April 11, 1939. J. A. ANDERSON ET AL 2,154,081

MACHINE FOR MAKING AIR CLEANER FILTER UNITS

Filed March 15, 1937 3 Sheets-Sheet 1

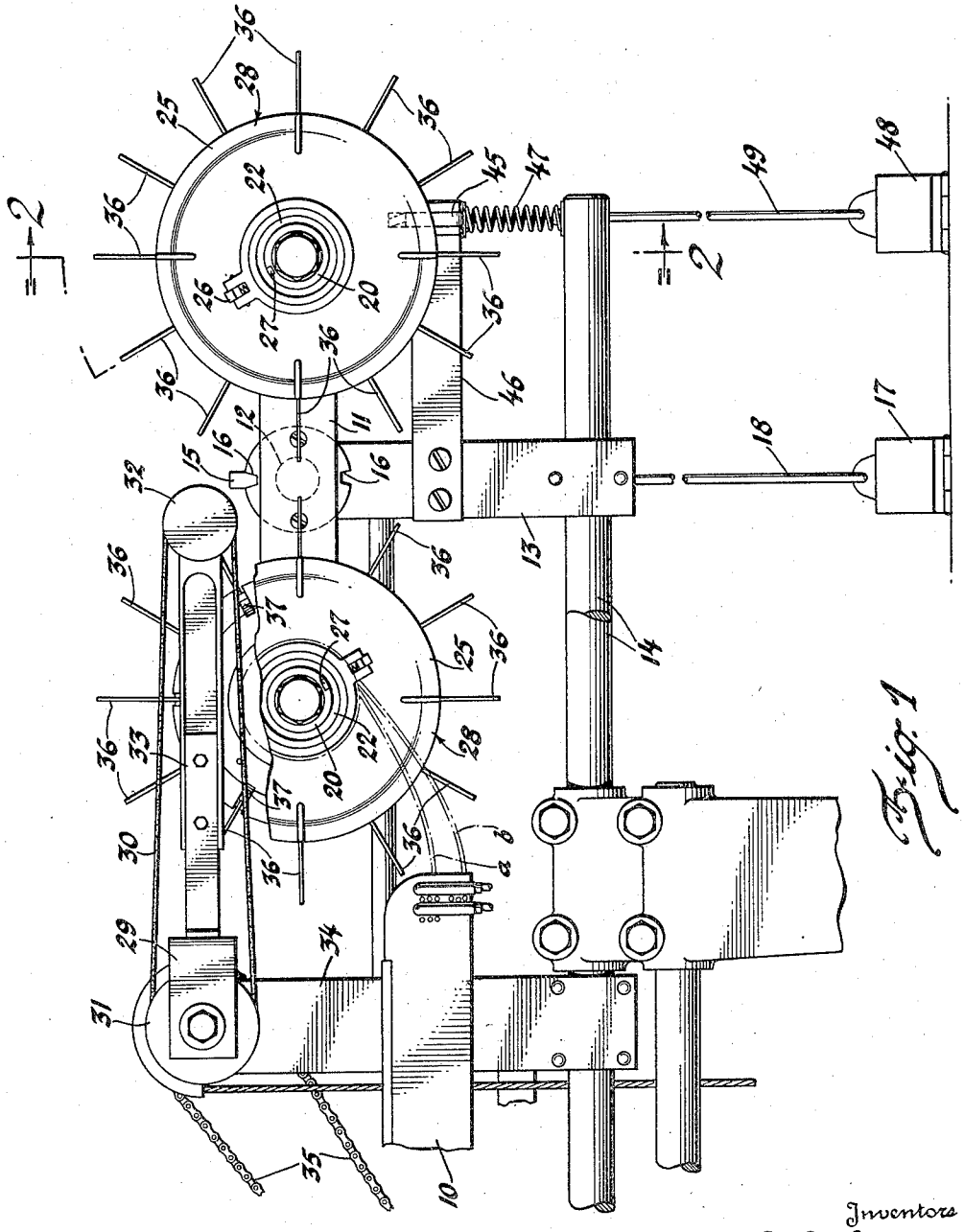



Fig. 1

Inventors
Joseph A. Anderson
Logan G. Hunt

By Blackmore, Spencer & Flint
Attorneys

April 11, 1939. J. A. ANDERSON ET AL 2,154,081

MACHINE FOR MAKING AIR CLEANER FILTER UNITS

Filed March 15, 1937 3 Sheets-Sheet 2

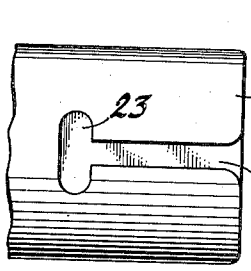



Fig. 3




Fig. 2

Inventors
Joseph A. Anderson
Logan G. Hunt
By Blackmore, Spencer & Flint
Attorneys

April 11, 1939. J. A. ANDERSON ET AL 2,154,081

MACHINE FOR MAKING AIR CLEANER FILTER UNITS

Filed March 15, 1937 3 Sheets-Sheet 3

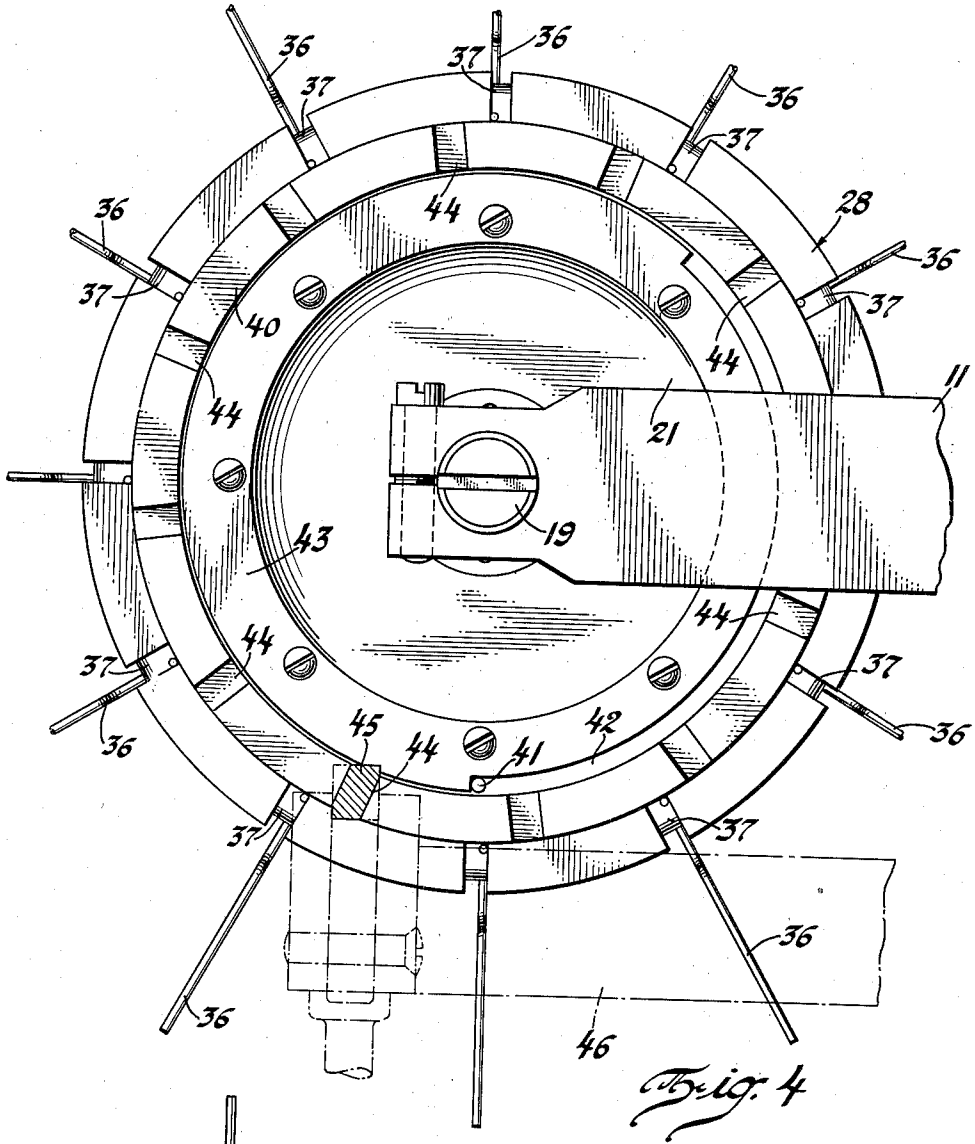



Fig. 4

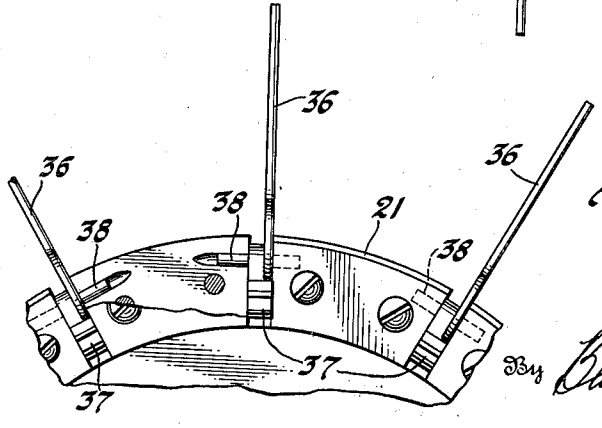



Fig. 5

Inventors
Joseph A. Anderson
Logan G. Hunt

By Blackwood, Spencer & Flick
Attorneys

Patented Apr. 11, 1939 2,154,081

# UNITED STATES PATENT OFFICE

2,154,081

## MACHINE FOR MAKING AIR CLEANER FILTER UNITS

Joseph A. Anderson and Logan G. Hunt, Flint, Mich., assignors to General Motors Corporation, Detroit, Mich., a corporation of Delaware

Application March 15, 1937, Serial No. 130,972

9 Claims. (Cl. 242—1)

This invention has to do with the manufacture of air cleaner filter units and, particularly, with the assembly with an element of an air cleaner filter unit on which a filter medium has been wound of a shell which encloses the filter medium. The principal object of the invention is to provide, in conjunction with mechanism for winding a filter medium on an element of an air cleaner filter unit, means which facilitates the assembly with the mentioned element of a shell which encloses the filter medium. For a better understanding of the nature and objects of this invention, reference is made to the following specification wherein there is described the preferred embodiment of the invention which is illustrated in the accompanying drawings.

In the accompanying drawings:

Figure 1 is a side elevation of a filter medium winding mechanism to which our invention is applied.

Figure 2 is an enlarged section taken as indicated by the line 2—2 of Figure 1.

Figure 3 is a side elevation of the outer end of the hub of a reel holder of the winding mechanism.

Figure 4 is a view taken as indicated by the line 4—4 of Figure 2.

Figure 5 is a fragmentary view of the side of the flange on the hub of the reel holder opposite that shown in Figure 4.

The winding mechanism shown in the drawings is of the type included in the machine disclosed in the Webb application Serial No. 98,556, which was filed on August 29, 1936. It includes a trough 10 and a bar 11 which is carried by a stub axle 12 which is secured to it at its center and journaled in the upper end of a post 13 which is secured to the main frame 14 of the machine so that the bar may swing in a vertical plane parallel to the length of the machine so that either end of it may be brought nearer the trough. So that the bar 11 may be locked in either of its horizontal positions, there is provided a dog 15 which may enter either of two notches 16 in the shoulder of the stub axle 12 and may be removed therefrom by a foot pedal 17 which is connected to it by a rod 18.

In each end of the bar 11, there is secured a spindle 19 on which there is mounted a reel holder 28 which includes a hub 20 with a flange 21 on its inner end which may rotate freely on the spindle. Around the outer end of the hub 20, there is telescoped a sleeve 22 which may rotate freely on it within the limits determined by a cross-groove 23 in the hub and a pin 24 which is secured in the sleeve and extends into the cross-groove. The outer end of the sleeve 22 is encircled by a plate 25 which is about equal in diameter to the flange 21 and releasably connected to the sleeve by a catch 26. So that the plate 25 and the sleeve 22 may be removed from the hub 20 as a unit, there is formed in the hub a groove 27 which extends from the cross-groove 23 to the outer end of the hub and through which the pin 24 may pass.

To rotate the reel holder 28 which is positioned nearest the trough 10, there is provided driving mechanism 29 which includes a belt 30 which passes around pulleys 31 and 32 mounted on the ends of a bar 33. The end of the bar 33 on which the pulley 31 is mounted is mounted on a post 34 which is secured to the main frame 14 of the machine so that the other end of the bar may be swung toward and away from the position in which the lower side of the belt 30 passes between the flange 21 and the plate 25 of the reel holder nearest the trough. To drive the belt 30, there is provided a chain 35.

On the outer edge of the flange 21, there are mounted, so that they may be swung toward and away from the axis of the spindle 19 in planes radial thereto, a number of fingers 36. Each of the fingers 36 is carried by a sectoral gear 37 which is mounted on a pin 38. The teeth of the gears 37 mesh with spiral threads 39 on a ring 40 which is mounted on the flange 21 so that it may rotate with respect thereto within the limits determined by a pin 41 secured in the ring 40 and a notch 42 in the ring 43 by which the ring 40 is retained on the flange 21.

In the rear face of each of the rings 40 there are formed notches 44 into any one of which a dog 45 which is pivoted on an arm 46 carried by the post 13 may, as the drawings show, enter when the reel holder is farthest from the trough 10. The dog 45 is urged toward the ring 40 of the reel holder which is farthest from the trough by a spring 47 but may be moved away from it by a pedal 48 which is connected to the dog by a rod 49.

The winding mechanism shown in the drawing was designed to wind two groups *a* and *b* of flattened and deformed metal strands around the center tube of the center tube and upper end wall assembly *c* of a filter unit of the type shown in Figure 2 of the drawings and thus produce the filter medium *d* of the unit. The filter unit includes a hollow annular member which is filled with the filter medium *d* and consists of the center tube and upper end wall assembly *c* which

has been mentioned and a cylindrical shell and lower end wall assembly *e*. In the end walls of the mentioned assemblies, there are formed series of radial slots separated by bars *f* and *g*. The elements of the cylindrical shell and lower end wall assembly *e* are made from one piece of metal and the elements of the center tube and upper end wall assembly *c*, together with the annular element *h* which constitutes a baffle and a filter unit supporting flange, constitute a subassembly separate therefrom.

Assuming that the parts of the winding mechanism are in the positions in which they are shown in the drawings, except that the fingers **36** are in the positions in which they are shown in broken lines in Figure 2 and there is no filter unit mounted on the reel holder **28** which is farthest from the trough **10**, a winding operation proceeds as follows:

The plate **25** and the sleeve **22** of the reel holder **28** which is farthest from the trough **10** are rotated to bring the pin **24** into line with the slot **27** in the hub **20** and then drawn off the outer end of the hub as a unit. After this, the center tube and upper end wall assembly *c* of a filter unit is impaled on the sleeve in the manner shown in Figure 2. Then, the plate **25** and sleeve **22** are replaced on the hub **20** so that the fingers **36** extend through slots in the end wall of the assembly *c* which is mounted thereon and turned counterclockwise when viewed as shown in Figure 1 to the limit permitted by the pin **41** and notch **42**. Since the dog **45** prevents the ring **40** from rotating, this operation causes the fingers **36** to move from the positions in which they are shown in broken lines in Figure 2 to the positions in which they are shown in solid lines and will not interfere with the operation of winding a filter medium on the center tube of the assembly *c*. Then the outer end of the driving mechanism **29** is lifted to clear it of the reel holder **28** nearest the trough **10**, the dogs **15** and **45** retracted and the bar **11** swung end for end to reverse the positions of the two reel holders. Then the dogs **15** and **45** are released to hold the bar **11** in its new position and the ring **40** of the reel holder now farthest from the trough against rotation. After this, the ends of the two groups *a* and *b* of strands which extend beyond the trough are given a turn around the center tube of the assembly *c* mounted on the reel holder nearest the trough and the outer end of the driving mechanism **29** lowered until the belt **30** comes into contact with the groups of strands wrapped around the center tube. Then the machine is started with the result that the groups *a* and *b* of strands are advanced through the trough **10** and wound on the center tube of the assembly *c* as they emerge from the trough.

While the groups of strands are being wound on the center tube of the assembly *c* mounted on the reel holder **28** nearest the trough **10**, another assembly *c* is mounted on the reel holder farthest from the trough in the manner previously described. After enough of the groups of strands to overfill slightly the assembly *c* mounted on the reel holder nearest the trough has been wound on it, the machine is stopped, the outer end of the driving mechanism **29** lifted, the groups of strands severed, the dogs **15** and **45** retracted and the bar **11** again turned end for end to reverse the positions of the two reel holders. Then the dogs **15** and **45** are again released, the groups *a* and *b* of strands given a turn around the center tube of the empty assembly *c*, the outer end of the driving mechanism **29** lowered into place and the machine started again.

While the groups of strands are being wound on the center tube of the empty assembly *c*, the plate **25** of the reel holder **28** farthest from the trough is turned in a clockwise direction when viewed as shown in Figure 1. This operation moves the fingers **36** from the positions in which they are shown in solid lines to the positions in which they are shown in broken lines in Figure 2 and compresses and confines the filter medium *d* which has been wound on the center tube within a circumference smaller than that of the cylindrical shell of the assembly *e*. Then the catch **26** which connects the plate **25** to the sleeve **22** is disengaged from the sleeve, the plate drawn off the outer end of the sleeve and a cylindrical shell and lower end wall assembly *e* of a filter unit slid over the outer end of the hub **20** and sleeve until the upper end of the shell is telescoped around the outer edge of the upper wall and the inner edge of the lower wall is telescoped around the lower end of the center tube of the assembly *c*. The fingers **36** effectively confine the filter medium *d* which has been wound on the center tube of the assembly *c* within a circumference less than that of the cylindrical shell of the assembly *e* and, therefore, eliminate all difficulty in assembling the assembly *e* with the assembly *c* due to the oversize of the filter medium or loose ends or turns on it. After the assembly *e* has been assembled with the assembly *c*, the plate **25** is replaced and latched on the sleeve **22**. Then the plate and the sleeve, together with the filter unit impaled on the latter, are drawn off the outer end of the hub **20**. After this, the filter unit is drawn as a unit off the sleeve **22** and replaced by an empty assembly *c* and the whole cycle of operations which have been described repeated.

We claim:

1. In winding mechanism, a member around which a body may be wound, means mounted on the member for confining the body circumferentially after it is wound movable to a position in which it does not interfere with the operation of winding the body around the member, and means mounted on the member for holding the first mentioned means in the position in which it does not interfere with the operation of winding the body around the member.

2. In winding mechanism, a member around which a body may be wound, fingers mounted on the member for confining the body circumferentially after it is wound movable to a position in which they do not interfere with the operation of winding the body around the member, and means mounted on the member for conjointly moving the fingers from one to the other of their positions.

3. In winding mechanism, a member around which a body may be wound, means for confining the body circumferentially after it is wound movable to a position in which it does not interfere with the operation of winding the body around the member, and means rotatable with respect to the member for moving the first specified means from one to the other of its position.

4. In winding mechanism, a member around which a body may be wound, fingers for confining the body circumferentially after it is wound movable to a position in which they do not interfere with the operation of winding the body around the member, and means by which the

fingers may be moved by rotation of the member, including an element mounted on and rotatable with respect to the member and geared to the fingers, and means for preventing rotation of the element.

5. In apparatus for facilitating the assembly of a shell and end wall assembly with a tube and perforated end wall assembly wound with a filter medium, fingers which may be inserted through perforations in the last mentioned end wall to confine the filter medium within a circumference less than that of the shell.

6. In apparatus for facilitating the assembly of a shell with a perforated end wall with a filter medium on it, fingers which may be inserted through perforations in the end wall to confine the filter medium within a circumference less than that of the shell.

7. In winding mechanism, a rotatable member with fingers on it on which a perforated end wall of a filter unit may be mounted impaled on the fingers, the fingers being movable from a position in which they do not interfere with the operation of winding a filter medium around the member to a position in which they confine the filter medium circumferentially after it is wound on the member.

8. In winding mechanism, a rotatable member with fingers on it on which a tube and perforated end wall assembly of a filter unit may be mounted with the perforated end wall impaled on the fingers, and means rotatable with respect to the member for moving the fingers from a position in which they do not interfere with the operation of winding a filter medium around the tube to a position in which they confine the filter medium circumferentially after it is wound.

9. In winding mechanism, a member around which a body may be wound, means mounted on the member for confining the body circumferentially after it is wound movable to a position in which it does not interfere with the operation of winding the body around the member, and means mounted on the member for moving the first mentioned means from the first mentioned to the last mentioned position and vice versa and holding it in either position.

JOSEPH A. ANDERSON.
LOGAN G. HUNT.