Dec. 1, 1964 A. E. REVELL 3,159,471

FLUID TREATING STRUCTURE FOR ELECTROSTATIC PRECIPITATORS

Filed Dec. 27, 1960

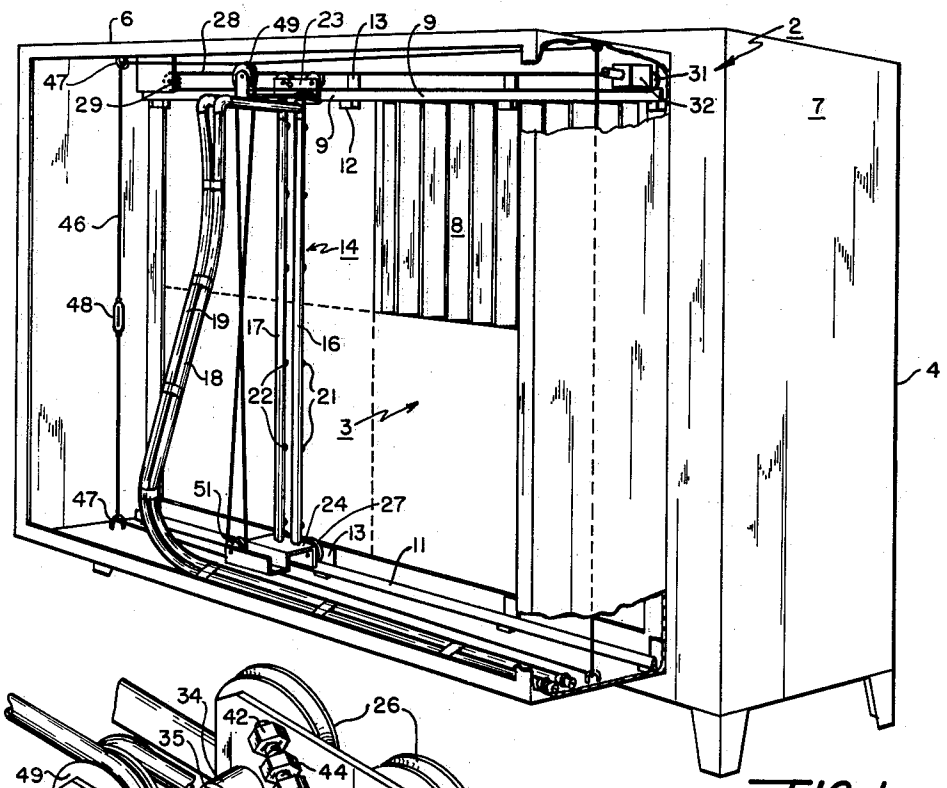

FIG. 1

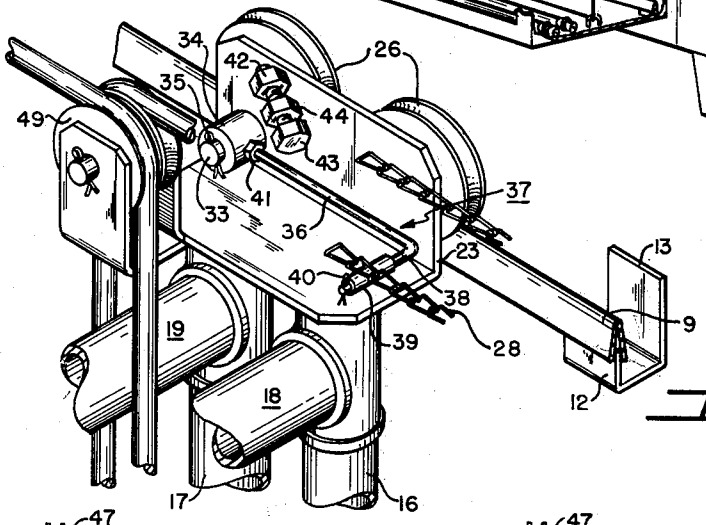

FIG. 2

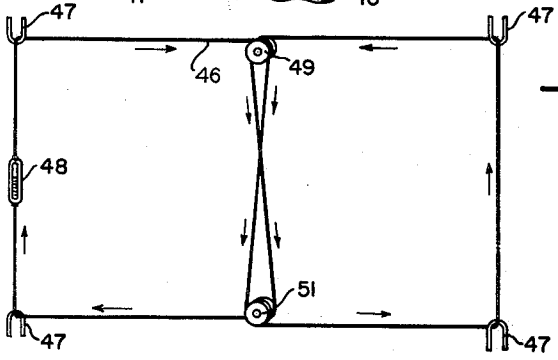

FIG. 3

INVENTOR.
ALAN E. REVELL

BY

Ralph B. Brick
ATTORNEY

United States Patent Office 3,159,471 Patented Dec. 1, 1964

3,159,471

FLUID TREATING STRUCTURE FOR ELECTROSTATIC PRECIPITATORS

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

Filed Dec. 27, 1960, Ser. No. 78,357
3 Claims. (Cl. 55—118)

The present invention relates to electrostatic precipitators and more particularly to fluid treating structure therefor.

As is well known in the electrostatic precipitator art, gas cleaning electrodes of precipitator apparatus become coated with collected matter which is subsequently washed away by fluid treating structure associated with the precipitator, such fluid treating structure also serving to spray adhesive upon the gas cleaning electrodes so that the electrodes might more effectively retain collected matter during precipitating operations.

The present invention provides a straight-forward, economical and efficient fluid treating structure for electrostatic precipitators, including fluid header assembly apparatus which can be readily and efficiently moved back and forth across the face of gas cleaning electrodes of precipitators with only momentary dwell periods as the header assembly changes course of direction. Thus, in accordance with the present invention, a reduced time in fluid treating operations and a more uniform, efficient fluid treatment of the precipitator apparatus is obtained. In addition, the present invention provides new and useful guide structure for fluid header assembly apparatus, the guide structure of the present invention assuring that the header assembly is maintained in erect and proper alignment during its movement across the face of the gas cleaning electrodes.

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

More particularly, the present invention provides in an electrostatic precipitator including a housing having spaced opposed gas inlet and gas outlet openings and a gas cleaning means disposed within the housing intermediate the gas inlet and gas outlet openings, fluid treating structure for the gas cleaning means comprising spaced parallel track members mounted on opposite sides of an opening of the housing, fluid header assembly means extending between the spaced track members, spaced track followers mounted on the header assembly means to ride on the track members, endless belt means powered to move the header assembly means along the track members, a connecting arm having one end pivotally mounted to the header assembly means and the other end joined to a portion of the endless belt means, stop means arranged to engage against the connecting arm as that portion of the endless belt means to which the connecting arm is joined changes from one of the flights of the endless belt means to the other, and guide-cable means disposed adjacent to and extending along the spaced track members, the guide-cable means further extending along and being cooperative with the fluid header assembly means to guide and maintain the header assembly means in erect position as it passes along the track members.

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 discloses one advantageous embodiment of the present invention:

FIGURE 1 is a partially broken perspective view of an

electrostatic precipitator incorporating the inventive fluid treating structure;

FIGURE 2 is an enlarged perspective view of the upper portion of the fluid header assembly means of FIGURE 1, disclosing the connecting arm and stop means therefor in detail; and,

FIGURE 3 is a schematic diagram of the guide-cable means for the header assembly of FIGURES 1 and 2.

Referring to FIGURE 1 of the drawings, open-ended electrical precipitator housing 2 is disclosed having spaced, opposed, upstream gas inlet opening 3 and downstream gas outlet opening 4. Housing 2 includes an upstream, open-ended housing section 6 which incorporates the fluid treating structure and a downstream open-ended housing section 7 communicating with housing section 6 and serving to house gas cleaning means indicated broadly by reference numeral 8. Gas cleaning means 8, which includes an ionizing section and a collector section, can be arranged in any one of several manners known in the art. Since the gas cleaning means, itself, does not constitute a critical part of the present invention, it is not described in detail herein.

Extending horizontally across housing section 6 in spaced parallel relationship on either side of gas inlet opening 3 are upper and lower track members 9, 11, respectively. Advantageously, track members 9, 11 can be U-shaped in cross section and are supported in position by engaging in interlocking fashion with vertically extending tongue portions 12 of spaced support brackets 13 (FIGURE 2). Support brackets 13 are fastened to a side wall of housing section 6 on either side of gas inlet opening 3 by some suitable means such as welding or riveting. Mounted to ride along spaced track members 9, 11 in vertically extending position therebetween is fluid header assembly 14. Assembly 14 includes spaced, vertically extending washing and adhesive conduits 16, 17, respectively, which are connected to suitable fluid supply sources (not shown) through hose connecting arrangements 18, 19, respectively. It is to be noted that conduits 16 and 17 each have sets of spaced nozzles 21, 22, respectively, disposed therealong, these nozzles serving to distribute fluid from their conduits to gas cleaning means 8. It is to be understood that any one of a number of known control arrangements can be connected to the washer assembly arrangement herein described in order to insure a cycling of fluid through conduits 16, 17. Since the control arrangement does not constitute an essential part of the present invention, details thereof are not disclosed herein.

Fastened to the upper extremities of conduits 16, 17 is an upper carriage plate 23 of right angle cross-section and fastened to the lower extremities of conduits 16, 17 is a lower carriage plate 24 of S-shaped cross-section. The vertically extending leg of upper carriage plate 23 is arranged to carry a set of track followers in the form of spaced and rotatably mounted rollers 26 which are slotted to ride securely on upper track member 9. In like fashion, lower carriage plate 24 is arranged to carry a set of track followers in the form of spaced rollers 27 slotted to ride securely on lower track member 11.

To move spaced upper and lower carriages 23 and 24 of header assembly 14 along the tracks 9, 11, respectively, endless belt 28 is provided. Belt 28, which is in the form of an endless ladder chain, is mounted in horizontally extending position in housing section 6 to engage with idler sprocket 29 and horizontally spaced and aligned drive sprocket 31. These spaced sprockets are mounted in housing section 6 above and adjacent track member 9. A suitable gear-motor 32, electrically connected to a power source (not shown), serves to drive sprocket 31 and move endless belt 28 through its flights.

It is to be noted that the vertical leg of carriage 23 is

provided with a pin 33 integral therewith and extending at right angles thereto. Pin 33 serves to rotatably support sleeve 34 which is slipped thereon and which is held in position by a suitable cotter pin 35 cooperating with the free extremity of pin 33. The side wall of sleeve 34 is provided with a threaded recess to receive the threaded end of leg 36 of right angle connecting arm 37. The other leg 38 of arm 37 passes through sleeve 39, which sleeve is fixed by some suitable means such as welding to one of the links of endless belt 28. A suitable cotter pin 40 cooperating with the extremity of leg 38 serves to retain leg 38 in position in sleeve 39 and a suitable jam nut 41 serves to maintain leg 36 in position in sleeve 34. It further is to be noted that the vertical leg of carriage 23 also has fastened thereto and extending at a right angle therefrom above pin 33, retaining nut 42. Stop 43 in the form of a threaded bolt engages in nut 42 and is fastened in selected position by means of jam nut 44 carried on the stop.

In operation of the apparatus described, and assuming the gear-motor 32 is arranged to turn drive sprocket 31 in counter-clockwise direction, the lower flight of endless belt 28 moves along a path in a direction away from idler sprocket 29 and towards drive sprocket 31. The header assembly 14, which is connected to belt 28 through connecting arm 37 on carriage 23 and sleeve 39 on the belt, moves along spaced track members 9, 11 therewith. As sleeve 39 on belt 28 passes from the lower flight of the belt to the upper flight about drive sprocket 31 and, at the furthest extremity of the endless belt path, the direction of motion of sleeve 39 is changed and the header assembly 14 is moved in a reverse direction along a path in a direction away from drive sprocket 31 toward idler sprocket 29, there being only a momentary dwell period with such direction change. At the point at which sleeve 39 enters into the linear, horizontal path of movement of the upper flight of belt 28, leg 36 of connecting arm 37 abuts against stop 43 to stop rotation of arm 37 about pin 33. Thus, connecting arm 37 and sleeve 39 do not raise above the level of the linear, horizontal path of movement of the upper flight of the belt to possibly cause the belt to be displaced from the sprockets 29, 31. It is to be noted that stop 43 can be adjusted to accommodate for any tolerance differences in the structure. It further is to be noted that the length of leg 36 of connecting arm 37, as well as the angle which is formed between the center line of the arm when it is resting against stop 43 and the linear path of horizontal travel of the belt must be adjusted to permit movement of sleeve 39 from the lower to the upper flight of belt 28 without lifting the belt away from its sprockets or the assembly 14 from its tracks 9, 11. This length and angle also must be such as to permit movement of sleeve 39 from the upper to the lower flight of belt 28 at the other extremity of the endless belt providing, at the same time, a horizontal component of force sufficient to overcome the inertial resisting forces of the header assembly. In this connection, it is to be understood that the length of arm 36 and the aforedescribed angle will vary in accordance with the size of the sprockets on which the belt is mounted and the mass of the header assembly moved by the belt.

To guide header assembly 14 in its back and forth movement along tracks 9, 11 and to hold assembly 14 in erect position, an endless guide-cable 46 is mounted along the peripheral inner wall of housing section 6 to surround gas inlet opening 3. Cable 46 is arranged to pass through a set of guide straps 47, one strap of the set being mounted at each of the four corners of the section 6. It is to be noted that a suitable turn-buckle 48 is provided with the guide-cable to maintain the same in proper tension. The cable 46 is connected to header assembly 14 through spaced, aligned sheave pairs 49, 51 rotatably mounted on upper and lower carriages 23, 24, respectively. In this connection, it also is to be noted that one end of cable 46 is fastened to one end of turn-buckle 48, passing from there through one of the two upper corner guide straps 47, along upper track member 9, over one of the sheaves of sheave pair 49, down along header assembly 14, under one of the sheaves of sheave pair 51, along track member 11 through one of the two lower corner guide straps 47 diametrically opposite the upper guide strap through which the cable has previously passed, up along a side wall of housing section 6 through the other upper guide strap, along track member 9, over the other sheave of sheave pair 48, down along header assembly 14, around the other sheave of sheave pair 51, through the other lower guide strap and to the other end of turn-buckle 48. With such an arrangement and with the guide-cable held in proper tension by turn-buckle 48, equal and opposite torsional forces are exerted on header assembly 14 by the guide-cable 46 intertwined therewith and, thus, the assembly is maintained in guided and erect position.

The invention claimed is:

1. In an electrostatic precipitator including a housing having spaced opposed gas inlet and gas outlet openings and gas cleaning means disposed within said housing intermediate said gas inlet and gas outlet openings and extending thereacross, a fluid treating structure for said gas cleaning means comprising spaced parallel upper and lower track members mounted in horizontally extending position adjacent to and on opposite sides of said gas inlet opening to extend beyond the extremities thereof, fluid header assembly means vertically extending between said spaced horizontally mounted track members and including fluid distributing nozzles positioned to distribute fluid to said gas cleaning means, spaced rollers rotatably mounted on said fluid header assembly means at the extremities thereof to engage with and ride on said track members, endless belt means including a pair of spaced sprockets rotatably mounted adjacent the opposite extremities of one of said track members and having an endless belt engaged thereon to provide upper and lower horizontal flights co-extensive with said track member, power means to drive one of said sprockets and said endless belt engaged thereon, a connecting arm including a body portion extending longitudinally of said endless belt between and connecting the adjacent extremity of said header assembly means with one of the flights of said endless belt, one end of said connecting arm being pivotally mounted to said fluid header assembly means with said body portion of said arm extending normal to the pivotal axis and along said endless belt, the other end of said arm being fixed to a portion of a flight of said endless belt, said body portion of said connecting arm being of a preselected length to insure fluid treatment along the over-all breadth of said gas cleaning means and yet sufficient to allow said end fastened to said endless belt to change from one flight thereof to the other, and stop means mounted on said header assembly in spaced relation from the pivotally mounted end of said connecting arm whereby said body portion of said connecting arm engages against said stop means at the moment said portion of said endless belt means to which said connecting arm is fastened enters one flight of the belt from the other.

2. The apparatus of claim 1, including a pair of spaced guide cable sheaves mounted substantially at opposite extremities of said vertically extending fluid header assembly means, and guide cable means comprising a first cable section extending in a direction from a position adjacent one of the ends of a first of said spaced track members, along said first track member, around a portion of a guide-cable sheave at a first extremity of said header assembly, longitudinally and co-extensively along said header assembly, around a portion of a guide-cable sheave at the other extremity of said header assembly, along the second track member in the same direction as it extends along said first track member to a position ad-

jacent one of the ends of said second track member, and a second cable section extending in an opposite direction from a position adjacent the other of the ends of said first of said spaced track members, along said first track member, around a portion of a guide-cable sheave at the first extremity of said header assembly, longitudinally and co-extensively along said header assembly, around a portion of a guide-cable sheave at the other extremity of said header assembly and along the second track member in the same direction as it extends along said first track member to a position adjacent the other of the ends of said second track member.

3. In an electrostatic precipitator including an open-ended housing having spaced opposed gas inlet and gas outlet openings and a gas cleaning means disposed within said housing intermediate said gas inlet and gas outlet openings, a fluid treating structure for said gas cleaning means comprising spaced parallel track members mounted on opposite sides of an opening of said housing, fluid header assembly means including fluid distributing nozzles to distribute fluid to said gas cleaning means extending between said spaced track members, spaced track followers mounted on said header assembly means, said followers being positioned to ride on said track members, power means to move said header assembly along said track members, a pair of spaced guide-cable sheaves mounted substantially at the opposite extremities of said fluid header assembly means, and a guide cable means comprising a first cable section extending in a direction

from a position adjacent one of the ends of a first of said spaced track members, along said first track member, around a portion of a guide-cable sheave at a first extremity of said header assembly, longitudinally and co-extensively along said header assembly, around a portion of a guide-cable sheave at the other extremity of said header assembly, along the second track member in the same direction as it extends along said first track member to a position adjacent one of the ends of said second track member, and a second cable section extending in an opposite direction from a position adjacent the other of the ends of said first of said spaced track members, along said first track member, around a portion of a guide-cable sheave at the first extremity of said header assembly, longitudinally and co-extensively along said header assembly, around a portion of a guide-cable sheave at the other extremity of said header assembly and along the second track member in the same direction as it extends along said first track member to a position adjacent the other of the ends of said second track member.

References Cited in the file of this patent

UNITED STATES PATENTS

2,333,551	Pegg	Nov. 2, 1943
2,448,045	Pegg	Aug. 31, 1948
2,448,046	Penney et al.	Aug. 31, 1948
2,591,404	Carlson	Apr. 1, 1952
2,737,257	Warburton	Mar. 6, 1956
2,910,993	Phillips	Nov. 3, 1959