May 20, 1958 E. M. DISS 2,835,121

SEALING ORIFICE FOR STEAM TUBES AND THE LIKE

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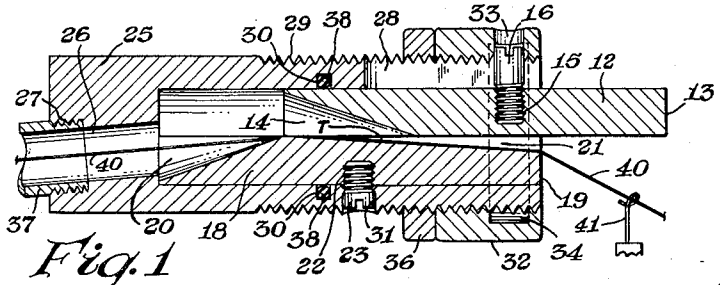


Fig. 1

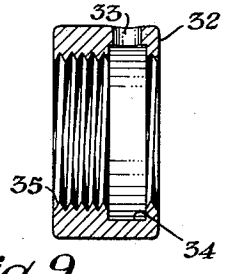


Fig. 9

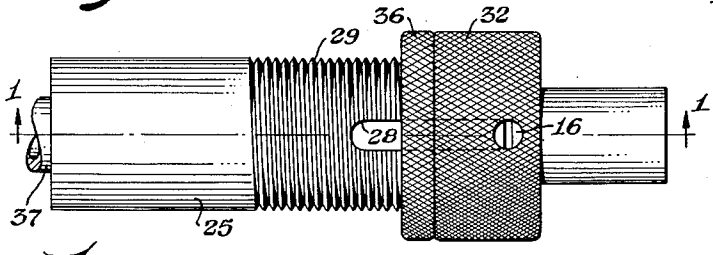


Fig. 2

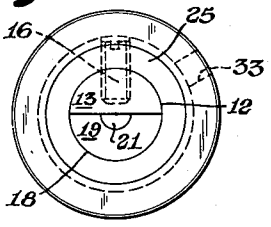


Fig. 3

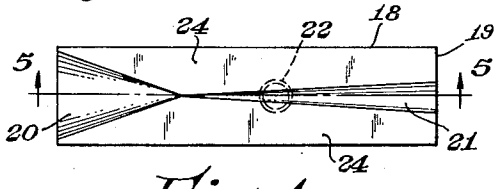


Fig. 4

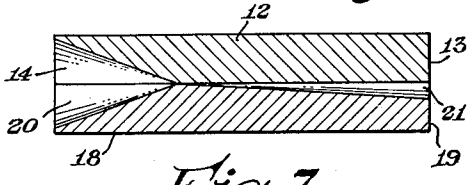


Fig. 7

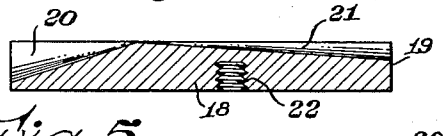


Fig. 5

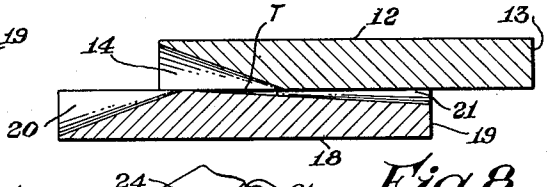


Fig. 8

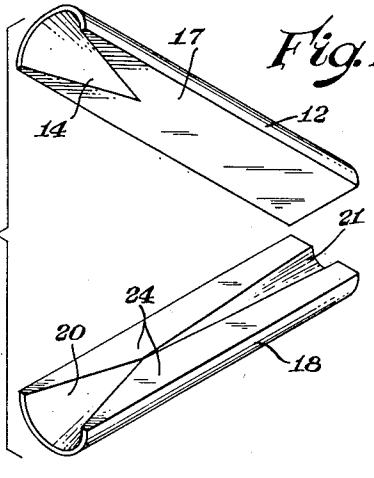
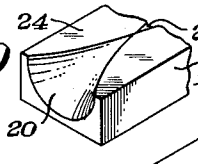


Fig. 6

Fig. 10



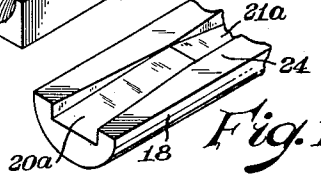


Fig. 11

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SEALING ORIFICE FOR STEAM TUBES AND THE LIKE

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Application October 26, 1955, Serial No. 542,862

15 Claims. (Cl. 68—6)

This invention relates to a sealing orifice for steam tubes and like enclosures wherein running lengths of strandular material are treated for various purposes while being subjected to a gaseous treating fluid, such as steam, which is maintained under pressure within the steam tube.

It is among the principal objects of the present invention to provide a sealing orifice which may advantageously be employed on the open ends of steam tubes and the like to restrict and minimize the escape of steam or other gaseous treating fluid from the steam tube while accommodating the free lengthwise passage of strandular material through the steam tube. It is also an object of the invention to provide a sealing orifice for steam tubes and the like which is especially suited for employment with steam tubes being utilized in the treatment of running lengths of textile fibers, including yarns, threads and particularly bundles and tows of continuous filament artificial and synthetic textile fibers.

According to the present invention, a sealing orifice for steam tubes and the like comprises a pair of aperture forming members having leading and trailing edges and extending longitudinally therebetween; adjacent and facing surfaces in contact on each of said members between their leading and trailing edges; one of said members being longitudinally slidable along the contacting surfaces relative to the other member; a groove in the contacting surface of one of said members extending longitudinally from its leading edge towards its trailing edge to provide an internal passageway between said members; said members being positioned with the trailing edge of the ungrooved member over the groove in said grooved member to form an outlet throat for the passageway provided by said groove; means for maintaining a sealing contact between the adjacent and facing surfaces of said members; and means for mounting said members in sealing contact as a longitudinally extending closure on the open end of a steam tube.

Further objects and advantages of the present invention will be apparent in the following description and the drawing, in which like reference numerals refer to like parts, wherein:

Figure 1 is a sectional side elevation of a sealing orifice according to the present invention, taken along the section line 1—1 in Figure 2;

Figure 2 is a plan view of the sealing orifice;

Figure 3 is a view of the leading end of the orifice;

Figure 4 is a plan view of the grooved aperture forming member in the sealing orifice;

Figure 5 is a sectional elevation of the grooved member taken along 5—5 in Figure 4;

Figure 6 is an exploded perspective view of the aperture forming members;

Figures 7 and 8 illustrate the interaction of the aperture forming members;

Figure 9 is a sectional view of the means for moving and positioning the aperture forming members relative to one another in the illustrated embodiment; and

Figures 10 and 11 illustrate other embodiments of aperture forming members which may be employed according to the present invention.

With initial reference to Figures 1–6 in the drawing, there is illustrated in Figures 1 and 2 a sealing orifice comprised of upper and lower aperture forming members 12 and 18 respectively which are positioned in an internal channel 26 within a hollow, cylindrical, open-ended housing 25. The longitudinally extending aperture forming members 12 and 18 have leading edges 13 and 19 and trailing edges 14 and 20, respectively. Advantageously the leading edges are outwardly exposed to the atmosphere when the sealing orifice is in position on a steam tube with the trailing edges being inwardly disposed. As shown, more particularly in Figures 4–6, each of the members 12 and 18 have adjacent surfaces 17 and 24 which face and are in contact with one another. It is desirable for the contacting surfaces 17 and 24 to be flat to readily permit sliding of one member relative to the other although other conforming contacting surfaces may also be employed. The surfaces preferably interfit closely enough to furnish a seal against the penetration of steam and other gaseous treating fluids under pressure between them.

The trailing edges 14 and 20 of each of the aperture forming members 12 and 18 are advantageously tapered and, preferably, as illustrated, are conically chamfered to have a funneled or semi-conical recessed configuration. It is usually desirable for the trailing edges of both of the aperture forming members to be similar or identical.

The lower aperture forming member 18 is provided with a groove 21 which begins in the leading edge 19 of the member 18 and extends longitudinally towards the trailing edge 20 to emerge or terminate on the contacting surface 24 before it is permitted to extend sufficiently to intersect the trailing edge. Advantageously, the groove 21 is tapered converging to the contacting surface 24 at its point of emergence thereon and is slightly flared out in the direction of the leading edge 19 of the lower aperture forming member. It is desirable for the point of emergence of the groove 21 on the surface 24 to be as close as possible to the trailing edge 20 without actually intersecting with it. It is also desirable for sharp and square edges to be provided at the intersection of the contacting surfaces with the groove or with the trailing edges.

A set screw 23 threaded in a tapped hole 22 on the bottom of the lower aperture forming member 18 and extending into an opening 31 in the bottom of the housing 25 holds the lower member 18 stationarily positioned in the housing. Advantageously, the upper member 12 is positioned slidably along the contacting surface of the lower member 18 to facilitate positioning the trailing edge 14 of the upper member 12 over the groove 21. This forms a throat T between the upper and lower members 12 and 18 to provide an outlet (or inlet, depending on the direction of passage) for strandular material in the groove 21. Alternatively, if desired, the non-grooved (upper) member 12 may be stationarily positioned and the grooved (lower) member 18 slidably positioned to effect relative movement between the pair.

The position of the upper member 12 relative to the lower member 18 may advantageously be altered to vary the size of the throat T by any suitable means which may be incorporated in the apparatus for slidably moving and positioning the upper member within the housing. Such a means, as shown in the illustrated embodiment, conveniently may consist of an adjusting nut 32 (also shown cross-sectionally in Figure 9), threaded on the outer threads 29 about the housing 25 of the sealing orifice, having an inner, annular channel 34. A set screw 16, threaded in a tapped hole 15 in the upper side of the upper member 12, extends through a slot

28 in the housing into the annular channel 34 of the adjusting nut 32. Movement of the adjusting nut 32 on the threads 29 causes a longitudinal movement in the same direction as the nut of the upper member 12 relative to the stationarily positioned lower member 18. An access hole 33 leading to the annular channel 34 in the adjusting nut 32 facilitates insertion of the set screw 16 in the tapped hole 15 in the upper member 12 after insertion of the member within the housing 25. A locking nut 36, when it is drawn up tightly against the adjusting nut 32, may advantageously be employed for clamping the adjusting nut in order to fix the upper member 12 in a desired position.

As is depicted in Figures 7 and 8, movement of the upper member 12 along the lower member serves to close off or open the throat T between the members to any desired extent. As shown in Figure 7, when the tapered trailing edge 14 of the upper member 12 is not over the groove 21, there is no throat formed in the passageway provided by the groove 21 between the members 12 and 18. However, movement of the upper member 12 to position the trailing edge 14 over the groove 21 forms the throat T and completes the passageway for strandular material between the members 12 and 18 from their leading to their trailing edges. As is apparent, the size of the throat T, when it is formed by a funneled groove and trailing edge, may be predetermined and varied within the limits of the size of the groove, according to the extent to which the trailing edge 14 is positioned beyond the edge of the groove. In all cases it is most advantageous to conform the size of the throat T as nearly as possible to the cross section of the strandular material being passed through the sealing orifice. This minimizes the extent and amount of loss of steam and the like through the passageway in the sealing orifice.

In order to provide a more efficient sealing orifice, it is also advantageous for the upper and lower members 12 and 18 to be peripherally sealed against the end of the steam tube or other enclosure on which they are employed or within the housing or other mounting confines in which they are positioned for connection to the steam tube. Thus, for example, when a cylindrical housing is employed for cylindrical peripheried members, an internal sealing gasket such as the O ring gasket 38 in the annular gasket seat 30 within the housing 25 may be utilized to prevent the escape of steam or other gaseous fluid around the aperture forming members. Other means for sealing the peripheral portions of the aperture forming members may also be utilized, including closely interfitting parts and other gasketing and sealing arrangements.

The cross-sectional periphery of the aperture forming members may assume other configurations besides semicircular structures. They may have rectangular cross sections, as illustrated by member 18A in Figure 10, or may be square, polygonal or curved in any desired manner. In addition, either of the members which is stationarily positioned may, if desired, be formed integral with the housing or mounting enclosure for the movable member. Likewise, the tapered trailing edges of either member, particularly the grooved member, and the groove in the grooved member may have various desired configurations. They may, for example, be formed in the shape of oppositely extending chisel-like indentures, as depicted at 20A and 21A in Figure 11, or they may have other linear or curvilinear outlines and recessed characteristics. The tapered trailing edges may even, if desired, be perfectly flat and unrecessed edges.

The aperture forming members may be mounted in any desired longitudinally extending manner to the open end of a steam tube or the like to provide a sealing orifice closure. They may be directly mounted in the end of a steam tube or, advantageously, may be positioned in a housing or other mounting enclosure which is fastened or coupled on the end of a steam tube. The internal channel 26 of the housing 25 may, as illustrated, be provided with threads 27 at one end to permit coupling the sealing orifice to the threaded end of a steam tube 37. Other fastening means such as flanges, welding joints, snap-on fittings and the like may also be employed for this purpose.

When mounting the sealing orifice of the present invention on the end of a steam tube or the like it is advantageous for it to be positioned in such a manner that the strandular material is more or less in tensioned contact against the grooved aperture forming member while being passed through the sealing orifice. This facilitates the passage of the strandular material through the sealing orifice. In particular, it reduces the tendency of certain strandular material, especially multiple filament tows and the like, to spread out and flare while being passed through the sealing orifice so as to become entangled therein, particularly in the throat between the aperture forming members. This may be accomplished, as illustrated in Figure 1, by offsetting a portion of the channel 26 at a slight angle so that the sealing orifice may be coupled to a steam tube in such a manner that the contacting surfaces 17 and 24 of the aperture forming members 12 and 18 are disposed in a plane at an angle relative to the axial path of passage of the strandular material 40 through the steam tube 37. This causes the passing strandular material to contact some portion of the trailing edge 20 of the grooved member. For this purpose it may also be advantageous by means of a suitably placed guide 41 to pass the material angularly through the sealing orifice along the bottom of the groove 21.

Sealing orifices according to the present invention may be effectively employed to substantially completely restrict the escape of steam or other gaseous fluid from steam tubes being employed for the treatment of running lengths of textile fibers. They are particularly effective for sealing steam tubes during the stretching for purposes of orientation and the like of continuous filament bundles and tows of artificial and synthetic textile fibers.

While the sealing orifices of the present invention have been discussed herein in terms of various relative positions such as leading and trailing, upper and lower and the like, it is to be understood that no restrictions as to the utility or adaptability of devices according to the invention are to be imputed therefrom. They are operative, within the inventive concept, regardless of the particular relative direction in which strandular material is being passed through them or of the relative positions in which they or their several elements may be employed. It is contemplated that, most commonly, the end of the orifice and the edges of the aperture forming members herein referred to as trailing or the trailing edge will be directed toward the steam tube on which the sealing orifice is mounted, but it is to be understood that, alternatively, it may be directed away from the steam tube or like enclosure with little, if any, loss in efficiency. Further, it is to be fully understood that many changes and modifications can be entered into in the practice of the present invention without substantially departing from its spirit and scope. Hence, it is intended that all the foregoing specification and description be interpreted and construed as being merely illustrative of certain of the possible embodiments of the invention. In no sense or manner should limiting or restrictive considerations of the invention be entertained excepting in view of its definition as set forth in the appended claims.

What is claimed is:

1. Sealing orifice for steam tubes and the like wherein a running length of a strandular material is subjected to a gaseous fluid under pressure, said orifice comprising a pair of elongate aperture forming members having leading and trailing edges with adjacent and facing surfaces extending between said edges, said surfaces being in con-

tact on each of said members between their leading and trailing edges; a groove in the contacting surface of one of said members extending longitudinally from its leading edge towards its trailing edge to provide an internal passageway between said members; said members being positioned with the trailing edge of the ungrooved member over the groove in said grooved member to form an outlet throat for the passageway provided by said groove; means for maintaining a sealing contact between the adjacent and facing surfaces of said members; and means for mounting said members in sealing contact as a longitudinally extending closure on the open end of a steam tube.

2. Sealing orifice for steam tubes and the like wherein a running length of a strandular material is subjected to a gaseous fluid under pressure, said orifice comprising a pair of elongate aperture forming members having leading and trailing edges with the adjacent and facing surfaces extending between said edges, said surfaces being in contact on each of said members between their leading and trailing edges; one of said members being longitudinally slidable along the contacting surfaces relative to the other member; a groove in the contacting surface of one of said members extending longitudinally from its leading edge towards its trailing edge and emerging on said contacting surface to provide an internal passageway between said members; said members being positioned with the trailing edge of the ungrooved member over the groove in said member to form an outlet throat for the passageway provided by said groove; means for maintaining a sealing contact between the adjacent and facing surfaces of said members; means for moving the movable one of said members in a longitudinal direction relative to the other; and means for mounting said members in sealing contact as a longitudinally extending closure on the open end of a steam tube.

3. The apparatus of claim 2 wherein the trailing edges of the aperture forming members are tapered away from said outlet throat.

4. The apparatus of claim 3 wherein the trailing edges of the aperture forming members are conically chamfered and have a funneled configuration away from said outlet throat.

5. Sealing orifice for steam tubes and the like wherein a running length of a strandular material is subjected to a gaseous fluid under pressure, said orifice comprising a hollow, open-ended housing; elongated upper and lower aperture forming members, having leading and trailing edges adjacent and facing surfaces extending between said edges, said members being positioned to fit closely within said housing in a longitudinally extending direction between its open ends; the adjacent and facing surfaces of said members being in contact with one another between their leading and trailing edges; one of said members being longitudinally slidable along the contacting surfaces relative to the other member; and a groove in the contacting surface of the lower member extending longitudinally from its leading edge towards its trailing edge and emerging on said contacting surface to provide an internal passageway between said members; said members being positioned with the trailing edge of the upper member over the groove in said lower member to form an outlet throat for the passageway provided by said groove.

6. Sealing orifice for steam tubes and the like wherein a running length of a strandular material is subjected to a gaseous fluid under pressure, said orifice comprising a hollow, open-ended housing; elongate upper and lower aperture forming members, having leading edges and tapered trailing edges with adjacent and facing surfaces extending between said edges, said members being positioned to fit closely within said housing in a longitudinally extending direction between its open ends; the adjacent and facing surfaces of said members being in contact with one another between their leading and trailing edges, one of said members being longitudinally slidable along the contacting surfaces relative to the other member; a groove in the contacting surface of the lower member extending longitudinally towards its trailing edge and emerging on said contacting surface to provide an internal passageway between said members; said members being positioned with the tapered trailing edge of the upper member over the groove in said lower member to form an outlet throat for the passageway provided by said groove; and means for moving the movable one of said members in a longitudinal direction relative to the other.

7. Sealing orifice for steam tubes and the like wherein a running length of a strandular material is subjected to a gaseous fluid under pressure, said orifice comprising a hollow, open-ended housing; elongate upper and lower aperture forming members, having leading edges and tapered trailing edges with adjacent and facing surfaces extending between said edges, said members being positioned to fit closely within said housing in a longitudinally extending direction between its open ends; the adjacent and facing surfaces of said members being in contact with one another between their leading and trailing edges; the lower of said members being stationarily fixed within said housing and the upper member being longitudinally slidable along the contacting surface thereon; a groove in the contacting surface of the lower member extending longitudinally towards its trailing edge and emerging on said contacting surface near the trailing edge to provide an internal passageway between said members; said members being positioned with the tapered trailing edge of the upper member over the groove in said lower member to form an outlet throat for the passageway produced by said groove; and means for moving the upper member in a longitudinal direction relative to the lower member.

8. Sealing orifice for steam tubes and the like wherein a running length of a strandular material is subjected to a gaseous fluid under pressure, said orifice comprising a hollow, cylindrical, open-ended housing; elongate semicylindrical upper and lower aperture forming members, having leading edges and tapered trailing edges with adjacent and facing surfaces extending flatly between said edges, said members being positioned to fit closely within said housing in a longitudinally extending direction between its open ends; the adjacent, flat facing surfaces of said members being in contact with one another between their leading and trailing edges; the lower of said members being stationarily fixed with said housing and the upper member being longitudinally slidable along the contacting surface thereon; a groove in the contacting surface of the lower member extending longitudinally towards its trailing edge and emerging on said contacting surface near the trailing edge to provide an internal passageway between said members; said members being positioned with the tapered trailing edge of the upper member over the groove in said lower member to form an outlet throat for the passageway provided by said groove; and means for moving the upper member in a longitudinal direction relative to the lower member.

9. The apparatus of claim 8 wherein the trailing edges of the upper and lower aperture forming members are conically chamfered and have a funneled configuration away from said outlet throat.

10. The apparatus of claim 8 wherein the groove in the lower aperture forming member is tapered from the leading edge to the contacting surface.

11. The apparatus of claim 8 wherein the groove in the lower aperture forming member is tapered from the leading edge to the contacting surface and is flared outwardly from its point of emergence on the contacting surface towards the leading edge.

12. Sealing orifice for steam tubes and the like wherein a running length of a strandular material is subjected to a gaseous fluid under pressure, said orifice comprising a cylindrical, open-ended housing; exterior threads at one end of said housing; a cylindrical internal channel within said housing; internal coupling threads at one end in

said channel at the end of said housing which is opposite said exterior threads; elongate, semi-cylindrical upper and lower aperture forming members positioned to fit closely in the channel within said housing, said members having leading edges and tapered trailing edges with adjacent and facing surfaces extending flatly between said edges, said trailing edges being conically chamfered and having a funneled configuration; the adjacent flat facing surfaces of said members being in contact with one another between their leading and trailing edges; the lower of said members being stationarily fixed within said housing and the upper memer being longitudinally slidable along the contacting surface thereon; a tapered groove in the contacting surface of the lower member extending longitudinally towards its trailing edge and emerging on said contacting surface near the trailing edge to provide an internal passageway between said members, said groove being flared outwardly from its point of emergence on the contacting surface towards the leading edge; said members being positioned with the conically chamfered tapered trailing edge of the upper member over the groove in said lower member to form an outlet throat for the passageway provided by said groove; an adjusting nut on the exterior threads of said housing; and means for connecting said adjusting nut with the upper member to move the upper member in a longitudinal direction relative to the lower member when said nut is moved along said threads.

13. The apparatus of claim 12 wherein a portion of the internal channel in said housing is offset at a slight angle at its threaded end so as to be disposed with the axis of its offset portion in a plane which is at an angle to the plane between the contacting surfaces of said aperture forming members.

14. The apparatus of claim 12 wherein the groove in said lower member emerges on said contacting surface at a point just before the point where it would intersect with the trailing edge.

15. Sealing orifice for steam tubes and the like wherein a running length of a strandular material is subjected to a gaseous fluid under pressure, said orifice comprising a cylindrical, open-ended housing; exterior threads at one end of said housing; a cylindrical internal channel within said housing; internal coupling threads in said channel at the end of said housing which is opposite said exterior threads; elongate, semi-cylindrical upper and lower aperture forming members positioned to fit closely in the channel within said housing, said members having leading edges and tapered trailing edges with adjacent and facing surfaces extending flatly between said edges, said trailing edges being conically chamfered and having a funneled configuration; the adjacent, flat facing surfaces of said members being in contact with one another between their leading and trailing edges; the lower of said members being stationarily fixed within said housing and the upper member being longitudinally slidable along the contacting surface thereon; a tapered groove in the contacting surface of the lower member extending longitudinally towards its trailing edge and emerging on said contacting surface near the trailing edge to provide an internal passageway between said members, said groove being flared outwardly from its point of emergence on the contacting surface towards the leading edge; said members being positioned with the conically chamfered trailing edge of the upper member over the groove in said lower member to form an outlet throat for the passageway provided by said groove; an adjusting nut on the exterior threads of said housing, said nut being provided with an annular interior channel; a slot in said housing through said exterior threads over said upper aperture forming member; and a pin extending from said upper aperture forming member through said slot in said housing to be engageable with said adjusting nut in the annular interior channel thereof, said upper member being thereby adapted to move in a longitudinal direction relative to the lower member when said nut is moved along said threads.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 2,835,121 May 20, 1958

Edward M. Diss

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

Column 6, line 75, strike out "at one end".

Signed and sealed this 18th day of November 1958.

(SEAL)
Attest:
KARL H. AXLINE
Attesting Officer

ROBERT C. WATSON
Commissioner of Patents