has notch **23** to interfit in slots **6** and **7**. Flange **20'** abuts against shoulder **24** of projection **5**.

To assemble the unit, springs **15** and **20** are grasped between the thumb and fingers and are compressed. Filter **8** is inserted into filter **1**, is rotated clockwise until the latches are in place, and then the springs are released. They rest against shoulders **5'** and **24** respectively.

FIGS. 10–14 illustrate an embodiment in which three filters are interlocked into a single unit. Outer filter **1** has the same structure as above. Inner filter **8** has lateral tongues **12** and **13** with notches **25** to fit into slots **7** and **6**. It also has springs **26** having extensions or pins **26'**. Springs **26** have their bases **27** secured to the sides of rim **28** at the upper end of filter **8**. Projections **7** and **6** are provided with holes **29** and **30** into which pins **26'** enter to lock filters **1** and **8** together.

A central filter **31** fits into inner filter **8**. It has an upper rim **32** onto which handle **11** is secured. Said handle has a pair of second tongues **33** and **34** in opposed relation and extending horizontally outward. The tongues have notches **35** and **36** which are adapted to fit into filter **8**. The sides of handle **11** have springs **37** and **38** with extensions or pins **39** and **40**. Filter **8** has second projections **4'** and **5'** forming slots similar to slots **6** and **7**, and openings **41** and **42** are formed in said second projections.

The assembly is made by grasping springs **26** and compressing them. Filter **8** is lowered into filter **1**, is twisted

clockwise to firmly seat tongues 12 and 13 in projections 4 and 5, after which the springs are released so that pins 26' enter openings 29 and 30. Then springs 37 and 38 are compressed, filter 31 is lowered into filter 8, filter 31 is twisted clockwise to seat second tongues 33 and 34 in the slots of second projections 4' and 5'. Then second springs 37 and 38 are released so that pins 39 and 40 enter openings 41 and 42. All three filters are locked together and handle 11 serves as means for inserting the unit into filter casing (not shown).

Although the invention has been described by the use of several specific embodiments, the invention is not limited to such embodiments as they have been described to illustrate the nature of the invention but not to limit its scope. Many changes may be made in the details of the construction. For instance, the several springs need not be compression springs but they may be extension springs which bias radially inward to provide the locks. The springs need not be flat but may be in other forms such as spring rods or wires or coils. The openings in the projections need not be holes but they may be slots of appropriate size and shape.

The filter elements are shown as being cylindrical, but they may vary, it being important that they nest together and are capable of rotation to lock them together. As another variation, a filter may be inserted into an outer filter until they nest, and without twisting, cause the pins to enter the keepers to lock the parts together. In some instances, the handle may be dispensed with and the movement of nesting filters may be performed by grasping the body of the filter with the hand.

These and other changes may be made within the spirit of the invention, which is to be broadly construed, and not to be limited except by the character of the claims appended hereto.

What is claimed is:

1. In a multi-element filter-separator comprising an outer substantially cylindrical filter and an inner concentric filter, an arcuate handle of inverted U-shape having its lower end secured to the inner filter, and cooperating means on said handle and said outer filter for latching said filters together, the improvement which comprises a tongue latch at the lower end of said handle extending laterally outward from said inner filter, a horizontal flange extending outwardly from the upper end of said outer filter, an upstanding projection on said outer filter, a horizontal slot in one of said tongue and projection, said projection extending above said flange and being secured to said outer filter, said tongue fitting into said projection on relative rotation of said filters, a spring having an attachment to an intermediate part of said handle and extending downwardly, an opening in one of said projection and spring, the lower end of said spring being adjacent to and in line with said projection, and cooperating means on the other of said projection and spring for entry into said opening, said opening and said cooperating means being in horizontal alignment when said tongue is in latched position in said slot.

2. A filter-separator according to claim 1 in which said spring is biased toward said projection.

3. A filter-separator according to claim 1 in which there are present springs on opposite sides of said handle and latches on opposite sides of said outer filter.

4. A filter-separator according to claim 1 in which said spring is a flat plate.

5. A filter-separator according to claim 1 in which said opening is in said spring and said entry means is on said projection.

6. A filter-separator according to claim 1 which said entry means is an outstanding pin.

7. A filter-separator according to claim 1 in which said tongue extends from said handle.

8. A filter-separator according to claim 1 in which a central filter is concentric with and within said inner filter, a second tongue extending laterally from said central filter, an upstanding second projection on said inner filter, a slot in one of said second tongue and projection, said second tongue fitting into said second projection.

9. A filter-separator according to claim 8 in which there is a spring on said central filter and cooperating pin and hole on said spring and second projection to interfit when said tongue is in latched position.

10. A filter-separator according to claim 8 in which there are at least two sets of said second tongue and second projection spaced from the first set.

11. A filter-separator according to claim 8 in which there are at least two sets of said second tongue and second projection spaced in substantially diametrically opposed relation to the first set.

12. A filter-separator according to claim 1 in which said tongue has a notch at one edge, said notch fitting into said slot when said tongue is in latched position.

13. In a multi-element filter-separator in which a plurality of concentric inner and outer filters are in concentric arrangement and means for latching said filters together, the improvement which comprises a flat substantially horizontal latch extending radially outward from said inner filter and along the top of said outer filter, an upstanding keeper on said top and having an open-ended slot for reception of said latch, a flat spring attached to said inner filter extending downward and outward, a radial projection on one of said keeper and the lower end of said spring, a complementary opening in the other of said keeper and spring, said spring being compressible inwardly to permit said latch and keeper to pass into latching position and upon release of said spring to allow said projection to enter said opening, whereby accidental unlatching thereof is prevented.

14. In a multi-element filter-separator according to claim 13 in which there is a pin on one of said spring and by-pass said latching means during latching movement, a notch at the lateral edge of said horizontal latch, said notch adapted to embrace said keeper at the inner edge of said slot.

15. In a multi-element filter-separator according to claim 13 in which there is a pin on one of said spring and keeper, and a hole in the other of said spring and keeper to interlock.

16. In a multi-element filter-separator according to claim 13 in which there is a second set of spring and keeper on the side of said multi-element opposite said first set.

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