Aug. 27, 1957 W. F. CANTIERI ET AL 2,804,032

SEALING MEANS FOR SOOT BLOWERS AND THE LIKE

Filed Nov. 7, 1952

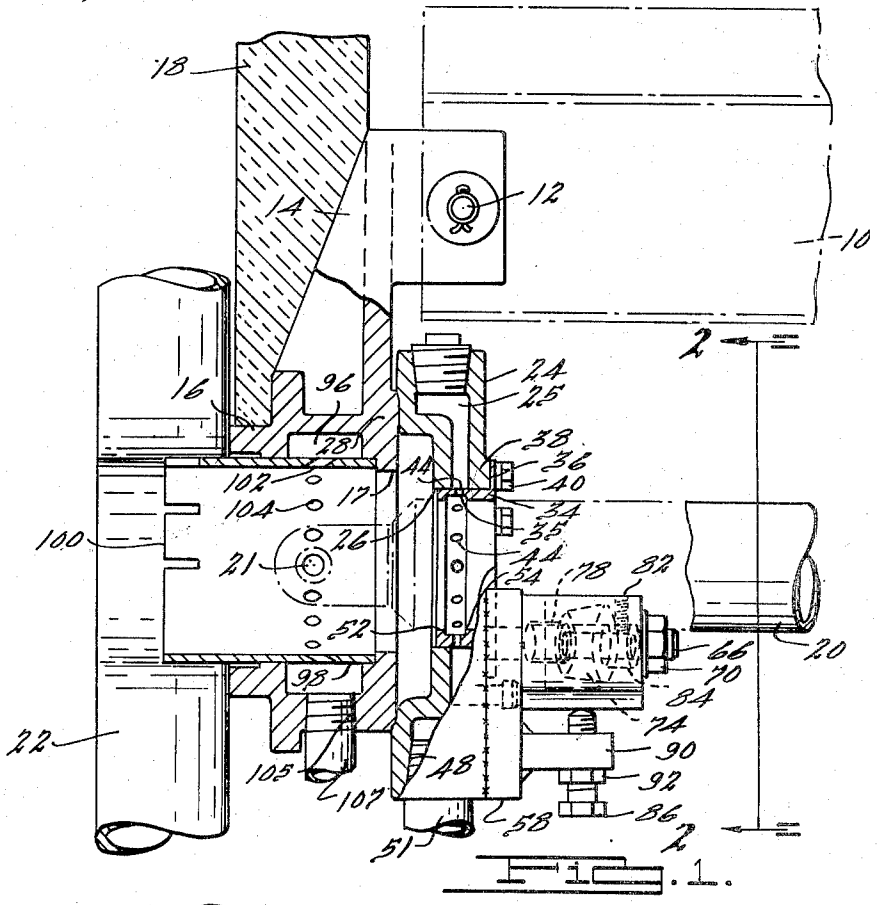


Fig. 1.

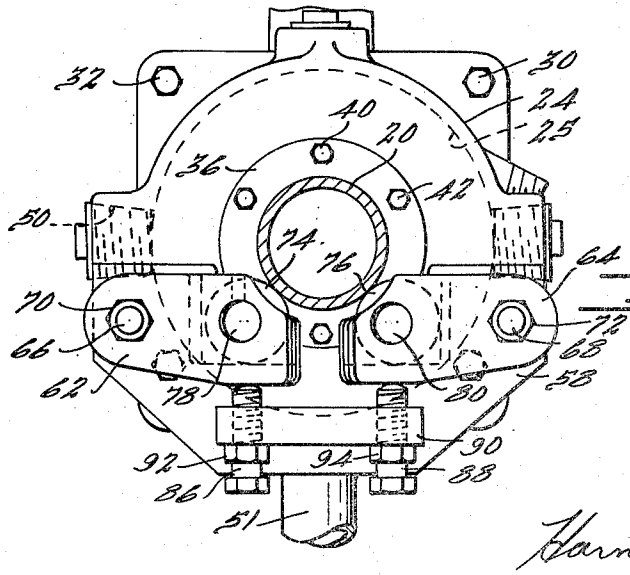


Fig. 2.

INVENTORS.
William F. Cantieri.
LeRoy S. DeMart.
Jacob Fogel.
BY
Harness, Dickey & Pierce.
ATTORNEYS.

United States Patent Office 2,804,032 Patented Aug. 27, 1957

2,804,032

SEALING MEANS FOR SOOT BLOWERS AND THE LIKE

William F. Cantieri, Le Roy S. De Mart, and Jacob Fogel, Lancaster, Ohio, assignors to Diamond Power Specialty Corporation, Lancaster, Ohio, a corporation of Ohio

Application November 7, 1952, Serial No. 319,374

9 Claims. (Cl. 110—179)

This invention relates to a sealing device and, more particularly, to an improved sealing device adapted for use with retractable soot blowers and the like.

An object of the invention is to overcome the disadvantages inherent in conventional sealing devices and to provide an improved sealing device adapted to prevent the escape of gases from the boiler furnace through the opening in the furnace wall which is provided to accommodate the lance tube of a retractable soot blower.

Another object of the invention is to provide an improved sealing device particularly adapted for use with positive pressure boilers.

Another object of the invention is to provide an improved sealing device adapted to prevent the escape of gases through such opening even though the retractable lance tube is bent or warped.

Another object of the invention is to provide an improved sealing device adapted to prevent the escape of furnace gases through such opening in the event the lance tube is completely removed from the opening in the furnace wall adapted to accommodate such tube.

Still another object of the invention is to provide a sealing device that is simple in construction, economical of manufacture, durable, efficient, and reliable in operation.

Yet another object of the invention is to provide a sealing device which can be easily and quickly secured to the wallbox of a boiler furnace; which operates at a relatively cool temperature; and which is adapted to support the lance tube of a retractable soot blower.

In the accomplishment of these objects, the present invention provides an annular chamber which surrounds the lance tube of a retractable soot blower adjacent the wallbox end in which air is maintained under pressure in excess of the pressure in the boiler furnace. Since the operating pressure of the furnace is greater than the ambient atmospheric pressure, the present invention provides means which compensates for such difference in pressure thereby enabling approximately the same amount of pressurized sealing air to flow from the aforementioned chamber through the wallbox into the furnace as flows from the chamber to the atmosphere, so as to provide an air seal which effectively prevents the escape of hot gases from the furnace. The present invention also provides means for forming an air seal in the event the lance tube of the soot blower is completely removed from the wallbox of the boiler furnace.

With the above as well as other and in certain cases more detailed objects in view, which will become apparent from the following description and the appended claims, a preferred but illustrative embodiment of the invention is illustrated in the accompanying drawing throughout the several views of which corresponding reference characters designate corresponding parts and wherein:

Fig. 1 is a side-elevational view of a soot blower sealing installation incorporating the present invention, with

portions in section and other portions broken away, as applied to the lance tube of a soot blower; and

Fig. 2 is a sectional view taken substantially on the line 2—2 of Fig. 1 and looking in the direction of the arrows.

Referring to the drawing, a preferred embodiment of the invention is shown incorporated in a seal for a retractable soot blower of a known type which is shown in installed relation with respect to a boiler, which is fragmentarily illustrated. The details of the boiler and blower form no part of the present invention. While a long-travel blower is shown, this is merely to typify an important use of the invention. The blower installation includes a stationary supporting I-beam **10** projecting horizontally and perpendicularly from the boiler wall **18**. A wallbox **16** is secured by pin **12** and an upwardly extending bracket **14** to the beam **10**.

The retractable and rotatable lance tube **20** is also carried by the beam **10**, so that alignment is maintained between the lance tube and wallbox. The rotational and sliding movement is imparted to the lance tube by any suitable or conventional driving means (not shown). The lance tube **20** is projectable into, and retractable from, the boiler furnace through the wallbox **16** which has an opening **17** coaxial with, but somewhat larger in diameter than, the lance tube **20**. When the blower is operated, compressed air, steam, solid pellets and/or other cleaning medium is supplied through the lance tube and discharged from the nozzle end **21** thereof against the boiler surfaces to be cleaned, which may include the water wall tubes, as **22**.

A housing **24**, having an annular, internal chamber **25** and a substantially axial bore **26**, is mounted on the outer wall **28** of the wallbox and secured thereto by bolts such as **30** and **32**, the bore **26** being coaxial with the opening **17** in the wallbox. A sleeve member **34** having an outwardly extending flange portion **36** is fitted in the bore **26** and secured to the outer end wall **38** by bolts such as **40** and **42** which pass through the flange portion **36** and threadably engage openings in the wall **38**. Sleeve member **34** is provided with an internal annular groove **35** having circumferentially spaced holes, such as **44**, therein communicating with the chamber **25**.

Pipe fitting openings, such as **48** and **50** are formed in the outer walls of housing **24** and a supply pipe, as **51**, is attached to the most readily accessible socket opening in the particular installation, the other sockets being, of course, plugged. Compressed air is fed to the chamber **25** through pipe **51**, and then passes through the holes, such as **44**, and along the periphery of the lance tube which passes through the sleeve member **34**. The internal diameter of the portion of the sleeve between groove **35** and the furnace is somewhat greater than the internal diameter of the sleeve portion between the internal groove **35** and the atmosphere. Greater clearance is thereby provided in the annular area designated **52** between the lance tube and the furnace end of the sleeve member **34** than is provided in the annular area **54** between the lance tube and the outer end portion **54** of the sleeve member. The air pressure at **52** is somewhat greater than the operating pressure of the furnace, which is greater than the ambient atmospheric pressure at **54**, and the clearance areas are proportioned so that approximately the same amount of air flows from the chamber **25** through the holes, such as **44**, along the periphery of the lance tube, and through the clearance area at **52** into the wallbox opening **17** as flows from the chamber, through the holes, along the periphery of the lance tube and through the clearance area at **54** to the atmosphere.

The compressed air flowing into the furnace forms an

air seal which prevents the escape of the hot gases from the furnace. In the event the lance tube becomes bent or warped, the two clearance areas will remain substantially proportionate and the compressed air will continue to flow into the furnace to prevent the escape of the hot gases.

For the purpose of supporting and guiding the lance tube **20**, a support is provided comprised of a rigid plate **58** welded or otherwise secured to the lower portion of the housing wall **38** and which carries a pair of oppositely disposed, inwardly extending brackets **62** and **64**, the outer end portions of which are pivotally attached to the plate **58** by studs **66** and **68** and nuts **70** and **72**. A pair of tapered rollers **74** and **76** are rotatably mounted on roller pins **78** and **80** which in turn are mounted in the inner end portions of the brackets **62** and **64**, respectively, the pins being secured by set screws, such as **82**, threadably fitted in the brackets and engaging a recess in the enlarged collar portion **84** provided on the outer end portion of each pin.

Since the lance tube **20** is rotated in one direction during the projection into the furnace and is rotated in the opposite direction during the retraction from the furnace, the rollers **74** and **76** are set at an angle to the axis of the lance tube, the angle corresponding to the pitch of the helix represented by such rotary and longitudinal movement of the lance tube so as to reduce the frictional contact between the rollers and the tube. Because of the angular positioning of the rollers, they are formed in the shape of a truncated cone to insure substantially line contact with the tube.

The inner end portions of the brackets **62** and **64** are supported on adjusting bolts **86** and **88**, threadably fitted in the forwardly projecting horizontal plate **90** which is welded or otherwise rigidly secured to the plate **58**, the bolts **86** and **88** being locked in the selected adjusted position by locking nuts **92** and **94**, respectively.

In order to prevent the escape of gases from the furnace in the event the lance tube is completely withdrawn from the furnace, as for repair or replacement, an internal annular chamber **96** is provided in the wallbox **16** at a position near but spaced from the outer wall thereof. A bushing member **98**, adapted to receive the lance tube **20**, is fitted in the opening **17** of the wallbox, the inner portion of the bushing having tongues, such as **100**, which are welded or otherwise rigidly secured to the wall water tubes **22**. A relatively large number of closely peripherally adjacent inwardly convergent duct openings, such as **102** and **104**, extend through the wall of bushing **98** and communicate with chamber **96**. Compressed air is adapted to be supplied to the chamber **96** through a supply pipe **107** threadably attached to the wall box as at **105** and is discharged from holes **102** in the form of a conelike screen at sufficient velocity to prevent outflow of furnace gases therethrough, even if the lance tube is backed away for servicing. A suitable hand valve (not shown) may enable control of the air supply to the air screen discharge openings, as will be apparent. It has been found desirable to allow discharge of a slight amount of air through openings **102** at all times while the boiler is in service, to protect the openings against fouling.

From the above description it will be observed that the entire sealing device will operate at a relatively low temperature because of the flow of air therethrough and also because of the cooling effect obtained as the compressed air expands to the lower pressures, thereby insuring relatively long life for the device.

While a preferred embodiment of the invention has been shown and described, it will be understood that various changes and modifications may be made without departing from the spirit and scope of the invention.

What is claimed is:

1. In combination with a boiler furnace having a wall defining an opening, a lance tube projectable into and retractable from said boiler furnace through the opening defined by said wall, a sealing device adapted to prevent the escape of gases from said furnace through the opening defined by said wall, said device comprising a tubular housing encompassing said lance tube at a position adjacent said furnace and defining a bore open at each end and through which the lance tube projects, means securing one end of said housing to said wall in gas-tight relationship with the open ends of the bore of said housing aligned with the opening defined by said wall, said housing defining an annular chamber wherein air is maintained under pressure in excess of the pressure in said furnace, means for supplying air under pressure to the chamber defined by said housing, means carried by said housing and defining clearance areas spaced longitudinally of said lance tube permitting air to flow from the chamber defined by said housing through the bore of the housing simultaneously into said furnace and to atmosphere for compensating for the difference in the pressure of the gases in said furnace and the pressure of the ambient atmosphere whereby the air flowing from the chamber defined by said housing opposes communication of the gas pressure with the atmosphere through the opening defined by said wall, means secured to said housing for supporting said lance tube, said support means comprising a pair of oppositely disposed brackets pivotally attached at the outer end portions thereof to said housing, a pair of rollers rotatably mounted on the inner end portions of said brackets and bearing against said lance tube, and means secured to said housing for supporting said brackets in a selected adjusted position.

2. In combination with a boiler furnace having a wall defining an opening, a lance tube projectable into and retractable from said boiler furnace through the opening defined by said wall, a sealing device adapted to prevent the escape of gases from said furnace through the opening defined by said wall, said device comprising a tubular housing encompassing said lance tube at a position adjacent said furnace and defining a passageway open at each end and through which the lance tube projects, means securing one end of said housing to said wall in gas-tight relationship with the open ends of the passageway of said housing aligned with the opening defined by said wall, said housing defining an annular chamber communicating with the passageway defined by said housing and wherein air is maintained under pressure in excess of the pressure in said furnace, means for supplying air under pressure to the chamber defined by said housing, means carried by said housing and defining clearance areas in the housing passageway spaced longitudinally of said lance tube permitting air to flow from the chamber defined by said housing through the housing passageway simultaneously into said furnace and to atmosphere for compensating for the difference in the pressure of the gases in said furnace and the pressure of the ambient atmosphere whereby the air flowing from the chamber defined by said housing opposes communication of the gas pressure with the atmosphere through the opening defined by said wall, means secured to said housing for supporting said lance tube, said support means comprising a pair of oppositely disposed brackets pivotally attached at the outer end portions thereof to said housing, a pair of tapered rollers rotatably mounted in the inner end portions of said brackets and bearing against said lance tube, the axis of each of said rollers being offset with respect to the axis of said lance tube, and means secured to said housing for supporting said brackets in a selected adjusted position.

3. In combination with a boiler furnace provided with a wall box having an opening therein to accommodate a lance tube, a lance tube projectable into and retractable from said furnace through the opening in said wall box, means for preventing the escape of gases from said furnace through the opening in said wall box, said means com-

prising a tubular housing encompassing said lance tube at a position adjacent said furnace and defining a bore open at each end through which the lance tube projects, means securing one end of said housing to said wall box in gas-tight relationship with the open ends of the bore of said housing aligned with the opening in said wall box, said housing defining an annular chamber communicating with the bore of said housing and wherein air is maintained under pressure in excess of the pressure in said furnace, means for supplying air under pressure to the chamber defined by said housing, means carried by said housing and defining clearance areas in the bore of said housing spaced longitudinally of said lance tube permitting air to flow from the chamber through the bore of said housing simultaneously into said furnace and to atmosphere for compensating for the difference in pressure of the gases in said furnace and the pressure of the ambient atmosphere whereby the air flowing from the chamber defined by said housing opposes communication of the gas pressure with the atmosphere, said wall box defining an annular chamber communicating with the opening in said wall box and wherein air is maintained under pressure in excess of the pressure in said furnace, means for supplying air under pressure to the annular chamber in said wall box, and means for directing the air from the chamber defined by said wall box into said furnace through the opening in said wall box whereby the air from the chamber defined by said wall box opposes communication of the gases in said furnace with the atmosphere.

4. In combination with a boiler furnace provided with a wall box having an opening therein to accommodate a lance tube, a lance tube projectable into and retractable from said furnace through the opening in said wall box, means for preventing the escape of gases from said furnace through the opening defined by said wall box, said means comprising a tubular housing encompassing said lance tube at a position adjacent said furnace and defining a bore open at each end through which the lance tube projects, means securing one end of said housing to said wall box in gas-tight relationship with the open ends of the bore of said housing aligned with the opening defined by said wall box, said housing defining an annular chamber communicating with the bore of said housing and wherein air is maintained under pressure in excess of the pressure in said furnace, means for supplying air under pressure to the chamber in said housing, means carried by said housing and defining clearance areas in the bore of said housing spaced longitudinally of said lance tube permitting air to flow from the chamber in said housing through the bore of said housing simultaneously into said furnace and to atmosphere for compensating for the difference in pressure of the gases in said furnace and the pressure of the ambient atmosphere whereby the air flowing from the chamber in said housing opposes communication of the gas pressure with the atmosphere, said wall box defining an annular chamber communicating with the opening in said wall box and wherein air is maintained under pressure in excess of the pressure in said furnace, means for supplying air under pressure to the annular chamber in said wall box, means for directing the air from the chamber in said wall box into said furnace through the opening in said wall box whereby the air from the chamber in said wall box opposes communication of the gases in said furnace with the atmosphere, means secured to said housing for supporting said lance tube, said support means comprising a pair of oppositely disposed brackets pivotally attached at the outer end portions thereof to said housing, a pair of rollers rotatably mounted on the inner end portions of said brackets and bearing against said lance tube, and means secured to said housing for supporting said brackets in an angularly adjusted position.

5. In combination with a boiler furnace provided with a wall box having an opening therein to accommodate

a lance tube, a lance tube projectable into and retractable from said furnace through the opening in said wall box, means for preventing the escape of gases from said furnace through the opening defined by said wall box, said means comprising a tubular housing encompassing said lance tube at a position adjacent said furnace and defining a bore open at each end through which the lance tube projects, means securing one end of said housing to said wall box in gas-tight relationship with the open ends of the bore of said housing aligned with the opening defined by said wall box, said housing defining an annular chamber communicating with the bore of said housing and wherein air is maintained under pressure in excess of the pressure in said furnace, means for supplying air under pressure to the chamber in said housing, means carried by said housing and defining clearance areas in the bore of said housing spaced longitudinally of said lance tube permitting air to flow from the chamber in said housing through the bore of said housing simultaneously into said furnace and to atmosphere for compensating for the difference in pressure of the gases in said furnace and the pressure of the ambient atmosphere whereby the air flowing from the chamber in said housing opposes communication of the gas pressure with the atmosphere, said wall box defining an annular chamber communicating with the opening in said wall box and wherein air is maintained under pressure in excess of the pressure in said furnace, means for supplying air under pressure to the annular chamber in said wall box, means for directing the air from the chamber in said wall box into said furnace through the opening in said wall box whereby the air from the chamber in said wall box opposes communication of the gases in said furnace with the atmosphere, means for supporting said lance tube, said support means comprising a pair of oppositely disposed brackets pivotally attached at the outer end portions thereof to said housing, a pair of tapered rollers rotatably mounted in the inner end portions of said brackets and bearing against said lance tube, the axis of each of said rollers being offset with respect to the axis of said lance tube, and means secured to said housing for supporting said brackets in an angularly adjusted position.

6. In combination with a boiler furnace provided with a wall box having an opening therein adapted to accommodate a lance tube, a lance tube projectable into and retractable from said furnace through said opening, means for preventing the escape of gases from said furnace through the wall box opening, said means comprising a tubular housing defining a horizontally extending bore open at each end, said housing also defining an annular chamber communicating with the bore of said housing and wherein air is maintained under pressure in excess of the pressure in said furnace, means for supplying air under pressure to the chamber in said housing, means securing one end of said housing to said wall box in gas-tight relationship with the open ends of the bore of said housing aligned with the opening defined by said wall box, a sleeve member fitted in the bore of said housing and adapted to receive said lance tube, said sleeve member having circumferentially spaced openings at a position near but spaced from the ends thereof interconnecting the chamber defined by said housing with the bore of said housing, said sleeve member defining clearance areas spaced longitudinally of the lance tube and permitting air to flow from the chamber defined by said housing through the openings in said sleeve member and the bore of said housing simultaneously into said furnace and to atmosphere whereby such air opposes communication of the gases in the furnace with the atmosphere.

7. A sealing device for soot blowers and the like comprising a housing defining an annular chamber, means for supplying compressed air to the chamber defined by said housing, a horizontally extending sleeve member fitted in said housing and defining a bore open at each end and adapted to accommodate therein a lance tube,

said sleeve member also defining a plurality of centrally disposed circumferentially spaced openings interconnecting the bore thereof with the chamber defined by said housing, the diameter of said sleeve member at one end thereof being less than the diameter at the opposite end thereof whereby said sleeve member defines spaced clearance areas permitting air to flow from the chamber defined by said housing through the openings in said sleeve member and proportionately through opposite ends of the bore of said sleeve member when a lance tube is inserted therein, means secured to said housing for supporting a lance tube, said support means comprising a pair of oppositely disposed brackets pivotally attached at the outer end portions thereof to said housing, a pair of tapered rollers rotatably mounted in the inner end portions of said brackets, the peripheral surfaces of said rollers being disposed within a cylindrical projection of the bore of said sleeve member and being adapted to bear against a lance tube when a lance tube is inserted in said sleeve member, the axis of each of said rollers being offset with respect to the longitudinal axis of said sleeve member, and means secured to said housing for supporting said brackets in an angularly adjusted position.

8. A sealing device adapted for use with a boiler furnace, said device comprising a wall box adapted to be mounted in an opening in the furnace wall, said wall box having an opening therein adapted to accommodate a lance tube, a tubular housing defining an annular chamber, a horizontally extending sleeve member fitted in said housing and defining a bore open at each end and adapted to accommodate a lance tube, said sleeve member being provided with a plurality of centrally disposed circumferentially spaced openings interconnecting the bore of the sleeve member with the chamber defined by said housing, the diameter of one end of said sleeve member being less than the diameter of the opposite end of said sleeve member whereby said sleeve member defines clearance areas spaced longitudinally thereof and permitting air to flow from the chamber defined by said housing through the openings in said sleeve member and the bore thereof simultaneously into said furnace and to atmosphere, means for securing said housing to said wall box in gas-tight relationship with the open ends of the bore of said sleeve member aligned with the opening in said wall box, said wall box defining an annular chamber at a position near but spaced from one end thereof, a bushing member fitted in said wall box opening and defining a bore, said bushing member being provided with circumferentially spaced inclined openings interconnecting the bore thereof with the chamber in said wall box, means for supplying compressed air to the chamber defined by said housing and to the chamber defined by said wall box, and means secured to said housing for supporting said lance tube.

9. A sealing device adapted for use with a boiler furnace, said device comprising a wall box adapted to be mounted in an opening in the furnace wall, said wall box having an opening therein adapted to accommodate a lance tube, a tubular housing having an annular chamber therein, a horizontally extending sleeve member fitted in said housing and defining a bore open at each end and adapted to accommodate a lance tube, said sleeve member being provided with a plurality of centrally disposed circumferentially spaced openings interconnecting the bore of the sleeve member with the chamber defined by said housing, the diameter of one end of said sleeve member being less than the diameter of the opposite end of said sleeve member whereby said sleeve member defines clearance areas spaced longitudinally thereof and permitting air to flow from the chamber defined by said housing through the openings in said sleeve member and the bore thereof simultaneously into said furnace and to atmosphere, means for securing said housing to said wall box in gas-tight relationship with the open ends of the bore of said sleeve member aligned with the opening in said wall box, said wall box defining an annular chamber at a position near but spaced from one end thereof, a bushing member fitted in said wall box opening and defining a bore, said bushing member being provided with circumferentially spaced inclined openings interconnecting the bore thereof with the chamber in said wall box, means for supplying compressed air to the chamber defined by said housing and to the chamber defined by said wall box, means secured to said housing for supporting said lance tube, said support means comprising a pair of oppositely disposed brackets pivotally attached at the outer end portions thereof to said housing, a pair of tapered rollers rotatably mounted in the inner end portions of said brackets, the peripheral surfaces of said rollers being disposed within a cylindrical projection of the bore of said sleeve and adapted to bear against a lance tube when a lance tube is inserted in said sleeve, the axis of each of said rollers being offset with respect to the axis of said sleeve, and means secured to said housing for supporting said brackets in an angularly adjusted position.

References Cited in the file of this patent

UNITED STATES PATENTS

1,567,416	Cagwin	Dec. 29, 1925
2,018,242	Von Schlippenbach	Oct. 22, 1935
2,528,671	Selnik	Nov. 7, 1950
2,545,886	Kooistra	Mar. 20, 1951
2,622,549	Fletcher	Dec. 23, 1952