

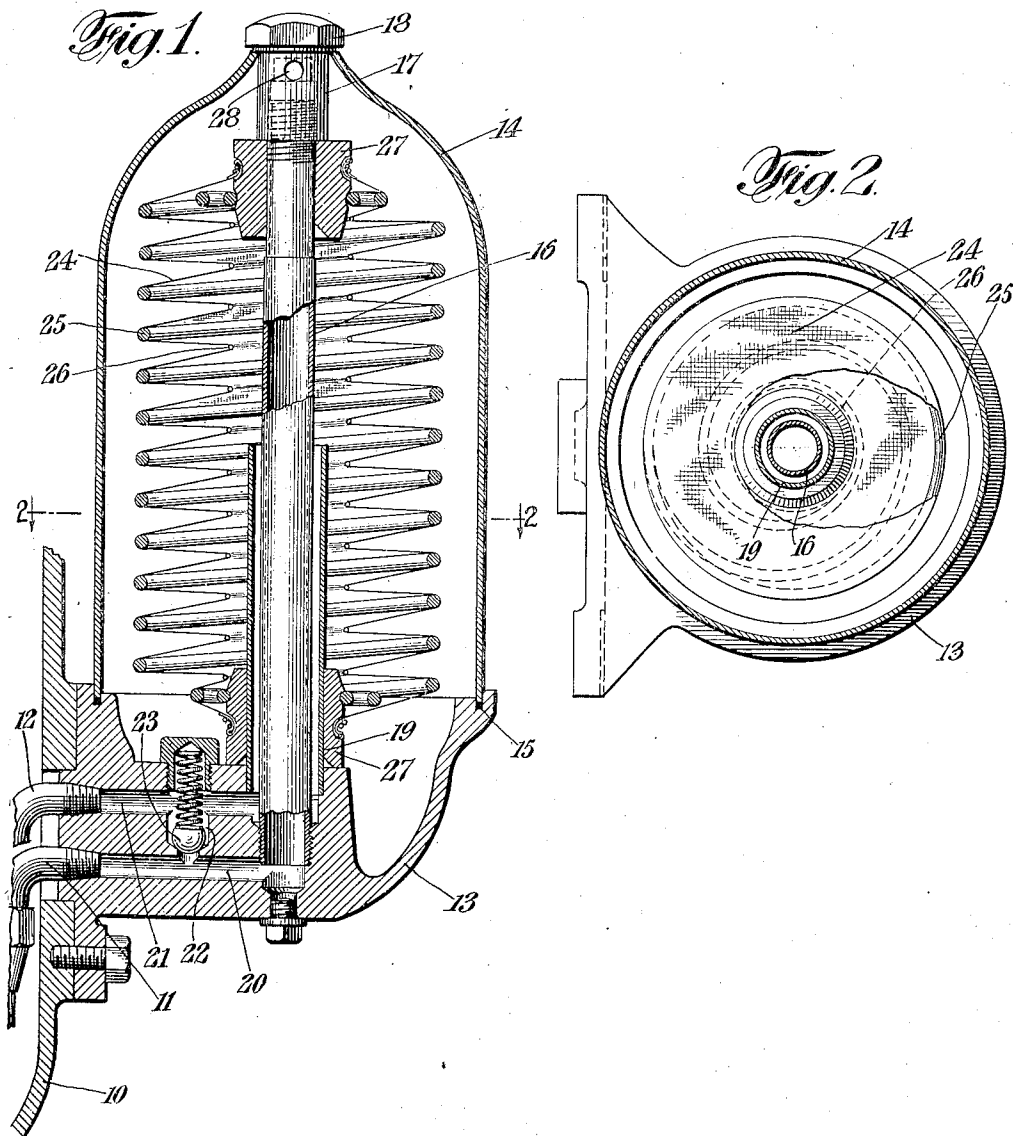
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FILTER

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UNITED STATES PATENT OFFICE

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FILTER

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This invention relates to filters and has for an object a simple, inexpensive and durable filter having large filtering surface with respect to its displacement and one which is capable of effectively filtering at a high rate.

According to one embodiment of the invention, the filtering unit comprises an envelope supported by a helix and drawn in between the turns of the helix to produce a deep thread screw-like contour. This unit is supported within a casing by means of concentric tubes, the larger of which projects into the interior of the filtering unit, while the smaller tube extends through the unit. Preferably, sleeves are provided at either end of the filtering unit, each of which is slidably but snugly mounted upon one of said tubes. The casing preferably comprises a base and a cover. One of the sleeves abuts the base and the other engages a member preferably threaded on the end of the inner tube. Preferably, the inner tube is rigidly attached to the base and the threaded member passes through an aperture in the casing and is provided with a head which engages the casing, so that said member also serves to clamp the casing to the base. Passageways are provided in the base leading to the concentric tubes and a bypass is provided between the passageways. Preferably, oil to be filtered flows through the inner of the concentric tubes into the space between the casing and the filtering unit, seeps through the filtering surface and is discharged through the annular space between the inner and outer tubes, although the circuit may be just reversed, if desired. The base of the casing may be designed for attachment to the crank case of an engine in which case there will be a supply and discharge pipe for the filter enclosed in the crank case or it may be designed for attachment to the dash board or other suitable support.

Other objects, novel features and advantages of the invention will be apparent from the following specification and accompanying drawings wherein

Figure 1 is a vertical section showing a filter embodying the invention attached to the crank case of an engine, and

Figure 2 is a section on the line 2—2 of Fig. 1.

10 designates a wall of the crank case of an internal combustion engine and 11 and 12 designate pipes communicating with the lubricating system of the engine. A filter is supported from the crank case 10 and comprises a base 13 bolted to the crank case 10 and a cover 14 which is substantially cylindrical throughout the major portion of its length and tapers towards the end remote from the base 13. A circular groove 15 is provided in the base 13 to receive the rim of the cover 14. A tube or pipe 16 is threaded to the base 13 and extends nearly to the end of the cover 14. The free end of the tube 16 is screw threaded to cooperate with a clamping member 17 extending through an aperture in the end of the casing 14 and having a head 18 which engages the casing 14 to clamp the latter in assembled relation to the base 13. A gasket is provided in the groove 15 and between the head 18 and the casing 14 to render the casing liquid tight.

A second tube 19 concentric with the tube 16 and surrounding the same has one end arranged in a socket in the base 13 and extends into the filter. A conduit 20 is provided in the base 13 leading to the tube 16 and a second conduit 21 is provided in the base 13 leading to the annular space between the tubes 16 and 19. Between the conduits 20 and 21 is provided a bypass 22 controlled by a relief valve 23.

Within the filter casing, composed of the base 13 and cover 14, is provided a filtering unit. This filtering unit comprises an envelope 24 of suitable filtering medium supported by a slow pitch resilient helix 25. The filtering envelope is normally of materially greater length than the helix 25 or the filter casing and is drawn in between the adjacent turns of the helix by means of a wire or the like 26 to form a deep thread screw-like contour. The filtering unit is thus provided with a large effective filtering area in compact space, the exposed surface being materially greater than the surface defined by the overall dimensions of the unit. Each end of the helix 25 is connected to a sleeve 27 by de-

creasing the diameter of the end turns and arranging them in grooves provided in the sleeve. Also the ends of the filtering envelope 24 are arranged in grooves provided in the sleeves 27 and tied therein by means of wire or the like. One sleeve 27 is of proper bore snugly but slidably to fit over the tube 19 while the other sleeve 27 is of proper bore snugly but slidably to fit over the tube 16. Thus when the filtering unit is arranged within the casing one sleeve 27 abuts a portion of the base 13 and the other sleeve 27 abuts the clamping member 17. The helix 25 is so designed that when arranged within the filter casing with the sleeves 27 abutting the base 13 and the member 17 it is under compression. The resiliency of the helix is such that when thus compressed it will not be further compressed when subjected to the pressure of the oil to be filtered. The snug fit of the sleeves 27 prevents any material seepage of oil between the tubes and the sleeves. In the member 17 is provided one or more apertures 28 by means of which oil may flow to or from the tube 16 and the interior of the filter casing.

Preferably the filter is of the outside-in type and when thus used the conduit 20 acts as the inlet for oil to be filtered and the conduit 21 as the outlet for filtered oil. The oil to be filtered passes from the conduit 20 through the tube 16, and the aperture 28 into the space between the casing and the filtering unit. It then seeps through the filtering medium 24 and is discharged through the annular space between the tubes 16 and 19 into the outlet conduit 21. The bypass 22 is provided to permit direct flow from the conduit 20 the conduit 21 should the filtering medium become so clogged or the oil so viscous that the pressure required to produce flow through the filtering unit rises above a predetermined limit. Although the outside-in type of filter is presented, yet this same type of filter may be produced as an inside-out filter merely by making the conduit 21 the inlet and the conduit 20 the outlet and correspondingly rearranging the relief valve 23.

In assembling this device after the tubes 16 and 19 have been properly positioned and the relief valve 23 put in place, one sleeve 27 of the filtering unit is slid over the tube 19, thus bringing the other sleeve in position to slide over the end of the tube 16. The cover 14 is then placed over the filtering unit and the member 17 inserted in the aperture in the cover and both pressed downwardly. The member 17 engages the sleeve 27, sliding the latter over the end of the tube 16, this action being facilitated by the tapered end of the bore in the tube 27 after which the member 17 is threaded on to the end of the tube 16. Tightening the nut 17 compresses the gaskets and clamps the cover in position and places the helix. At the same time the helix 25 is somewhat collapsed and placed under com-

pression. The sleeves 27 preferably fit the tubes 16 and 19 snugly enough to prevent oil seepage between them. If desired the resiliency of the helix 25 may be made such as to force the sleeves into fluid-tight contact with their abutments. Thus the one nut or clamping member completes the assembly of the filter and holds the filtering unit in proper position. It is evident, however, that the filtering unit might be held in position by other means and the cover clamped to the head in a different manner. Although the snug fit of the sleeves or the resiliency of the helix may be depended upon to prevent seepage along the tubes into the filtering units it is to be understood that other means may be utilized for so doing.

In the drawings the base 13 is shown as designed for attachment to the crank case of an engine with the conduits 20 and 21 leading through the clamping plate. The invention is not limited to such arrangement and the base 13 may be designed to be attached to any suitable support such for example as the dashboard of an automobile or some part of the engine other than the crank case. In such event the conduits 20 and 21 preferably would not extend through the clamping plate but would be angularly spaced therefrom. When the base is attached to the crank case of an engine the supply and discharge pipes may be contained wholly within the crank case. When otherwise supported these pipes will be exterior of the crank case. Although a relief valve controlled bypass has been disclosed between the inlet and outlet, the invention is not limited thereto as such valve is of practical importance only in a direct line filter. If the filter be used in a branch circuit the outlet of which discharges back into the crank-case, such relief valve controlled bypass may be dispensed with.

Although the filter has been disclosed as being supported with the cover 14 above the base 13 it is apparent that it might be turned upside down and operate equally well. It is also to be understood that various modifications may be made in the structure without in any way departing from the spirit of the invention as defined in the appended claims.

In the copending application of Lewis D. Williams, Serial No. 150,434, filed Nov. 24, 1926, is disclosed and claimed a filtering unit composed of an envelope of filtering material supported by a resilient helix and drawn in between the adjacent turns by a tie member. The present invention is directed to an improved type of filter in which such filtering unit is utilized. The filtering unit disclosed in this application is endowed with the same advantageous features set forth in the aforementioned Williams application.

Having thus described my invention, what

I claim as new and desire to secure by Letters Patent of the United States is:

1. A filter comprising a casing, a filtering unit therein, said filtering unit comprising an envelope of filtering material supported by a resilient helix, a tube projecting through said filtering unit and means on said tube for maintaining said helix under compression.

either end of said helix of proper bore slidably and snugly to receive one of said tubes and means on said second tube for maintaining said helix under compression.

7. In a filter, a base, a filtering unit comprising an envelope of filtering material supported by a resilient helix, a tube supported by said base and projecting into said unit, a second tube concentric therewith and extending through said unit, said second tube being rigidly connected to said base, a sleeve at either end of said helix of proper bore slidably and snugly to receive one of said tubes and means for supplying oil to be filtered to one of said tubes and withdrawing filtered oil from the other of said tubes.

2. A filter comprising a casing, a filtering unit therein, said filtering unit comprising an envelope of filtering material supported by a resilient helix, a tube projecting into said unit, a second tube concentric with said first tube and extending through said unit and means on said second tube for maintaining said helix under compression.

3. A filter comprising a base and a cover cooperating therewith to form a casing, a filtering unit in said casing, said filtering unit comprising an envelope of filtering material supported by a helix, a tube supported by said base projecting into said unit, a second tube concentric therewith extending through said unit, said second tube being rigidly connected to said base, a cover clamping member extending through said cover and connected to said second tube, and means for supplying oil to be filtered to one of said tubes and withdrawing filtered oil from the other of said tubes.

4. A filter comprising a casing, a filtering unit therein, said filtering unit comprising an envelope of filtering material supported by a helix, a tube projecting into said unit, a second tube concentric with said first tube and extending through said unit, a sleeve attached to each end of said helix and slidably mounted on one of said tubes, and means for maintaining said sleeves in position on said tubes.

8. In a filter, a base and a cover cooperating to form a casing, a filtering unit in said casing, said filtering unit comprising an envelope of filtering material supported by a resilient helix, a tube supported by said base and projecting into said unit, a second tube concentric with said first tube and extending through said unit, said second tube being rigidly connected to said base, a sleeve at either end of said helix of proper bore snugly and slidably to receive one of said tubes, a cover clamping member extending through said cover to engage one of said sleeves and a screw threaded connection between said cover clamping member and said second tube.

9. In a filter, a base, a filtering unit, said filtering unit comprising an envelope of filtering medium supported by a resilient helix, a tube projecting into said unit, a second tube concentric therewith extending through said unit, said second tube being rigidly connected to said base, a sleeve connected to either end of said helix and said envelope, each of said sleeves being slidably mounted on one of said tubes and a member mounted on said second tube, said sleeves abutting said base and said member respectively whereby said helix is maintained under compression.

10. In a filter a base and a cover cooperating therewith to form a casing, a filtering unit in said casing, a tube projecting into said unit, a second tube concentric therewith extending through said unit, means for supplying oil to be filtered to one of said tubes and withdrawing filtered oil from the other of said tubes and a sleeve connected to each end of said unit of suitable bore snugly to receive one of said tubes.

11. In a filter, a casing, a filtering unit therein comprising an envelope of filtering material supported by a frame, sleeves connected to said frame and filtering material, a tube supported by said casing and extending through both of said sleeves, a second tube surrounding and concentric with said first tube and extending through one of said sleeves and conduits communicating with said first tube and the annular space between said first and second tubes.

5. A filter comprising a base and a cover cooperating therewith to form a casing, a filtering unit in said casing, said filtering unit comprising an envelope of filtering medium supported by a resilient helix, a tube projecting into said unit, a second tube concentric therewith extending through said unit, said second tube being rigidly connected to said base, a cover clamping member extending through said cover and connected to said second tube, and means for supplying oil to be filtered to one of said tubes and withdrawing filtered oil from the other of said tubes, sleeves connected to either end of said helix and slidably mounted on said tubes, one of said sleeves abutting said head and the other of said sleeves abutting said clamping member.

6. In a filter, a base, a filtering unit comprising an envelope of filtering material supported by a resilient helix, a tube supported by said base and projecting into said unit, a second tube concentric therewith and extending through said unit, said second tube being rigidly connected to said base, a sleeve at

12. In a filter, a casing, a filtering unit therein comprising a resilient frame and an envelope of filtering material supported by said frame, a pair of concentric tubes supported by said casing, one of said tubes projecting into said filtering unit and the other of said tubes extending through said filtering unit and communicating with the space between the casing and the filtering unit, a sleeve slidably mounted on each of said tubes and connected to one end of said frame, means on the longer of said tubes for maintaining said frame under compression and channels communicating with the annular space between said tubes and with the space between said filtering unit and the casing wall.
13. In a filter, a base and a cover forming a casing, a filtering unit therein comprising a resilient frame and an envelope of filtering material supported by said frame, a pair of concentric tubes supported by said base, one of said tubes projecting into said filtering unit and the other of said tubes extending through said filtering unit and communicating with the space between the casing and the filtering unit, a sleeve slidably mounted on each of said tubes and connected to one end of said frame, a cover clamping member extending through said cover to engage one of said sleeves and having a threaded connection with the longer of said tubes and channels communicating with the annular space between said tubes and with the space between said filtering unit and the casing wall.
14. In a filter, a casing, a filtering unit therein comprising a resilient helix and an envelope of filtering material supported by said helix, a member supported by said casing and extending through said filtering unit coaxial with said helix, a sleeve slidably mounted on said member and connected to one end of said unit, means forming with said member an annular passageway communicating with the interior of said filtering unit at the other end of said helix, means on said member engaging said sleeve to maintain said helix under compression and channels communicating with said annular passageway and with the space between the filter unit and the casing wall.
15. In a filter, a casing, a filtering unit therein comprising a resilient frame and an envelope of pliable filtering material supported by said frame, a sleeve in either end of said unit, a hollow supporting member extending from said casing through both of said sleeves, one of said sleeves having a sliding but snug fit with said member, and a conduit in said casing communicating with said hollow supporting member.
16. In a filter, a casing, a filtering unit therein comprising a resilient frame and an envelope of filtering material supported by said frame, and means slidably supporting the ends of said unit, said unit being supported on said means with said frame under compression and said frame being of sufficient resiliency to prevent further contraction of the unit under normal operating conditions.
17. In a filter, a casing, a filtering unit in said casing, said unit comprising a resilient frame and an envelope of filtering material surrounding said frame, a supporting member carried by said casing and extending through said unit, and means slidably connecting one end of said unit to said member, said unit being supported by said member with said frame under compression and said frame being of sufficient resiliency to prevent further contraction of the unit under normal operating conditions.
- In testimony whereof, I have signed my name to this specification.
- GEORGE A. ARNOLD.