Nov. 7, 1967 A. E. REVELL 3,350,854

ROLL-TYPE AIR FILTER

Filed Jan. 21, 1965 2 Sheets-Sheet 1

Fig. 1

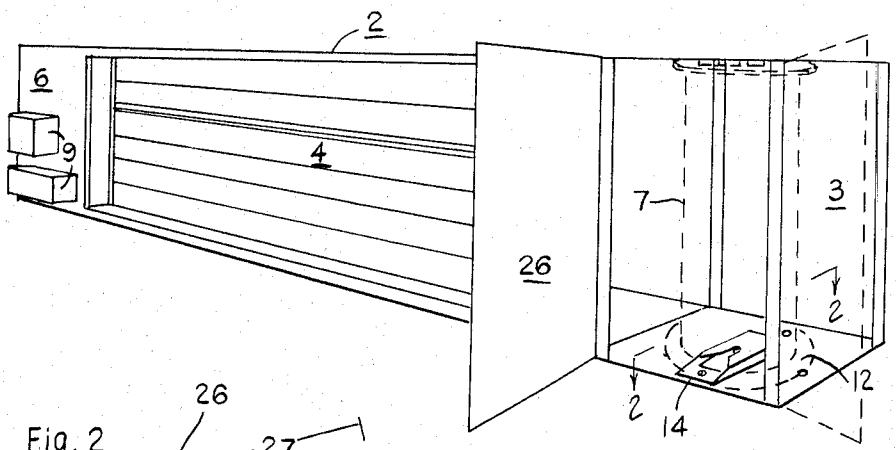
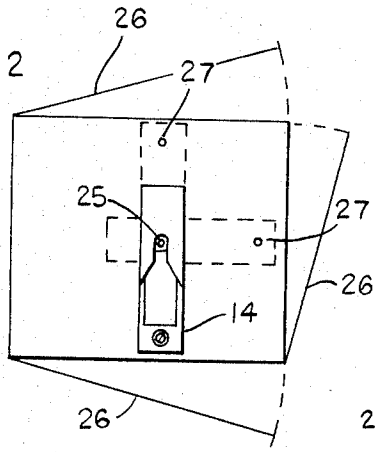


Fig. 2



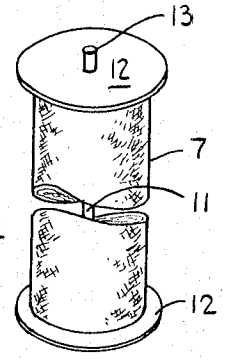


Fig. 4

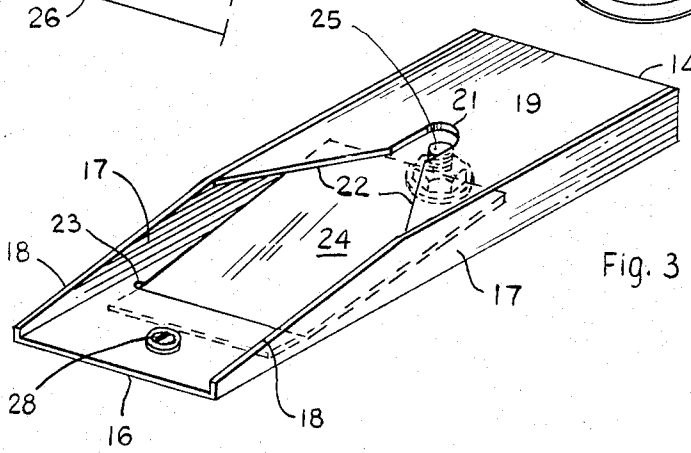


Fig. 3

INVENTOR.

BY Alan E. Revell

Ralph G. Brueck

ATTORNEY

Nov. 7, 1967 A. E. REVELL 3,350,854

ROLL-TYPE AIR FILTER

Filed Jan. 21, 1965 2 Sheets-Sheet 2

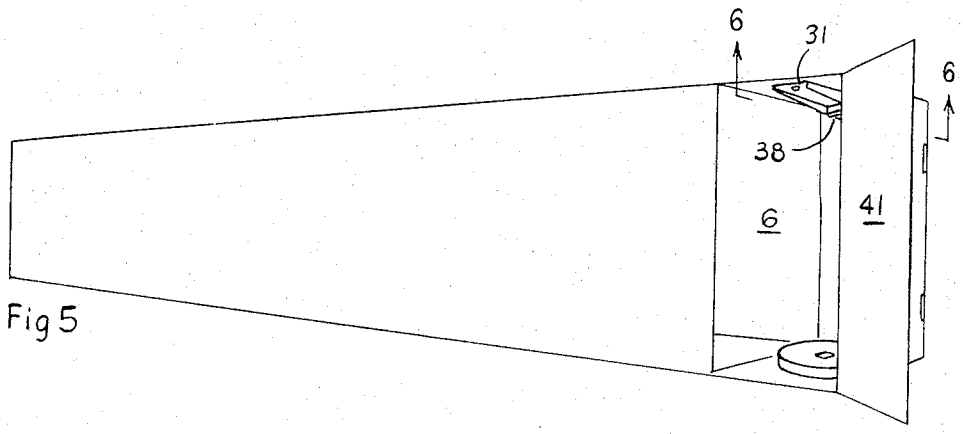


Fig 5

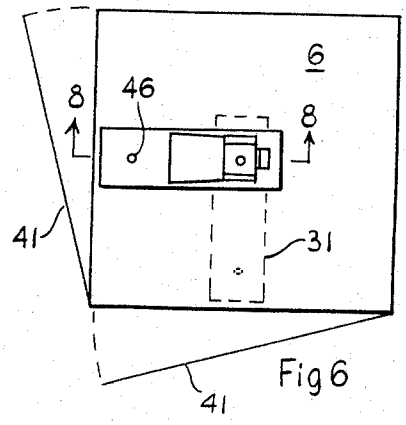


Fig 6

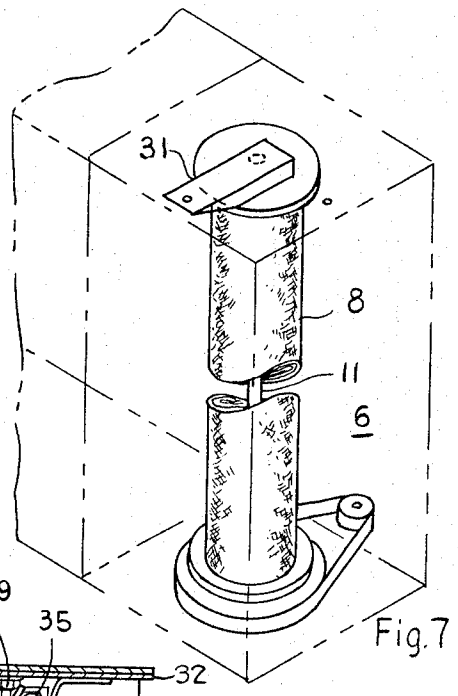


Fig. 7

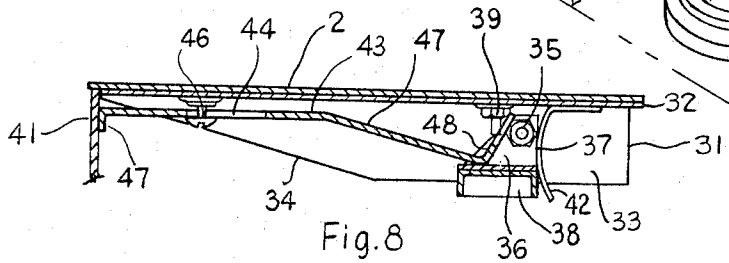


Fig. 8

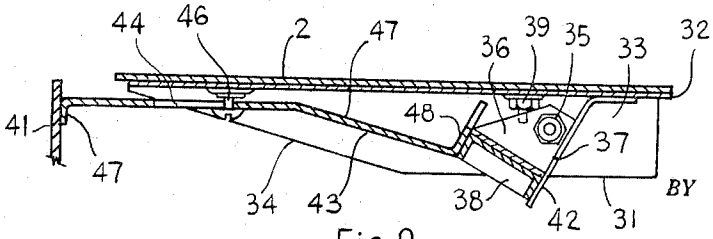


Fig. 9

INVENTOR.

Alan E. Revell

BY

Ralph B. Brink

ATTORNEY

United States Patent Office 3,350,854 Patented Nov. 7, 1967

3,350,854

ROLL-TYPE AIR FILTER

Alan E. Revell, Louisville, Ky., assignor to American Air Filter Company, Inc., Louisville, Ky., a corporation of Delaware

Filed Jan. 21, 1965, Ser. No. 426,954
6 Claims. (Cl. 55—354)

ABSTRACT OF THE DISCLOSURE

An improved roll storage section of a filter assembly wherein the storage section includes at least two roll insertion openings through which a filter medium roll can be selectively inserted and a bearing assembly arrangement to support the spindles of the filter roll, the bearing assembly arrangement being positionable in alignment with either of such openings.

The present invention relates to roll-type filters and more particularly to an improved roll support zone construction in roll-type filters wherein filter material is passed from a supported position in a supply zone through a fluid treating zone to a supported position in a rewind zone.

In accordance with the present invention, an economical and straightforward arrangement is provided for loading and supporting roll-type filter material with a minimum of operational steps and with a minimum of structure. In addition, the present invention provides a structure which permits selective insertion and withdrawal of a roll of filter material to and from a filter zone having more than one roll insertion opening. Further, the roll support construction of the present invention provides improved means for centrally aligning the longitudinal axis of a filter roll, for guiding the projecting spindles of a filter roll into nesting position with its bearing slot and for holding a spindle in firm position—including a means for holding a spindle firm in interrelationship with the closing of a door adjacent the opening through which the filter roll has been inserted.

Various other features of the present invention will become obvious to one skilled in the art upon reading the disclosure set forth herein.

More particularly, the present invention provides in a roll-type filter, an improved zone construction for supporting a roll of filter material wound upon a mandrel having projecting spindles comprising: a housing having a roll support zone including two opposed end walls and at least two roll insertion openings through which the roll can be selectively inserted; and bearing means projecting inwardly from the inner faces of the end walls to receive and support the spindles with the roll therebetween when the roll is in operative position; the bearing means including at least one integral unit having a slot means into which one of the projecting spindles of the mandrel can nest, the unit being movable to a position wherein the unit can be properly aligned with the roll insertion opening through which the roll is to be selectively mounted. In addition, the present invention provides an inclined ramp on the bearing unit for centering the longitudinal axis of the roll of filter material, converging guide edges to insure proper positioning of the spindle into the slot of the bearing unit and a resilient leaf spring retaining member to hold the spindle in fixed position in the slot. Further, the present invention provides a slot arrangement which can be canted or tilted to permit easy insertion of the spindle of a filter roll and which can be held firmly in place with the closing of a door for a roll insertion opening by a locking means responsive to such door closing action.

It is to be understood that various changes can be made by one skilled in the art in the arrangement, form and construction of the apparatus disclosed herein without departing from the scope or spirit of the present invention.

Referring to the drawings which disclose one advantageous embodiment of the present invention:

FIGURE 1 is a perspective front view of a roll-type filter disclosing a roll supply zone and a bearing unit for supporting a roll of filter material, the filter material roll being disclosed in phantom;

FIGURE 2 is an enlarged, plan view of the supply zone of FIGURE 1 taken in a plane passing through line 2—2 of FIGURE 1;

FIGURE 3 is a further enlarged isometric view of the bearing unit of FIGURES 1 and 2;

FIGURE 4 is a perspective view of a filter material roll which can be used in the present invention;

FIGURE 5 is a perspective rear view of a roll-type filter disclosing the roll rewind zone and a bearing unit therefor;

FIGURE 6 is an enlarged plan view of the rewind zone of FIGURE 5 taken in a plane passing through line 6—6 of FIGURE 5;

FIGURE 7 is an enlarged isometric phantom view of the rewind zone of FIGURE 5 with the filter material roll in place;

FIGURE 8 is an enlarged side view of the bearing unit of FIGURE 6 taken in a plane passing through line 8—8 of FIGURE 5; and

FIGURE 9 is a view similar to that of FIGURE 8 with the bearing unit in canted position.

Referring to FIGURE 1 of the drawing, a roll-type filter housing **2** is disclosed, this housing including roll support supply zone **3**, filter zone **4**, and roll support rewind zone **6**. Supply zone **3** serves to receive and support a roll of filter material **7**, disclosed in FIGURE 1 of the drawings in phantom line form and in FIGURE 4 in solid line form. Roll **7** can be comprised of a web of suitable filter medium material such as fiber glass. This web is progressively advanced through filter zone **4** which frames a fluid stream passage through which the fluid to be treated must flow. The contaminant loaded web **7** is then progressively advanced to the rewind zone **6** where it is wound onto a discharge roll **8** which ultimately can be thrown away or reconditioned. Suitable drive motor and web metering controls, known in the art and not described in detail, can be utilized to advance the medium progressively in the manner aforedescribed. This drive motor and web metering control equipment is positioned on housing **2** adjacent roll support rewind zone **6** and is broadly referred to herein by reference numeral **9**.

The clean roll of filter material **7**, as well as discharge roll **8**, is wound upon a mandrel **11**, which has opposite end rims **12** and opposite projecting spindles **13**, the spindles **13** being of preselected cross-sectional contour so as to nest with slots in the bearing units of the roll support zone in a manner described hereinafter. It is to be understood that the mandrel and end rims can be made from any one of a number of suitable material and advantageously a lightweight, strong metal can be used.

Before proceeding with the further details of the description of the invention, it is to be noted that supply zone **3** and rewind zone **6** are each provided with several roll insertion openings for loading operations of the filter material roll into and out of the zones.

As can be seen in FIGURES 1 to 3 of the drawings, roll support supply zone **3** is provided with bearing units **14**, these bearing units **14** projecting inwardly from the inner faces of the end walls of housing **2** to receive and support projecting spindles **13** of roll **7** when roll **7** is in

operative position. In this connection, it is to be noted that although only one bearing unit 14 is disclosed in FIGURE 1, a similar unit of a spaced pair can be provided so as to be in mirror image relationship to that shown on the opposite end wall of housing 2.

As can be seen more readily in FIGURE 4, each unit 14 includes a base wall 16 and opposed side walls 17 extending therefrom, the side walls 17 having corresponding inclined portions 18 to provide an inclined ramp for roll 7 during loading operations of the roll, thus serving to center the longitudinal axis of the roll relative the end walls of the housing 2 when the roll is in operative position. Extending between side walls 17 parallel to and spaced from base wall 16 is plate member 19. This plate member 19 is provided with an open-end groove or slot 21 for receiving a projecting spindle 13 of roll 7, the slot 21 being preceded by opposed spindle guide edges 22 of plate 19 which opposed guide edges converge in a direction toward slot 21 to provide for ready centering of spindle 13 into the slot. It is to be noted that base wall 16 of unit 14 is provided with a slot 23, this slot receiving one end of leaf spring 24 to hold the same fast against the end wall of housing 2. Leaf spring 24, which advantageously can be formed from a suitably resilient metal material, is prestressed to project in an upwardly inclined fashion from base wall 16, the opposite end of the leaf spring terminating adjacent slot 21. This opposite end of leaf spring 24 serves to maintain projecting spindle 13 in locked position when it is nested with slot 21, the leaf spring yielding to the force of spindle 13 as the roll is moved inwardly and springing back into its inclined position when the spindle has nested properly into slot 21.

It is to be noted that unit 14 is pivotally mounted to its end wall of housing 2 at a position adjacent slot 21. A suitable nut and bolt arrangement 25 can be provided to permit unit 14 to be pivoted thereabout to any one of several operational positions adjacent any one of the several roll insertion openings of supply zone 3. It is to be understood that each opening of supply zone 3 is provided with a suitable door 26 to permit closing of the zone after roll 7 has been properly inserted into operative positon. It also is to be noted that the end walls of housing 2 are each provided with three threaded bolt holes 27, each adjacent one of the openings of supply zone 3 and adapted to receive hold-down bolt 28 mounted at the leading edge of unit 24 adjacent the lowest portion of the incline ramp produced by the incline portions 18 of wall members 17. It will be obvious that when bolts 28 are fastened tightly against the end walls to hold the units 14 in a preselected position adjacent one of the openings, such fastening further serves to firmly hold the ends of leaf springs 24 in position.

As can be seen in FIGURES 5 to 9, another type of unit bearing support is provided for filter material discharge roll 8. This unit bearing assembly, broadly designated by reference numeral 31, includes base wall 32 and opposite side walls 33 having inclined ramp portions 34 (FIGURES 8 and 9). Pivotally mounted to side walls 33 by means of nut and bolt assemblies 35 are the leg portions 36 of a saddle member, broadly designated by reference numeral 37. Saddle member 37 has a slot box 38 fixed thereto, this box being contoured in cross section to receive in nesting engagement therewith the projecting spindle 13 of a mandrel 11. It is to be noted that slot box 38 is substantially adjacent and alignable with the nut and bolt arrangement 39. This nut and bolt arrangement 39 serves as a means to pivotally mount bearing unit 31 to housing 2 to permit the unit to be pivotally moved in a selective manner to one of several roll insertion openings in zone 6. In this connection, it is to be noted that each opening of zone 6 is provided with a suitable door 41 which serves to close the opening during filtering operations.

As can be seen more clearly in FIGURES 8 and 9, a device is provided for canting or tilting slot box 38 toward

a roll insertion opening to readily receive spindle 13 of roll 8. This canting device includes a resilient leaf spring 42, one end of which is fastened to the base wall 32 of unit 31 and the other end which resiliently bears against slot box 38 to pivot the saddle member 37 about its pivots 35 and urge the box into canted spindle-receiving position. When mandrel 11 of roll 8 has its projecting spindle 13 properly engaged with the slot box and the mandrel is pushed inwardly toward operating position, slot box 38 pivots about its pivot members 35 from canted position against resilient spring 42 to be in alignment with the longitudinal axis of mandrel 11. In order to lock slot box 38 in such aligned position, a locking member 43 is provided. This locking member is comprised of a longitudinal bar having a slot 44 therein which permits the bar to be slid relative the bolt assembly 46, the bolt of assembly 46 passing through slot 44. It is to be noted that bolt assembly 46 serves to fasten unit 31 in proper position after the unit has been pivoted to a selected opening. It also is to be noted that slot 44 is of sufficient length to permit member 43 to project outside an opening into a door path 41 when the slot box 38 is in canted position. Further, it is to be noted that the bolt of assembly 46 is of such length as to permit bar 44 to slidably move thereon even though unit 31 is fastened by the assembly. When door 41 is closed, it abuts against end 47 of locking member 43, urging it inwardly so that the canting portion 48 engages underneath slot box 38 to hold the slot box in fast position.

From the aforegoing description, it can readily be seen that the present invention provides an economical and straight-forward arrangement for loading and unloading roll-type filter materials with a minimum of operational steps and with a minimum of structure.

The invention claimed is:

1. A filter assembly including a housing having filter medium storage sections at opposite ends thereof and a flow-through gas treating section intermediate said storage sections with at least one one of said sections serving as a roll storage section and receiving and supporting a roll of filter material wound upon a mandrel having projecting spindles; an improved construction for said roll storage section of said housing comprising: a pair of spaced, oppositely disposed end walls; at least two side walls extending between said end walls, the inner faces of said side walls being in spaced relation from each other to define with said end walls a roll support zone therebetween, each of said side walls being individually pivotally mounted to said housing to provide upon pivotal movement away from said roll support zone two roll insertion openings through which said roll of filter material wound upon a mandrel having projecting spindles can be selectively inserted; and a pair of roll support bearing assemblies projecting inwardly from the inner faces of said end walls and receiving and supporting said spindles with the roll therebetween when said roll is in operative position, at least one of said roll support bearing assemblies being pivotally mounted as a unit on said end wall and having slot means into which one of said projecting spindles of said mandrel can nest, said assembly being movable to a position wherein said slot means can be properly aligned with either of said roll insertion openings through which said roll is to be selectively mounted, said slot means affording an open-ended U-shaped channel to receive and support a projecting spindle of said roll.

2. The apparatus of claim 1, said slotted roll support assembly unit having guide and retention means cooperable with said slot to guide and retain said spindle inserted into said U-shaped channel in position.

3. The apparatus of claim 2, said guide and retention means comprising: a longitudinally extending resilient leaf spring rising in a direction from that edge of said assembly closest to the roll insertion opening to which the assembly is selectively pivoted to a position adjacent said slot, said spring being compressible by said projecting

spindle of said roll during loading operations to permit said spindle to pass thereover and engage in nesting relationship in said slot with the leaf spring edge then abutting against the sides of said spindle to retain the same in place when so nested; and a pair of spaced longitudinally extending ramp members integral with said roll support assembly positioned on opposite sides of said leaf spring and rising in a direction corresponding to the direction of rise of said spring to provide for support and centering of a rim of said roll of filter material, said ramp members terminating in a pair of oppositely disposed flanks which converge in a direction toward said slot to provide for ready centering of said projecting spindle into said slot.

4. The apparatus of claim 2, said guide and retention means comprising: a U-shaped saddle member including a base portion and a pair of oppositely disposed leg portions, said leg portions being pivotally mounted to said assembly and said base portion having a circumferential wall member extending therefrom to provide an open-ended slot box which receives said projecting spindle in nesting engagement therewith; a spring having one end fixed to said assembly and the other abutting a portion of said slot box forming circumferential wall urging said slot box in canted position toward a roll insertion opening to pivot an opposite portion of said circumferential wall to displace the same and afford said open-ended U-shaped channel to receive said projecting spindle; a longitudinally extending locking arm slidably mounted on said assembly having one end adapted to abut against said displaced portion of said circumferential wall to pivot and lock said arm in normal position after receiving said projecting spindle; and a pair of spaced longitudinally extending ramp members integral with said roll support assembly positioned on opposite sides of said slidable lock arm rising in a direction from that edge of said assembly closest to the roll insertion opening to which the assembly is selectively pivoted to a position adjacent said pivoted slot box to provide for support and centering of a rim of said roll of filtering material.

5. A roll storage section in a filter assembly having therein a roll of filter material wound upon a mandrel having projecting spindles and insertable through a roll insertion opening of said storage section and supported by said spindles by means of bearing assemblies mounted in spaced opposed relation in said section, an improved bearing assembly comprising: a U-shaped saddle member including a base portion and a pair of oppositely disposed leg portions, said leg portions being pivotally mounted to said assembly and said base portion having a circumferential wall member extending therefrom to provide an open-ended slot box which receives said projecting spindle in nesting engagement therewith; a spring having one end fixed to said assembly and the other abutting a portion of said slot box forming circumferential wall to urge said box in canted position toward a roll insertion opening to pivotally remove an opposite portion of said circumferential wall and afford an open-ended U-shaped channel to receive said projecting spindle; and a longitudinally extending lock arm slidably mounted on said assembly having one end adapted to abut against said removed portion of said circumferential wall to pivot and lock said box in normal position after receiving said projecting spindles.

6. The apparatus of claim 5, and a pair of spaced longitudinally extending ramp members positioned on opposite sides of said slidable lock arm rising in a direction from that edge of said assembly closest to said roll insertion opening to a position adjacent said pivoted slot box to provide for support and centering of a rim of said roll of filter material.

References Cited

UNITED STATES PATENTS

953,657	3/1910	Aldhouse	248—267
1,196,935	9/1916	Du Mont	248—269
1,332,794	3/1920	Boland	248—268
1,544,550	7/1925	Barrett	248—268
1,635,700	7/1127	Bigelow	248—268
1,756,113	5/1930	Hequarty.	
1,982,639	12/1934	Christofferson	55—354 X
2,039,972	5/1936	Moore	248—268
2,226,581	12/1940	Richardson	248—267 X
2,579,440	12/1951	Palmer	55—354 X
2,689,607	9/1954	Loucony	248—267 X
2,722,993	11/1955	Gerber et al.	55—354
2,743,023	4/1956	Larson	248—215 X
2,954,954	10/1960	Larson	248—215
3,033,339	5/1962	Simms	242—55.53 X
3,175,873	3/1965	Blomquist et al.	312—287 X
3,237,827	3/1966	Di Domenico et al.	312—39 X

FOREIGN PATENTS

537,181	2/1957	Canada.
212,088	3/1924	Great Britain.
235,998	7/1925	Great Britain.
850,488	10/1960	Great Britain.

HARRY B. THORNTON, *Primary Examiner.*

D. TALBERT, *Assistant Examiner.*