

Oct. 26, 1948.

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2,452,486

FILTER

Filed Jan. 24, 1947

2 Sheets-Sheet 1

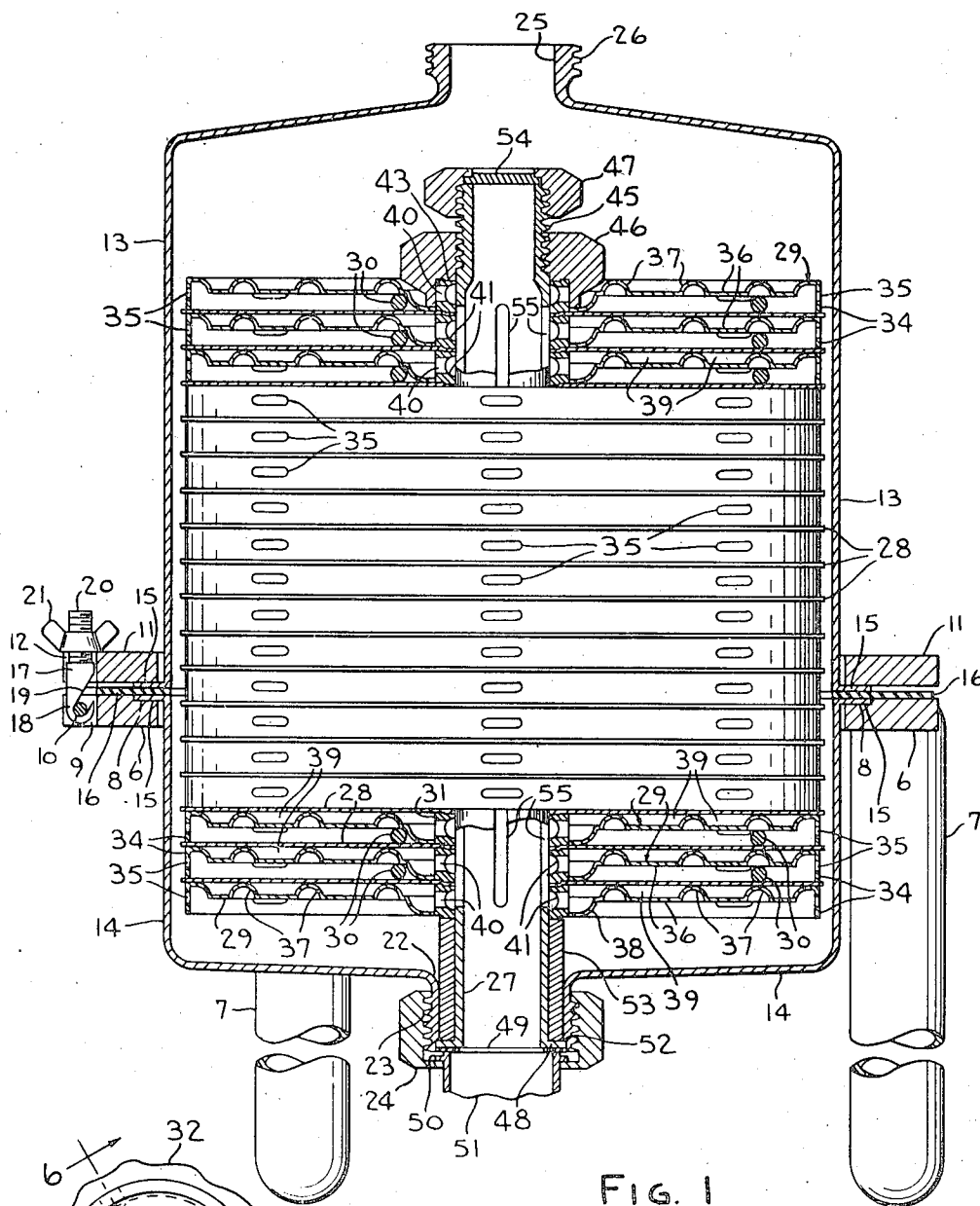


FIG. 1

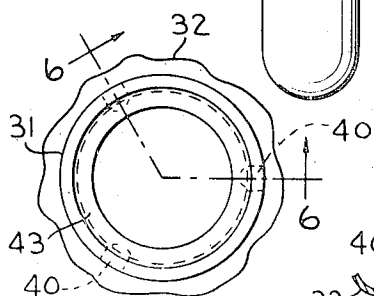


FIG. 5

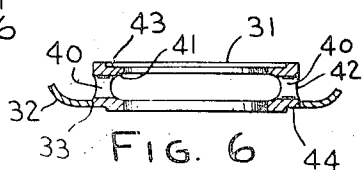


FIG. 6

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FIG. 2

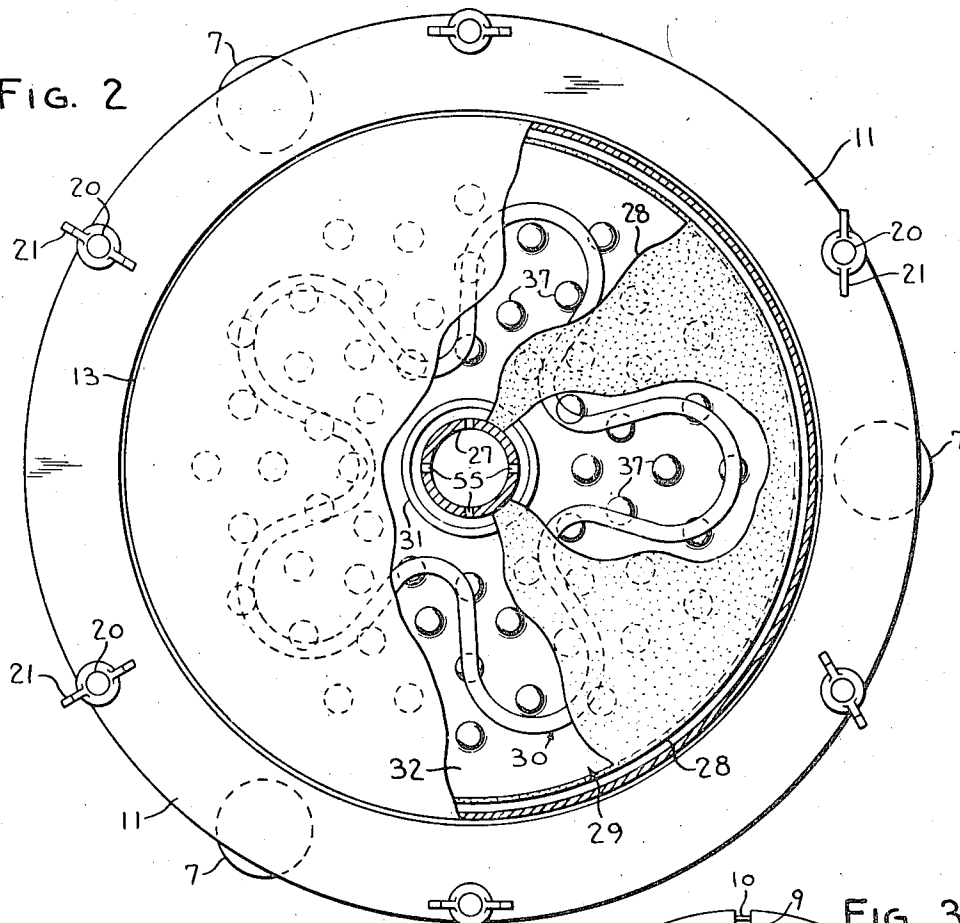


FIG. 3

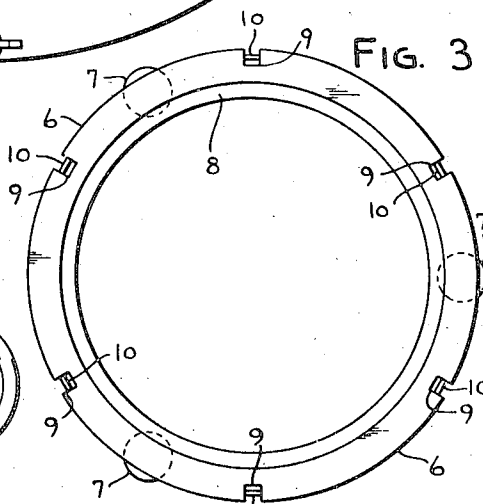
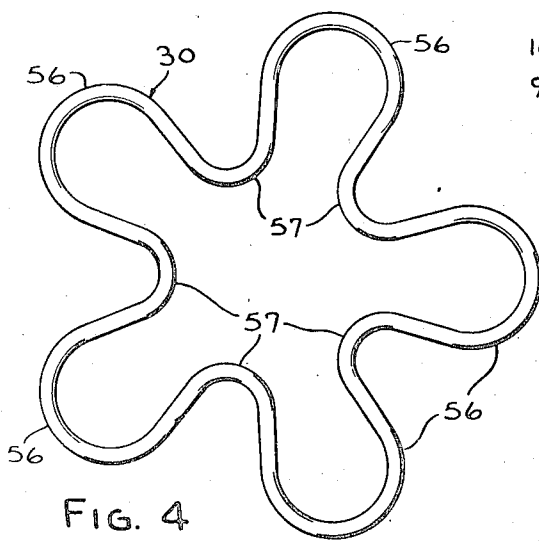


FIG. 4

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FILTER

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4 Claims. (Cl. 210—185)

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The invention relates to filters.

One object of the invention is to provide a low pressure filter of simple and compact construction for use in filtering liquids, such as milk, in which the filtering pads are clamped between supporting disks of novel construction. More particularly, according to the present invention, the hubs of the supporting disks are of relatively heavy metal construction and are welded to the thinner metal portion of the disks, each hub having a cylindrical recess in its top and a complementary annular recess in its bottom, so that adjacent hubs will center themselves relative to each other when clamped together with the inner portion of the filter pad firmly clamped between these recessed portions over a relatively wide area, thus preventing tearing of the pad by the hubs of said disks. Also the relation of the peripheral portions of the disks relative to their hubs is such that a firm clamping engagement of the pad between the peripheral flange of one disk and the top of an adjacent disk is provided.

A further object of the invention is to provide means herein specifically shown in the form of a spider for holding the filter pad down adjacent a lower plate and preventing its obstructing the flow of milk through the outlet passages in the adjoining upper plate.

A further object of the invention is to provide a new and improved stand-pipe and connection between the same and the outer casing of the filter.

A further object of the invention is to provide a new and improved means for quickly clamping the outer casing members together and to the supporting structure.

The invention further consists in the several features hereinafter set forth and more particularly defined by claims at the conclusion hereof.

In the drawings:

Fig. 1 is a vertical sectional view through a filter embodying the invention, some of the interior parts being shown in full, and parts being broken away;

Fig. 2 is a top plan view of the filter, parts being shown in section and parts being broken away;

Fig. 3 is a top plan view of the supporting structure or stand;

Fig. 4 is a plan view of one of the spiders;

Fig. 5 is an enlarged plan view of the hub portion of one of the disks;

Fig. 6 is a detailed vertical sectional view taken on the broken line 6—6 of Fig. 5.

The device in general includes a support, a

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clamping ring, a multi-part housing or casing clamped to the support by said ring, and a filter unit mounted in and carried by said housing.

The support includes a top cylindrical ring member 6 to which the upper ends of supporting legs 7 are welded, said ring having an annular recess 8 and radially disposed clamp receiving slots 9 extending inwardly from its outer edge, each slot having a transversely disposed pin 10 anchored at its ends in said ring 6. The clamping ring 11 is an annular ring provided with radially disposed slots 12 aligned with the slots 9 and extending inwardly from its outer edge.

The housing or casing includes a cup-shaped upper section 13 and a similar bottom section 14, each having an outwardly extending base flange 15. The flange 15 of the bottom section is adapted to seat in the recess 8 with a gasket 16 disposed between said sections and to be clamped in this position between the rings 6 and 11 by clamping bolts 17. As shown in Fig. 2, each bolt has a head 18 provided with a diagonally disposed or inclined slot 19 running to its axis and adapted to receive the pin 10 in the support or ring 6 where said head is positioned in the slot 9, the shank 20 of said bolt extending through the slot 12 and threaded to receive a wing nut 21 which bears upon the top of said ring 11 when turned down to clamp the casing sections between the support and said clamping ring. This provides a very simple construction by which the parts may be clamped together without the use of wrenches or other tools and which permits a thorough cleaning of all the parts when disassembled since the clamping bolts are separate members.

The lower casing section has a central opening 22 in its bottom to which a threaded section 23 is welded to provide a threaded end upon which an inwardly flanged clamping nut 24 is mounted.

The upper casing section has a central opening 25 in its top to which a threaded section 26 is welded to provide a mounting for a union coupling connecting said casing to an outlet pipe.

The filter unit includes a stand-pipe 27, filter pads 28, supporting disks 29, and spiders 30. The filter pads are annular thin rings of filtering material of known construction. The supporting disks are formed of two sections, a heavy hub section 31 and an annular sheet metal section 32, both preferably formed of stainless steel with the inner edge 33 of the section 32 butt welded to the hub 31. The sections 32 are annular sheet metal stampings formed to provide a peripheral or exterior flanged portion 34 provided with

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spaced openings 35, a medial depressed portion 36 provided with a series of radially disposed up-standing protuberances 37 which are arranged in staggered relation with each other, and an inner inclined portion 38 whose inner edge is welded as noted above to the hub 31. Between the inner edge of section 32 and the outer flange 34, the medial portion 36 lies in a medial plane so as to provide channels 39 between the bumps or protuberances. The hub sections 31 are solid annular rings machined from stainless steel having radially disposed openings 40 connecting the exterior of the ring with the interior with the sides of said ring grooved at 41 and 42 in the area of the ring through which the openings 40 are made. The top of each ring has a cylindrical recess 43 formed therein, and the bottom of each ring has an annular recess 44 complementary to said top recess, so that said rings will nest together or center themselves relative to each other, said tops and bottoms being of relatively large area and receiving the inner portions of the pads 28 between them and firmly holding them in position by the interlocking connection provided by the recessed portions of the rings above described. The flange 34 is so dimensioned relative to the hub 31 that when the pads 28 are disposed between adjacent disks, a firm clamping pressure will be produced between the flange 34 of one disk and the top peripheral portion of an adjoining disk.

The stand-pipe 27 is a metal tube preferably of stainless steel whose upper end 45 is threaded to receive a disk clamping nut 46, and a cap clamping nut 47 and whose lower end 48 is flanged and clamped with a gasket 49 and the flanged end 50 of the inlet pipe 51 between the flange of the nut 24 and a shoulder 52 in the threaded end 23 of the casing 14.

The disks 29 are supported on the stand-pipe 27 and are clamped between a spacing sleeve or tube 53 abutting the flange 48 of said pipe and the nut 46.

A metal cap 54 having a fluid-tight valve seat connection with the top of the stand-pipe is clamped thereto by the nut 47.

In the region where the disks are positioned on the stand-pipe 27, said pipe is provided with one or more vertically extending outlet slots 55.

A spider 30 is placed in between superimposed disks and rests on the filter pad 28 whose lower surface abuts the upper surface of said superimposed disk. This spider is relatively loosely mounted between the disks and is preferably of a general clover leaf design, shown in Fig. 4, to provide a plurality of radially disposed curved arm portions 56 joined together by curved base portions 57 which are spaced from the center of the spider a diametric distance somewhat greater than the diameter of the hubs 31 of the disks. The spider is formed of relatively small diameter of round wire. With this form of spider no matter in what way the spider is placed on the top of the pad 28 resting on a lower disk, it will always be in line with such a number of the spaced protuberances 37 of the upper disk that when it may contact with such upper disk, it will lie substantially in a plane parallel with such disk.

Removal of the nuts 47 and 46 permits the removal of the pads and disks, so that disks can be cleaned and new pads positioned on the stand-pipe.

With this arrangement milk or other fluid to be filtered is delivered through the pipe 51 to the

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stand-pipe and passes out through the slot or slots 55 into the groove 41 of the hubs of the disk and then through the openings 40 therein into the space formed between the medially depressed portions of the disk and the filter pads 28, and then through said pads to the spaces below the undersides of said disks in which the spiders 30 are located and out through the openings 35 and into the casing and then through the opening 25 connected with the outlet pipe. With the above arrangement the filter pads 28 are firmly clamped between the hub portions of the supporting disks, so that they will not break down and tear at this point and are efficiently clamped at the outer peripheral edges of the disks and are prevented by the spiders 30 from coming into contact with the upper plate which would stop the flow through a greater portion of the filter media and cause excessive pressure on the balance of the media which would tend to pull the media away from the seal causing its rupture and thus allowing by-pass. The weight of the spider keeps the filter media from stretching as it fills with sediment or impurities. Thus the stainless steel spider holds the filter media in what I term controlled suspension, the media being free to move somewhat with the spider, so that at all times the media between its clamped edges is free and the full effective area of the pad is available for filtration, giving maximum capacity with a minimum number of plates and assuring maximum life without by-pass.

It is to be noted that when the clamping nut 46 is tightened with the pads disposed therebetween, the plates have a bellows action tending to force out around the entire circumference and bring the filter media or pad into tension. At the same time, the interlocking clamping hubs clamp the inner periphery of the pad, so that the pad lies flat suspended between the two plates.

It is further to be noted that the flow of the milk is up through the central stand-pipe and then is distributed to the individual filter plates through three small holes in each of the stainless steel center collars. The flow of the milk from these collars over the plates under the filter media is at a very slow rate of speed. This flow is comparable to fluid passing from a half inch pipe to a ten inch diameter pipe, giving a gentle seepage up through the pad at a rate of speed no greater than one would have with a gravity filter, yet having all of the advantages of a pressure filter. The flow of the milk up through the filter media is at such a slow rate of speed that the only impurities carried to the pad are those in suspension in the milk. The heavier particles tend to settle on the stainless steel plate itself. This principle greatly increases the amount of milk which can be put through a given filter disk and at the same time prevents the tendency of heavy particles to work through the disk under pressure, causing rupture of the filter media which would be the case if the flow of milk were down through the filter media.

I desire it to be understood that this invention is not to be limited to any particular form or arrangement of parts except in so far as such limitations are included in the claims.

What I claim as my invention is:

1. In a filter, the combination with a housing having a threaded opening, of an apertured stand-pipe having a flanged end abutting a portion of said opening, a supply pipe having a flanged end, a washer interposed between the flanged ends of said pipes, a nut for clamping

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the above named parts together and to said threaded opening, a spacer sleeve abutting the flanged end of said stand-pipe, a series of annular pad supporting disks arranged on said stand-pipe in juxtaposition having openings communicating with the apertures in said standpipe, annular filter pads interposed between said disks and clamped therebetween at their inner and outer edge portions, the upper end of said stand-pipe being threaded, and a nut mounted on said upper threaded end for clamping said disks and pads between it and said spacing sleeve.

2. In a filter, the combination with an enclosing housing, of an apertured stand-pipe carried by and mounted within said housing and having an inlet at one end for the liquid to be filtered, a series of filtering units mounted on said stand-pipe in juxtaposition, each unit including a pad supporting annular disk having an apertured peripheral portion forming outlets for the filtered liquid and a hub portion having passages connected with the apertured portion of said stand-pipe, a filter pad supported on said disk and clamped at its inner edge between the hub portions of adjacent disks and at its outer edge between the peripheral portions of adjacent disks, and a skeleton spider loosely interposed between adjacent disks and resting freely by its own weight upon the top of the filter pad clamped between said disks and holding said pad in controlled suspension.

3. A filter in accordance with claim 2 in which the spiders are provided with radially disposed

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looped arms which are connected by inner looped portions that are spaced from the hubs of said disks.

4. In a filter, the combination with a housing having a threaded opening, of an apertured stand-pipe having a flanged end abutting a portion of said opening, a supply pipe having a flanged end, a washer interposed between the flanged ends of said pipe, a nut for clamping the above named parts together and to said threaded opening, a spacer sleeve abutting the flanged end of said stand-pipe, a series of annular pad supporting disks arranged on said stand-pipe in juxtaposition having openings communicating with the apertures in said standpipe, annular filter pads interposed between said disk and clamped therebetween at their inner and outer edge portions, and means for exerting a clamping pressure on said pads and disks.

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