July 14, 1964 LE ROY S. DE MART 3,140,503

SOOT BLOWER CONSTRUCTION

Filed Jan. 6, 1961 3 Sheets-Sheet 1

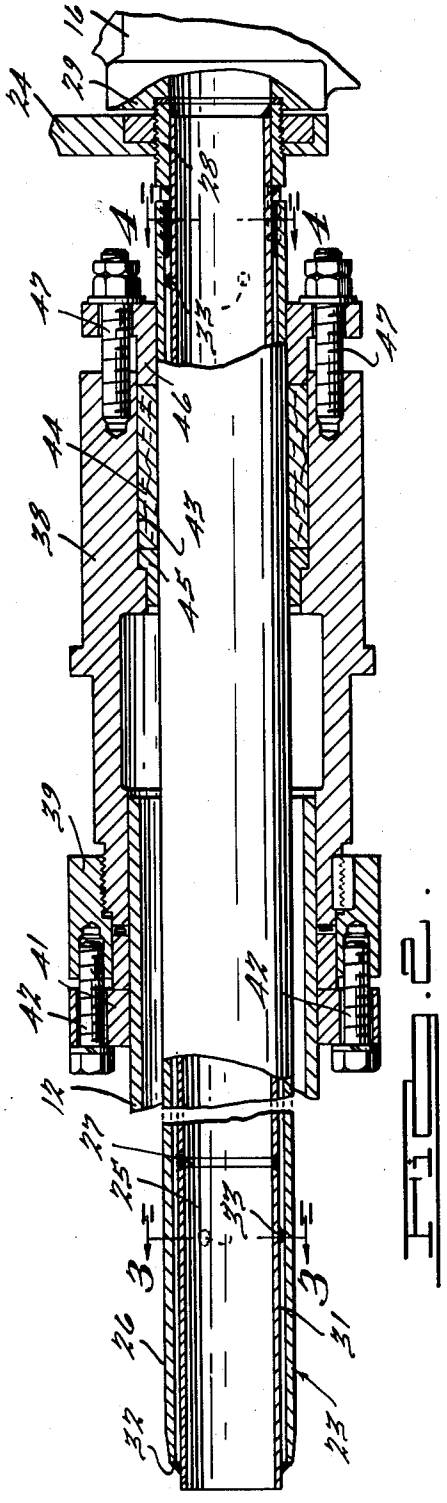

Fig. 2.

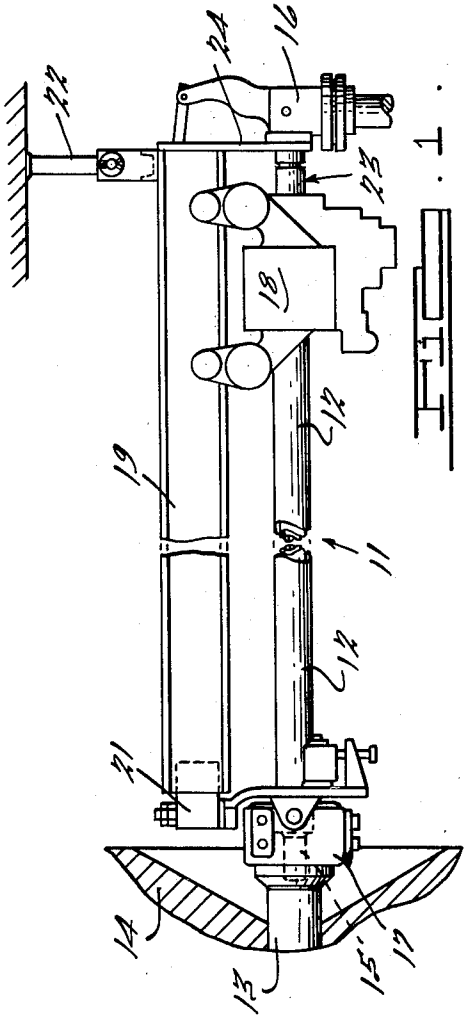

Fig. 1.

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SOOT BLOWER CONSTRUCTION

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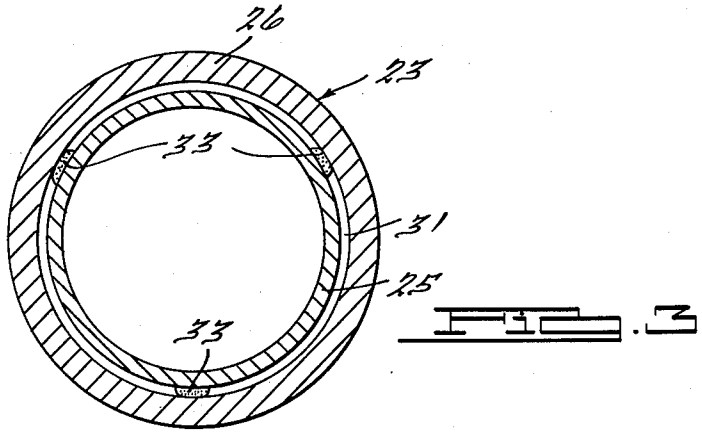

FIG. 3

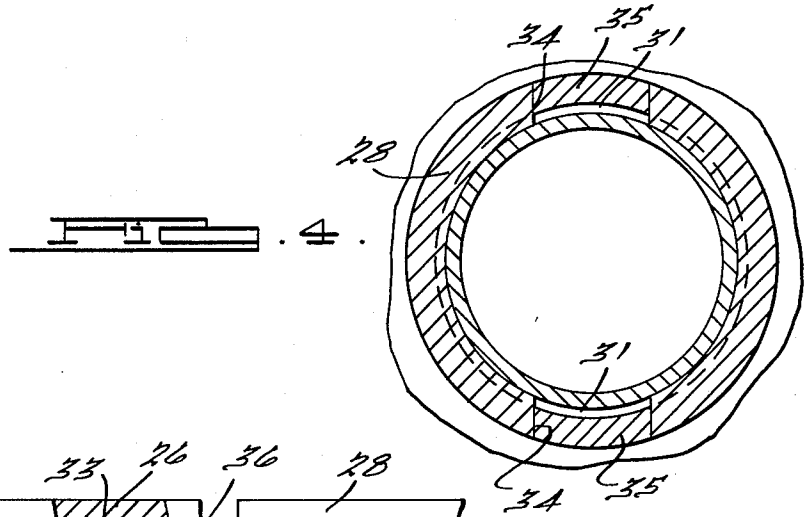

FIG. 4

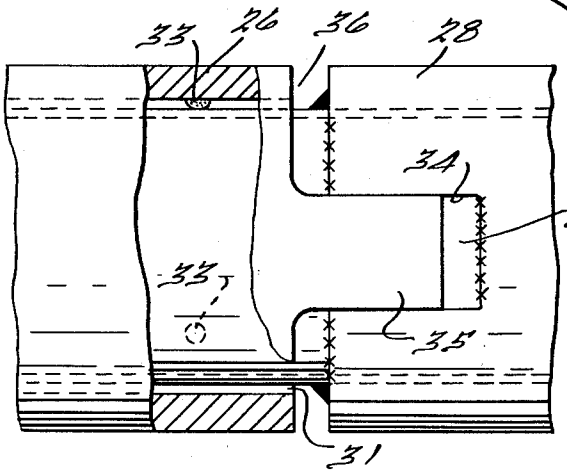

FIG. 5

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SOOT BLOWER CONSTRUCTION

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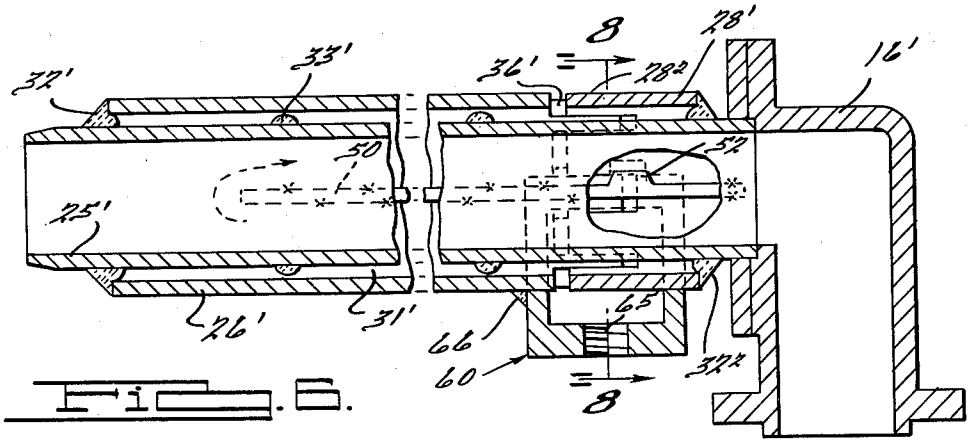

Fig. 6.

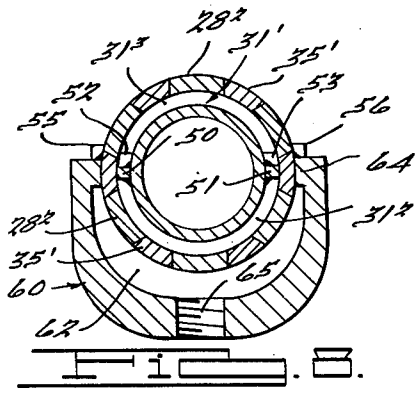

Fig. 8.

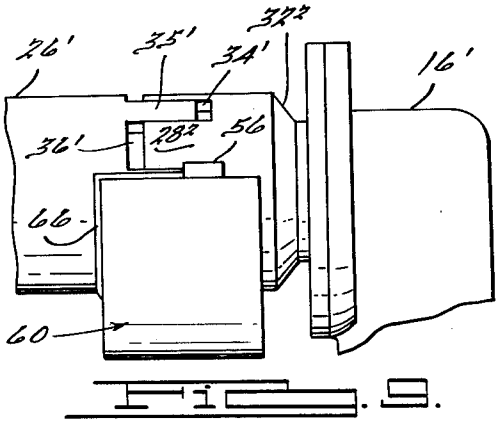

Fig. 9.

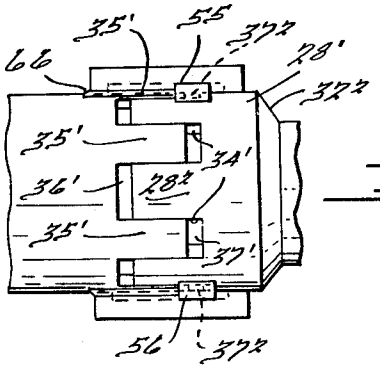

Fig. 7.

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United States Patent Office 3,140,503 Patented July 14, 1964

3,140,503

SOOT BLOWER CONSTRUCTION

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Filed Jan. 6, 1961, Ser. No. 81,176
8 Claims. (Cl. 15—317)

This invention relates to soot blower constructions, and more particularly to soot blowers of the long retracting type using steam for the soot blowing.

The present application is continuation-in-part of my previously filed copending application Serial No. 817,873, filed June 3, 1959, now abandoned.

In the use of steam in the long retracting type of soot blowers, the extremely high temperatures at which the steam is supplied by modern-day boilers has created severe problems with regard to the maintenance of sealing connections between the moving parts.

It is an object of the present invention to provide an improved feed tube construction which overcomes these difficulties and prevents undue deterioration of packing material used as seals between moving parts.

It is another object to provide an improved soot blower construction of this nature which prevents high temperature feed tube surfaces from being contacted by the lance tube packing, and insures air circulation between the packing and these high temperature surfaces, thus prolonging the life of the packing material.

It is a further object to provide a novel and improved feed tube construction of this character which permits relative expansion and contraction of the feed tube with respect to the stationary portions of the assembly while being of double-walled construction, and prevents the possibility of damage to the parts when the lance tube is being moved.

It is also an object to provide an improved soot blower construction of this nature which is of relatively simple construction and may be fabricated with standard parts and materials.

Other objects, features and advantages of the present invention will become apparent from the following detailed description taken in conjunction with the accompanying drawings, in which:

FIGURE 1 is a side elevational view of a long retracting type of soot blower incorporating the principles of the invention, parts being broken away;

FIG. 2 is a longitudinal section with parts broken away showing the novel construction of the feed tube;

FIG. 3 is a cross-sectional view taken along the line 3—3 of FIG. 2 and showing the supporting means for the outer tube wall;

FIG. 4 is a cross-sectional view taken along the line 4—4 of FIG. 2 and showing the keyed connection between the inner end of the outer feed tube wall and the adjacent stationary structure which permits air circulation between two two feed tube walls;

FIG. 5 is a fragmentary top plan view of the construction shown in FIG. 4;

FIG. 6 is a longitudinal section of a modified feed tube;

FIG. 7 is a fragmentary side elevation;

FIG. 8 is a section on the line VIII—VIII of FIG. 6; and

FIG. 9 is a fragmentary side elevation.

In general terms, the invention comprises a double-walled feed tube construction comprising two concentric tubular members, the inner tube being connected in a conventional manner to conduct steam to the lance tube nozzle. The outer feed tube wall is secured to and supported by the inner wall in a manner which provides an annular air space between the two walls, and the lance

tube packing has sealing engagement with the outer surface of this outer wall. The inner end of the outer tube wall is keyed to the adjacent structure so as to permit expansion and contraction of both walls during operation. This key connection is so constructed as to allow the circulation of air into and out of the annular space between the walls, thus further enhancing the insulating properties of the assembly.

Referring more particularly to the drawings, a soot blower assembly of the long retracting type is generally indicated at **11** in FIG. 1, and comprises a lance tube **12** which is movable into and out of a housing **13** mounted in a boiler wall **14**. Lance tube **12** has a nozzle **15** adapted to eject steam, the delivery of this steam being controlled by a blow valve **16**. The forward end of the lance tube is supported within a wall box assembly **17**, and the rear end by a trolley **18** which is supported by an I-beam track **10**. This track is in turn supported at its forward end by bracket means **21** mounted on wall box assembly **17**, and at its rear end by a suitable hanger support **22**. A feed tube assembly generally indicated at **23** is disposed within lance tube **12**, the novel construction of this feed tube assembly to be later described. The rear end of the feed tube assembly is supported by a bracket **24** depending from the rear end of track **19**, this bracket also serving to support blow valve **16**.

The novel construction of feed tube assembly **23** is best seen in FIGS. 2–5. The feed tube assembly comprises an inner tubular wall **25** and an outer concentric wall **26**, Wall **25** may be fabricated of a plurality of tube sections as indicated in FIG. 2, these being connected by welding **27** or similar means. The rear end of wall **25** is secured to bracket **24** by means of a ring **28** surrounding the rear end of the tube and to which the tube is secured by welding or similar fastening means. Ring **28** has an externally threaded surface which is secured within a threaded aperture in bracket **24**, the rear end of the ring being connected with the outlet port **29** of blow valve **16**. Thus, tube **25** is adapted to receive the steam issuing from valve **16** and to conduct this steam to the lance tube after the latter has been inserted in housing **13**.

The inner diameter of outer tube wall **26** is such that an annular space **31** exists between the two walls. Wall **26** is slightly shorter than wall **25**, as is seen in FIG. 2, and the forward end of outer wall **26** is secured to the forward end of wall **25** by welding **32** or by a similar type of connection which also provides a seal preventing back flow of steam into space **31**. Outer wall **26** is supported in spaced concentric relation will wall **25** by a plurality of sets of circumferentially spaced buttons **33**, two such sets being seen in FIG. 2, the circumferential spacing being visible in FIG. 3. It will be noted that buttons **33** are of such a nature as to permit relative longitudinal movement between the two walls such as would occur during expansion and contraction of inner wall **25** during operation. The outer surface of wall **26** is smoothly finished for cooperation with a packing as later described.

The forward end of ring **28** is provided with a pair of keyways **34** within which are disposed a pair of key extension **35** at the rear end of outer wall **26**. As is best seen in FIG. 5, a space **36** is left between the rear end of wall **26** and ring **28**, a similar space **37** being left between each key **35** and the rear end of its keyway **34**.

Lance tube **12** is provided with a packing housing **38** secured to the rear end thereof by a threaded ring **39**, this ring in turn being mounted on tube **12** by a collar **41** and bolts **42**. The rear end of packing housing **38** has a bore **43** within which is disposed a packing **44**. The forward end of this packing is retained by a sleeve **45** mounted within housing **38**, and the rear end of packing

44 is held in place by a retaining ring 46 which is adjustably mounted on housing 38 by bolts 47, so that the tightness of the packing may be adjusted.

In operation, lance tube 12 will be rotated and moved from right to left in FIG. 1 when it is desired to inject steam into the boiler for tube cleaning purposes. During this movement, packing 44 will slide on the smooth outer surface of outer wall 26 of the feed tube. It should be noted that the presence of keyed connections 34, 35 between outer wall 26 and stationary ring 28 will prevent any torsional forces from being exerted on tube 25 by packing 44, thus avoiding the possibility of distorting this tube. Upon operation of valve 16, steam will be forced through inner wall 25 and through nozzle 15 into the boiler. It will be noted that because of seal weld 32 and packing 44, no steam can escape through lance tube 12. The high temperature steam will of course heat inner tube wall 25, but the fact that packing 44 engages outer tube wall 26, and the further existence of air space 31 between the tube walls, will prevent excessive heating of packing 44, thus minimizing its deterioriation and prolonging the packing life. The heating of inner tube wall 25 will cause it to elongate longitudinally, but the key connection between the rear end of outer tube wall 26 and ring 28 will permit the outer tube wall to move longitudinally relative to the stationary portions of the assembly, relative longitudinal movement between tube walls 25 and 26 being permitted by supporting buttons 33. During operation, space 31 will be constantly open to atmosphere, as will be noted from an examination of FIGS. 4 and 5. Air circulation through this annular space will thus be permitted, preventing overheating of the outer tube wall.

In FIGS. 6–9 a modified construction is shown incorporating means for augmenting the efficiency of convection of cooling air within the annular chamber space between the steam feed tube and the insulating tube. Provision is also made in the modified construction for positively circulating cooling air through such chamber space. Parts of such modified embodiment corresponding to those previously disclosed are designated by like reference numbers primed.

The main feed tube 25′ is directly secured to the fitting portion 16′, which may be a part of the blow valve body, and extends uninterruptedly through the assembly to deliver the blowing medium to the lance tube in similar fashion. The lance tube is not shown in FIG. 6 but is of course slidably overfitted upon the concentrically outspaced insulating tube 26′ of the double-walled feed tube assembly when the parts are in service, as in the first embodiment. Weld buttons 33′ assist in similar fashion in maintaining the concentric spacing of the tubes 25′, 26′, and the chamber between such tubes is closed at its forward end by an annular weld 32′.

In lieu of the coupling ring 28, used in the first embodiment, the rear portion of the insulating tube 26′ is formed as a separate short section 28′ which is connected mechanically to the main section 26′ of the insulating tube by means of a plurality of slidably interfitted tongue and slot portions 35′, 34′, respectively. On their longitudinally extending or radial sides such portions are fitted relatively closely. It will be seen that by virtue of the provision of several such rearwardly extending tongues 35′ upon the main insulating tube section 26′, with a plurality of corresponding tongue-receiving slot portions 34′, forwardly extending tongue-like portions 28^2 are also formed, and integral with coupling tube portion 28′, between the slotted portions 34′. The tongue portions 28^2–35′ are of similar length but are not fully interfitted, so that peripherally extending slot-like openings 36′, 37′ are formed at their ends. Openings 36′, 37′ provide communication between the exterior and the annular chamber 31′. The short rear section 28′ is secured and sealed at its rear end with respect to the feed

tube 25′ by means of an annular weld 32^2, so that the only communication to the chamber space 31′ is through the radial openings provided by slots 36′, 37′.

Chamber space 31′ is divided into upper and lower sections by means of baffling ribs 50, 51 secured as by welding to the periphery of feed tube 25′ on diametrically opposite sides thereof and extending longitudinally from juncture at their rear ends with weld 32^2 to a position two or three inches short of the front sealing weld 32′. As shown in FIG. 8, the ribs 50, 51 are located upon a horizontal plane and their outer edges lie closely against the inner surface of insulating tube 26′, so that the chamber space 31′ is partitioned into a lower section, designated 31^2, and an upper section designated 31^3. In the preferred construction shown, it will be seen that two of the rearwardly extending tongue portions 35′ are also approximately centered upon a horizontal plane, upon opposite sides of the double-walled tube assembly. The slot portions at the rear extremities of the last-mentioned tongues are designated 37^2. The lower extremities of the slot 37^2 overlap the lower chamber section 31^2, while the upper ends of such slots overlap the upper chamber section 31′. It is desired to prevent escape of air from section 31^2 either directly to the atmosphere or into the upper section 31′ except by flowing around the forward ends of ribs 50, 51. The upper extremities of slots 37^2 are therefore externally blocked, by means of short blocking portions 55, 56 which overlie the outer upper extremities of such slots, and the ribs 50, 51, at least in the area underlying the upper ends of slots 37^2, is thickened in an upward direction, as indicated at 52 and 53, so that no air can flow into the upper chamber space 31^3 through the upper extremities of the slots 37^2.

Means may be provided for supplying air under pressure to the chamber space 31′ to provide a high degree of cooling under severe operating conditions. Such means comprises an inlet fitting generally designated 60 which defines a generally semi-cylindrical chamber 62 surrounding and enclosing the outer extremities of those slot portions 36′, 37′ which open into the lower chamber portion 31^2. Fitting 60 also extends upwardly far enough to enclose the lower extremities of the side slots 37^2. The axial length of the inlet fitting 60 is somewhat in excess of the axial spacing of the front and rear slots 36′, 37′ which it bridges, and the fitting is provided with inturned marginal flanges 64 proportioned to fit tightly against the surfaces of the insulating tube portions 26′, 28′. Flanges 64 are seam welded to tube portion 26′ but are not secured to section 28′, although they fit snugly enough against the latter so as to complete a substantially airtight enclosure of the space 62. Space 62 is thus effectively in communication only with the aforementioned slots, and with an inlet coupling opening 65, in its peripheral wall, through which cooling air may be introduced. The seam weld which secures fitting 60 to tube 26′ is designated 66. It will be noted that the upper portion of the fitting 60 extends horizontally along and is secured to the side tongues 35′, and that, as best shown in FIG. 9, the rear wall of the fitting lies farther to the rear than the rearmost slots 37′, 37^2, and such rear wall, and adjacent portions of the flange 64 therefore overlie parts of the rear tube section 28′. The securing weld 66 is interrupted, however, in all portions which overlie the section 28′, as indicated above, so that sections 26′, 28′ may move axially relatively to each other during thermally-induced distortions. Blocking portions 55, 56 are formed as lugs integrally cast on the upper side portions of the fitting 60 in positions to overlie the upper extremities of slots 37^2.

It will be apparent upon consideration of the disclosure that air which enters lower chamber section 312 via those slot portions 36′, 37′, 37^2 located in the lower half of the assembly can only reach the upper chamber section 31^3 by flowing forwardly below the ribs 50, 51 and around

the forward extremities of such ribs. Such a flow is induced by natural convection resulting from the heating of the air within the chamber space, and the air flows rearwardly through upper chamber space 31^2 and out through the slots 37' in the upper half of the assembly.

In the preferred construction shown, a source of cooling air is adapted to be connected to the fitting 60 at the coupling opening 65, and the forced draft of such air maintains a positive circulation through the indicated path.

While it will be apparent that the embodiments of the invention herein disclosed are well calculated to fulfill the objects of the invention, it will be appreciated that the invention is susceptible to modification, variations and change without departing from the proper scope or fair meaning of the subjoined claims.

What is claimed is:

1. In a soot blower construction, a steam feed tube having a rear inlet end adapted to be attached and interconnected to a steam supply element and at its outlet end remote from said inlet end being free to move longitudinally under thermally induced expansion and contraction, an outer tube in concentric spaced surrounding relation with respect to said feed tube to provide an annular insulating space therebetween, said feed tube and outer tube being of substantial axial length, a sealed mechanical connection of relatively short axial length, rigidly securing together said feed tube and outer tube in the area of their forward ends and forming the only axially rigid connection between said tubes, thereby permitting independent longitudinal expansion and contraction of said tubes in areas spaced from said connection, a plurality of spaced supporting elements between said tubes adapted to permit relative longitudinal movement between the tubes, a lance tube surrounding and longitudinally movable with respect to said outer tube, a packing carried by the rear end of said lance tube and slidably engageable with the outer surface of said outer tube, means located rearwardly of the rear end of said lance tube and providing a vent to atmosphere from said annular insulating space, and means maintaining the rear portions of said inner and outer tubes in spaced relation without obstructing said venting means.

2. In a feed tube construction for soot blowers, an inner tube wall having a rear end adapted to be connected to a blow valve, an outer tube wall in concentric spaced relation with said inner tube wall to provide an annular space therebetween and having a smooth outer surface, means rigidly securing together the forward ends of said inner and outer tube walls in sealed relation, a plurality of spaced supporting elements disposed between said two walls and adapted to permit relative longitudinal movement between the walls, and a keyed connection between the rear ends of said inner and outer tube walls, said connection permitting circulation of air between the atmosphere and the annular space between the walls, a keyed connection between the rear ends of said inner and outer tube walls, said connection permitting circulation of air between the atmosphere and the annular space between the walls.

3. In a soot blower construction, an inner feed tube wall, a ring secured to the outer surface of said wall at the rear end thereof and adapted to be connected to a blow valve, an outer tube wall in concentric spaced relation with said inner wall to provide an annular space therebetween, means rigidly securing the forward end of said outer wall in sealed relation with said inner wall, a plurality of spaced supporting elements between said walls adapted to permit relative longitudinal movement therebetween, a plurality of key slots formed in the forward end of said ring, and a plurality of keys extending rearwardly from the rear end of said outer wall and disposed within said key slots, the rear end of the space between said tube walls being open to the atmosphere.

4. The combination according to claim 3, said supporting elements comprising a plurality of groups of circumferentially spaced buttons mounted on the outer surface of said inner tube wall and slidably engageable with the inner surface of said outer tube wall.

5. In a soot blower construction, an inner feed tube wall, a ring secured to the outer surface of said wall at the rear end thereof and adapted to be connected to a blow valve, an outer tube wall in concentric spaced relation with said inner wall, means securing the forward end of said outer wall in sealed relation with said inner wall, a plurality of groups of circumferentially spaced buttons mounted on the outer surface of said inner tube wall and slidably engageable with the inner surface of said outer tube wall, a plurality of key slots formed in the forward end of said ring, a plurality of keys extending rearwardly from the rear end of said outer wall and disposed within said key slots, the rear end of the space between said tube walls being open to the atmosphere, a lance tube surrounding said outer tube wall, and a packaging secured to the rear end of said lance tube and in slidable engagement with the outer surface of said outer tube wall.

6. In a feed tube construction for a soot blower, an inner tube wall having a rear end adapted to be connected to a source of blowing fluid, an outer tube wall in surroundingly spaced relation with respect to said inner tube wall to provide a generally annular space therebetween, means rigidly joining the forward ends of said inner and outer tube walls in sealed relation, a plurality of spaced supporting elements disposed between said two walls and adapted to permit relative longitudinal movement between the walls, portions defining openings substantially at the rear end of said outer wall and providing communication between said space between the walls and the exterior, said openings including at least one opening in an upper area of said outer wall and at least one opening in a lower area of said outer wall, and longitudinally extending partitioning means between said inner and outer walls and substantially isolating from one another said openings which are respectively in the upper and lower areas, and also dividing said space throughout a portion of its length into upper and lower sections, whereby to move between the lower and upper openings air must flow around said partitioning means.

7. Means as defined in claim 6 including a fitting covering only certain of said openings, whereby airflow through said openings may be induced by means including air conducting means connected to said fitting.

8. Means as defined in claim 6 wherein said portions defining the openings include slidably interfitted keying portions, a fitting overlying at least certain of the openings and through which airflow may be induced through such openings, and means securing said fitting to certain only of said keying portions.

References Cited in the file of this patent

UNITED STATES PATENTS

1,317,345	Bayer	Sept. 30, 1919
1,367,347	Barnes	Feb. 1, 1921
1,367,348	Barnes	Feb. 1, 1921
1,571,038	Bayer	Jan. 26, 1926
2,127,073	Topping	Aug. 16, 1938
2,441,112	Hibner et al.	May 4, 1948
2,664,271	Arutunoff	Dec. 29, 1953
3,069,715	Hochmuth	Dec. 25, 1962

FOREIGN PATENTS

604,370	Germany	Oct. 19, 1934

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,140,503 July 14, 1964

Le Roy S. De Mart

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 2, line 18, for "10" read -- 19 --; line 50, for "will" read -- with --; lines 61 and 62, for "extension" read -- extensions --; column 4, line 72, for "312" read -- 31^2 --; column 6, line 22, for "packaging" read -- packing --.

Signed and sealed this 10th day of November 1964.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents