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3,608,125

POWER SUPPLY FOR SOOT BLOWERS

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2 Sheets-Sheet 1

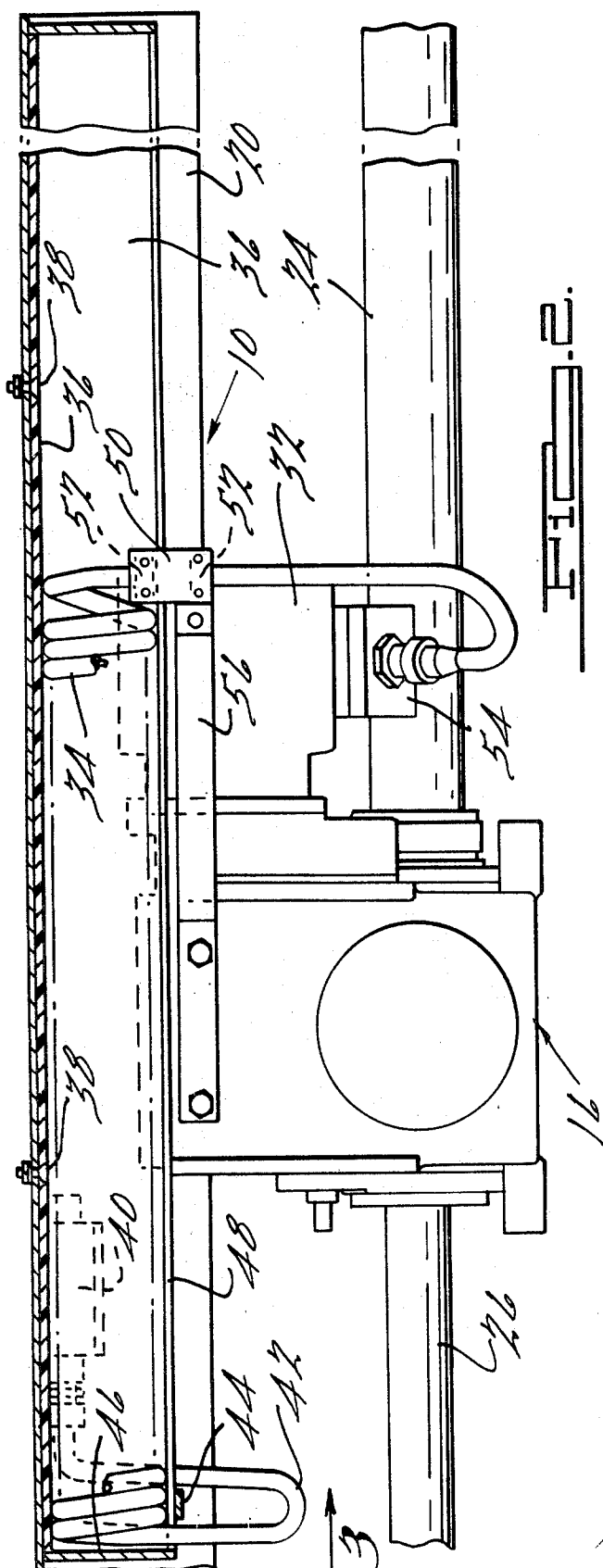


FIG. 2.

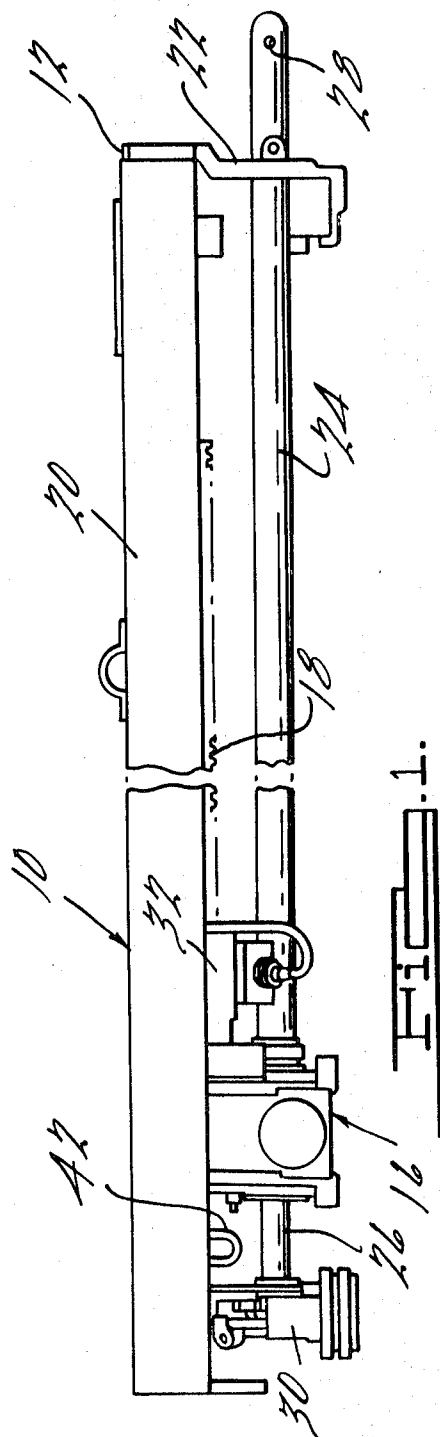


FIG. 1.

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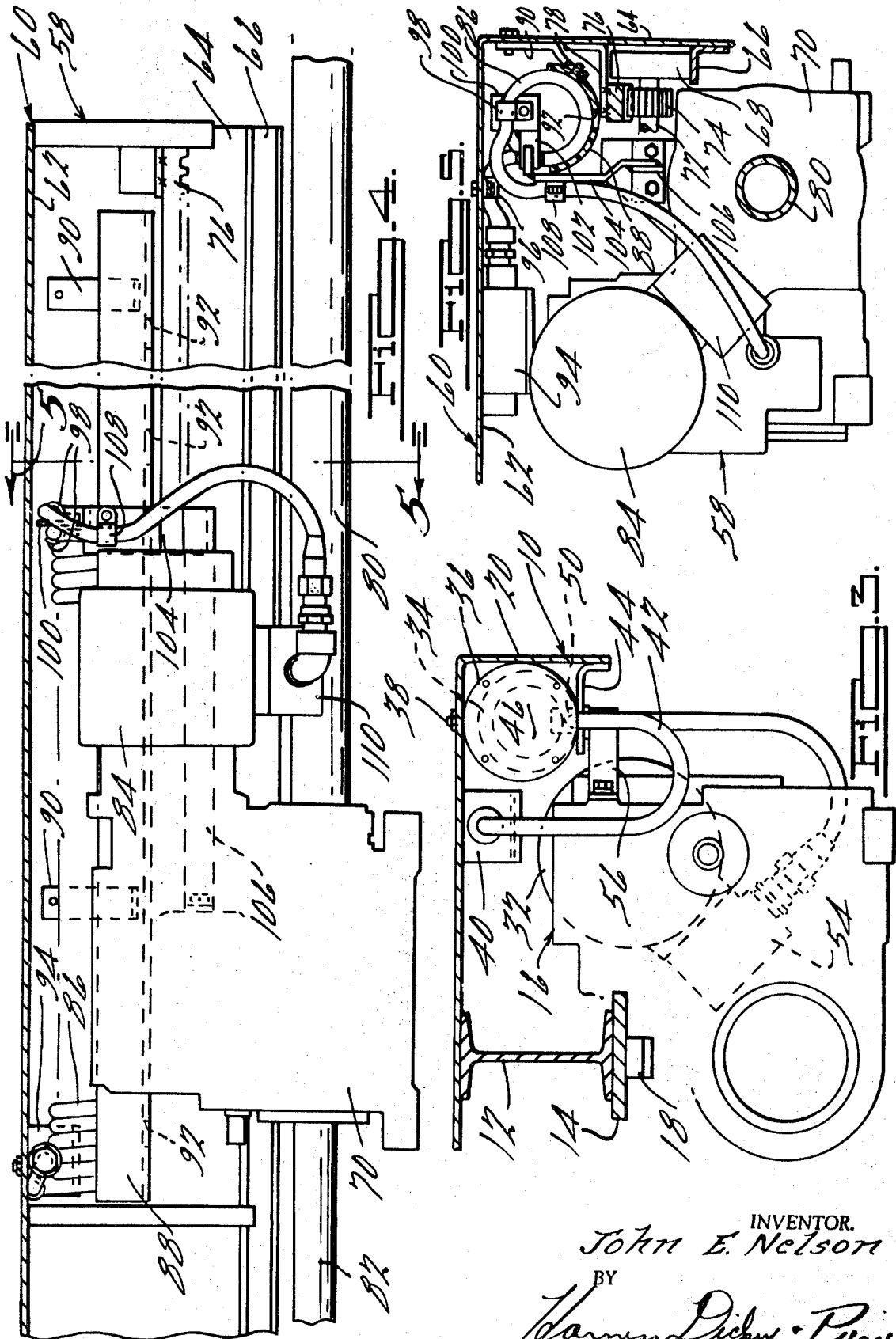
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POWER SUPPLY FOR SOOT BLOWERS

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10 Claims

ABSTRACT OF THE DISCLOSURE

A soot blower having a motor driven carriage mounted for travel along a frame including an elongated guide disposed adjacent to the path of travel of the carriage in which a helically wound conductor is disposed for supplying power to the carriage and which conductor is extensible between a substantially nested compact condition and an open expanded condition in response to the movement of the carriage.

BACKGROUND OF THE INVENTION

The present invention broadly relates to apparatus for cleaning the heat exchanger surfaces of furnaces and particularly high pressure steam boilers and the like. More specifically, the present invention is concerned with an improved power supply for soot blowers of the so-called long travel type which incorporate a power driven carriage mounted on a frame. The carriage supports a lance tube which is reciprocated and rotated during the course of the travel of the carriage from a retracted position in which the nozzle end of the lance tube is positioned within a port in the wall of a heat exchanger apparatus and a projected position in which the nozzle end traverses the heat exchanger surfaces within the boiler. A suitable pressurized cleaning fluid is discharged from one or more nozzles provided in the end portion of the lance tube which impinges on the heat exchanger surfaces effecting a dislodgment of accumulated deposits such as soot and slag therefrom thereby maintaining optimum operating efficiency of the boiler.

In soot blowers of the specific type to which the present invention is applicable, the travel of the carriage along the frame is accomplished by a motor connected to a suitable gear box on the carriage incorporating a driven gear or pinion that is adapted to engage a suitable rack mounted on the framework for effecting translation of the carriage and the lance tube carried thereby. The gear box ordinarily also incorporates gearing for effecting a concurrent rotation of the lance tube during translatory movement thereof, whereby the pressurized cleaning fluid is discharged in the form of a helical blowing pattern from the nozzles provided in the forward end of the lance tube.

There has been a continuing problem in connection with soot blowers of the foregoing type in providing a simple, durable and substantially maintenance-free arrangement for supplying power to the motor on the carriage in all moved positions thereof. In soot blowers of the long retracting type, it has been the practice in some installations when reversible electric motors are employed on the carriage to include conductor rails extending longitudinally of the path of travel of the carriage from which electric power is withdrawn by means of a suitable trolley movably mounted on the conductors. This construction, in spite of various shielding arrangements, does present a danger to operators and servicemen and also has occasioned service problems due to the accumulation of soot and fly ash carried by the atmosphere on the conductor rails. In installations where a fluid-type reversible motor such as an air motor or hydraulic motor is employed, difficulty has been encountered in arranging the

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hose or conductor to minimize the space required and avoid interference with the other moving parts of the soot blower while at the same time avoiding any kinking or excessive deformation of the conductor resulting in a restriction in the free transfer of the motive fluid to the fluid motor. The abrasive characteristics of fly ash and soot that generally accumulate in and around soot blower installations has also contributed to excessive wear of such conductors or hoses in installations of the types heretofore known.

The improved power supply arrangement of the present invention overcomes the problems associated with power supply installations of the types heretofore known providing a simple, economical and compact installation which is readily adaptable for supplying electrical or fluid power to a motor on a carriage of long retracting type soot blowers and which, furthermore, embodies a self-cleaning feature.

SUMMARY OF THE INVENTION

The advantages and benefits of the present invention are achieved by a soot blower including a motor driven carriage movably mounted on a frame which includes a guide extending longitudinally of the path of travel of the carriage and within which guide a helically wound conductor is disposed having one of its ends stationarily connected to the frame and the other end thereof to the carriage motor. The helically wound conductor is extensible within the guide between a substantially nested compact condition to an open helically expanded condition in response to the travel of the carriage in one direction along the frame and from the expanded condition to the compact condition by pusher means on the carriage disposed in pushing relationship with the end portion of the conductor in response to the travel of the carriage in the opposite direction. In accordance with a preferred embodiment of the present invention, the guide is so constructed that its surfaces are of a low friction plastic material and is formed with apertures therein through which any inadvertent accumulation of slag or other contaminants is discharged in response to a sweeping action of the helical conductor during its extending and compacting movement.

Additional advantages and benefits of the present invention will become apparent upon a reading of the description of the preferred embodiments taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a fragmentary side elevational view of a typical soot blower of the long retracting type to which the present invention is applicable;

FIG. 2 is an enlarged fragmentary side elevational view partly in section illustrating the disposition of the helically wound conductor in a guide adjacent to the path of travel of the carriage;

FIG. 3 is an end elevational view partly in section of the soot blower shown in FIG. 2, as viewed in the direction of the arrow indicated at 3;

FIG. 4 is a fragmentary side elevational view partly in section of an alternative guide and helical conductor installation for a soot blower having a substantially closed housing; and

FIG. 5 is a transverse vertical sectional view through the soot blower shown in FIG. 4 and taken substantially along the line 5—5 thereof.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now in detail to the drawings and as may be best seen in FIGS. 1-3, a long retracting type soot blower 10 is illustrated incorporating the improved power supply

device constructed in accordance with one of the embodiments of the present invention. The soot blower 10 comprises a frame consisting of an elongated I-beam 12 having a track plate 14 affixed to the lower flange thereof as shown in FIG. 3 on the projecting side edges of which a carriage 16 is adapted to be movably suspended. A rack 18 is affixed centrally of and on the lower surface of the track plate 14 which is adapted to be disposed in constant meshing relationship with a pinion gear (not shown) drivingly coupled to the drive train of the carriage. The soot blower frame additionally includes and inverted U-shaped housing 20 which is affixed to the I-beam 12 and extends for substantially the entire length of the soot blower serving as a cover or shield to shelter the carriage and other soot blower components from the elements and any falling fly ash. A front support roller bracket 22 is attached to the forward end of the frame as shown in FIG. 1, and is adapted to slidably and rotatably support a lance tube 24 extending longitudinally of the frame having its rearward end rotatably supported by the carriage 16.

The soot blower is adapted to be mounted adjacent to a port in the wall of a heat exchanger or boiler apparatus such that the forward end of the lance tube 24 when the carriage and lance tube are in a fully retracted position as shown in FIG. 1 is retracted within the wall port out of direct contact with the hot combustion gases within the heat exchanger apparatus. A stationary feed tube 26 is slidably and telescopically disposed within the lance tube 24 for supplying a pressurized cleaning fluid such as steam or air to the interior of the lance tube which in turn is discharged from one or more nozzles 28 provided in the forward end portion of the lance tube. The rearward end of the feed tube 26 is secured to a supply valve 30 which in turn is connected to a suitable header (not shown) containing the pressurized blowing medium. The supply valve 30 is adapted to be actuated in response to the travel of the carriage, effecting an opening thereof during the initial travel of the carriage toward the projected position and a closing thereof during the return travel of the carriage before the nozzle end of the lance tube is again withdrawn within the wall port.

In the specific embodiment illustrated in FIGS. 1-3, the travel of the carriage to and from the retracted and projected positions, as well as a rotation of the lance tube during its translatory travel, is achieved by a reversible motor 32 mounted directly on the carriage and drivingly connected to a gear drive arrangement disposed within the carriage housing. The operating sequence of the soot blower can be manually or remotely controlled whereby each of a plurality of such soot blowers are operated in a pre-selected sequence to achieve intermittent cleaning of the heat exchanger surfaces of the apparatus. Initiation of the operating cycle of the soot blower is achieved through a suitable electrical switching device or remotely actuable fluid control valve whereby the motor 32 is energized causing it to initiate its movement toward the projected position in accordance with the cycle as previously described. In order to provide a supply of power to the motor 32 of the soot blower during all moved positions of the carriage, an extensible and contractable helically wound conductor 34 is provided which is adaptable for use in connection with fluid-type motors as well as the electrical motor 32 as exemplarily shown in the drawings.

The helically wound conductor 34 as best seen in FIGS. 2 and 3 is disposed within a guide tube 36 extending longitudinally of the path of travel of the carriage and for the entire length of travel thereof. The guide tube is securely fastened within the corner of the U-shaped housing 20 of the frame by means of a series of flat-head machine screws 38 disposed at longitudinally spaced intervals therealong. The guide tube 36 preferably is composed of a plastic material of a type having a relatively low coefficient of friction to facilitate the sliding movement of the coils of the helical conductor during its expanding and contracting

movement. Alternatively, the tube may be provided with a lining of such low friction material. In addition to providing a low friction surface, the guide tube composed of plastic or provided with a plastic lining also provides an electrical insulating barrier or shield between the soot blower framework, providing increased safety in installations using an electrical conductor which may become worn or frayed during long periods of use. In installations in which the conductor is a pressurized air hose, the guide tube serves as a protective sheath serving to contain the hose in the event it should rupture or inadvertently become disconnected during use.

The conductor 34 is connected at its rearward end to a suitable junction box 40 stationarily affixed to the underside of the frame housing 20 and extends therefrom in the form of a depending loop 42 upwardly and into the rear end portion of the guide tube 36 rearwardly of an L-shaped strap 44 affixed to the depending inner side surface of the housing 20. As will be noted in FIGS. 2 and 3, the end of the guide tube adjacent to the junction box 40 is provided with a removable cover plate 46 for facilitating installation of the helically wound conductor. It will be further noted that the guide tube is provided with a longitudinally extending slot 48 in the lower center portion thereof which extends for substantially the entire length of the guide tube. This slot provides the dual function of providing access of a pusher bracket 50 to within the interior of the guide tube as well as providing a discharge chute of any accumulated contamination in accordance with the self-cleaning feature of the apparatus as subsequently to be described.

The forward end portion of the conductor 34 is fastened to the pusher bracket 50 by means of straps 52 and extends therefrom downwardly through the longitudinal slot 48 and is appropriately connected to a junction box 54 on the motor 32. The pusher bracket 50 is securely fastened to the forward end of an arm 56 bolted on the side of the carriage housing, as best seen in FIGS. 2 and 3.

The helically wound conductor may be of any one of a variety of suitable materials which are sufficiently resilient to enable deflection of the conductor from a substantially nested compact condition as shown in FIG. 2 to an expanded condition in which the individual coils of the conductor are disposed in an open spiral condition. The diameter of the coils comprising the helically wound conductor are slightly smaller than the inner diameter of the guide tube so as to provide a sliding clearance fit therebetween. The diameter and number of coils provided in the helically wound conductor is selected so as to enable the carriage to travel from one position to the opposite extreme position while still retaining an open spiral configuration in the conductor. In order to restore the conductor to its appropriate substantially nested compact condition after being fully extended, the inner projecting portion of the pusher bracket 50 is adapted to contact or engage the lower forward portion of the coils of the conductor effecting a progressive compaction thereof in response to the movement of the carriage in a direction opposite to that in which an extension or expansion of the conductor occurred.

It will be apparent from the foregoing arrangement than an extension and compaction of the helical conductor is achieved in response to the travel of the carriage in opposite directions. Due to the presence of contaminating substances including dust and fly ash in the atmosphere surrounding the soot blower, some such foreign particles will enter the interior of the guide tube and would ordinarily present an abrasive problem accelerating the wear of the conductor. In addition, some accumulation of the products of abrasive wear between the conductor and inner surfaces of the guide tube will occur during prolonged use of the apparatus. In accordance with the self-cleaning feature of the present invention, the sliding sweeping movement of the coils of the conductor during their expansion and compaction effects a

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sweeping movement of the inner surfaces of the guide tube effecting a dislodgment of such foreign particles and a discharge thereof out through the longitudinal slot 48. In accordance with this arrangement an extremely simple, inexpensive and substantially maintenance free power supply conductor is provided which itself is protected within the guide tube and has the further capacity of removing any potentially abrasive contaminating substances through its self-cleaning operation.

An alternative satisfactory arrangement for the power supply is shown in FIGS. 4 and 5 in connection with a soot blower in which a framework is provided consisting of a housing that encloses the top and both sides of the soot blower minimizing ingress of contaminating substances into sections adjacent to the upper portion of the housing. The structural features of the soot blower shown in FIGS. 4 and 5 is described in detail in U.S. Pat. No. 3,439,376 assigned to the same assignee as the present invention. Reference to the aforementioned patent is made for further details of the soot blower construction which are not necessary for an understanding of the present invention.

In the specific arrangement as illustrated in FIGS. 4 and 5, a soot blower 58 is shown which includes a frame 60 in the form of an inverted U-shape housing including an upper web 62 having two depending side webs 64 of which only one is shown for the purposes of clarity. An angle iron brace 66 is securely fastened to the inner surface of each of the side webs 64 and extends longitudinally of the frame providing a track or rail on which a supporting roller 68 of a soot blower carriage 60 is movably supported. The roller 68 is mounted for free rotation on a cross shaft 72 drivingly connected to the gear box on the soot blower carriage and on which a pinion gear 74 is affixed which is disposed in constant relationship with a gear rack 76 affixed to the underside of an L-shaped flange 78 attached to the side web above the angle iron brace 66. A similar supporting roller, pinion gear, rack and L-shaped flange is provided on the opposite side flange for transversely supporting the soot blower within the webs of the frame.

As in the soot blower 10 previously described, a lance tube 80 is rotatably supported at its rearward end by the carriage 70 and a stationarily mounted feed tube 82 is disposed in telescopic sliding relationship within the lance tube. The lance tube similarly is reciprocable in response to the travel of the carriage between a retracted position as shown in FIG. 4, and a projected position during the performance of a cleaning operation by means of a reversible motor 84 mounted on the carriage.

The supply of power to the reversible motor 84 in all moved positions of the carriage is achieved by a helically wound conductor 86 similar to the conductor 34 previously described, which is supported within a semi-circular guide trough 88 extending longitudinally of the length of the frame and path of travel of the carriage. As shown in FIGS. 4 and 5, the guide trough 88 is mounted in an upper corner of the frame providing maximum protection against fly ash and other air-borne contaminants. The guide trough is secured by means of a series of hanger straps 90 attached to the adjacent side web 64 of the frame. As in the case of the guide tube 36, the guide trough 88 is preferably comprised of a plastic material having relatively low frictional characteristics to facilitate relative sliding movement of the coils of the conductor 86 during the course of the extension and compaction of the conductor. The plastic material or lining also serves to electrically insulate an electric conductor from the soot blower framework providing increased safety to operators in the event of wear or fraying of the helically wound electrical conductor during use. The lower portion of the guide trough is also preferably provided with a series of apertures or ports 92 along the lowermost portion thereof through which any abrasive particles or products of wear are discharged from the interior of the guide trough

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in response to the self-cleaning action provided by the longitudinal travel of the coils of the conductor. It will be further observed in FIG. 5 that the radius of curvature of the interior of the guide trough corresponds substantially to the radius of the periphery of the coils of the helically wound conductor providing for optimum sliding guidance of the conductor during its extension and contracting movement.

One end of the conductor 86 is stationarily affixed to a suitable power or junction box 94 affixed to the lower surface of the upper web of the frame and is further secured by a clamping bracket 96 to the underside of the upper web adjacent to the depending portion which enters the rearwardmost section of the guide trough. The conductor thereafter, when in the compact condition as shown in FIG. 4, extends in a substantially nested helically coiled condition to a point adjacent to the forward end of the reversible motor 84 and the forwardmost coil is secured by means of a pair of clamps 98 to opposite sides of a rectangular pusher member 100 projecting inwardly and overlying the forwardmost portion of the coiled conductor. The pusher member 100 is secured to a lateral brace 102 which is rigidly affixed to the upper end of an upstanding bracket 104 which in turn is securely fastened to a horizontally extending arm 106 secured to the housing of the carriage. The conductor extends from the clamp 98 and is secured by a similar clamping member 108 to the side surface of the upstanding bracket 104 and thereafter is connected or coupled to a junction box 110 on the reversible motor 84.

In accordance with this arrangement the helically wound conductor is extended in response to the travel of the carriage from a substantially nested compact condition as shown in FIG. 4 to an extended position and thereafter is returned to the compact condition during the retracting travel of the carriage and in response to the pushing or compacting action of the pusher member 100 disposed in pushing engagement against the forward section or portion of the helical conductor. The operation of the soot blower can be initiated automatically or manually in the same manner as previously described in connection with the soot blower 10 shown in FIGS. 1-3.

While it will be appreciated that the description of the preferred embodiments of the present invention are well calculated to achieve the advantages and benefits as hereinbefore described, the invention is susceptible to variation, modification, and change without departing from the spirit thereof.

What is claimed is:

1. A soot blower comprising a frame, a carriage movably and guidably mounted on said frame, a lance tube supported and movable by said carriage between a retracted position and a projected position, drive means including motor means on said carriage for effecting movement thereof between the aforesaid positions, guide means on said frame extending longitudinally of the path of travel of said carriage, a helically wound conductor comprising a plurality of coils slidably disposed in said guide means having one end thereof stationarily connected to said frame and the other end thereof connected to said motor means for supplying power thereto in all moved position of said carriage, said coils of said conductor extensible within said guide means between a substantially nested compact condition to an open helically expanded condition in response to the travel of said carriage in one direction and from said expanded condition to said compact condition by pusher means on said carriage in response to the travel of said carriage in the opposite direction.

2. The soot blower as defined in claim 1 in which said guide means is of an arcuate cross section for guidably and slidably supporting said helically wound conductor.

3. The soot blower as defined in claim 1 in which said guide means is of an arcuate cross section and is provided with a low friction surface for slidably and guidably supporting said helically wound conductor.

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4. The soot blower as defined in claim 1 in which said pusher means projects and overlies the end portion of said helically wound conductor for engaging and moving said conductor toward said compact position in response to travel of said carriage in said opposite direction.

5. The soot blower as defined in claim 1 in which said guide means comprises a tube of substantially circular cross section formed with a longitudinally extending slot therein through which said pusher means projects for engaging the end portion of said conductor.

6. The soot blower as defined in claim 5 in which at least the inner surface of said tube is lined with a low friction plastic material.

7. The soot blower as defined in claim 5 in which said tube is composed of a plastic material of low frictional resistance and is formed with an elongated slot extending longitudinally along the lower portion thereof.

8. The soot blower as defined in claim 1 in which said guide means comprises an elongated trough of arcuate cross section for slidably and guidably supporting the lower portions of said helically wound conductor.

9. The soot blower as defined in claim 8 in which at

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least the inner surface of said trough is lined with a plastic material of relatively low frictional resistance.

10. The soot blower as defined in claim 8 in which said trough is provided with a plurality of apertures along the length thereof for discharging contaminants accumulated in said trough.

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JOHN PETRAKES, Primary Examiner

U.S. Cl. X.R.

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