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2,649,273

DEVICE FOR CONTROLLING THE PASSAGE OF A FLUID

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Fig. 1.

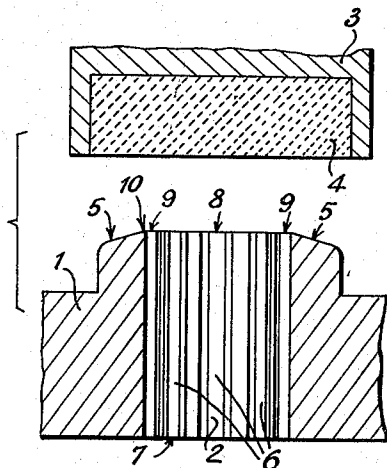


Fig. 3.

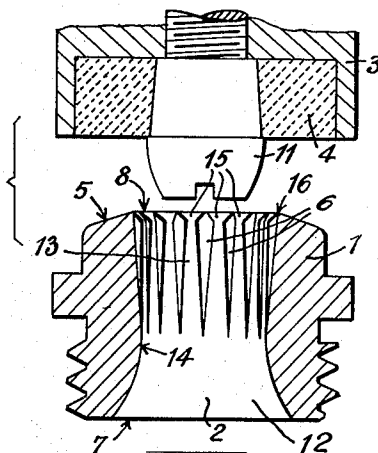


Fig. 2.

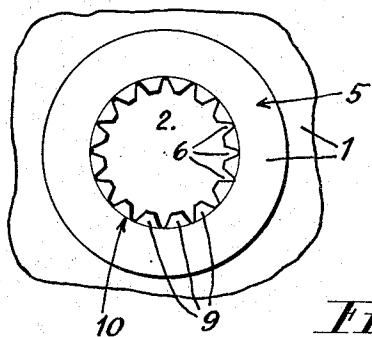


Fig. 4.

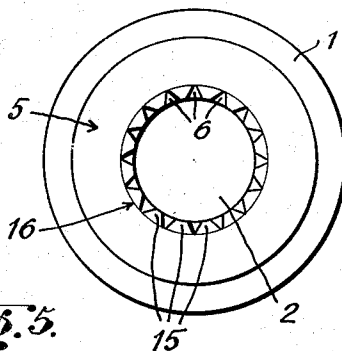


Fig. 5.

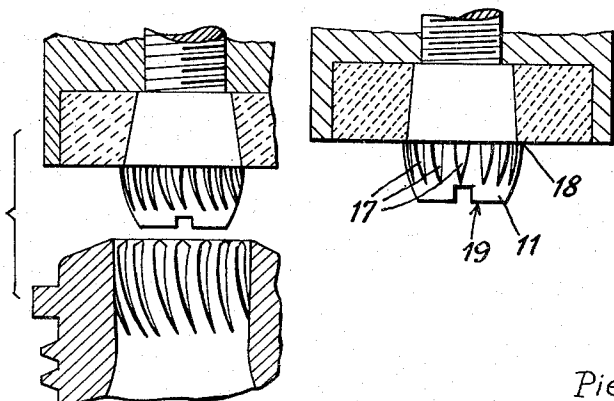


Fig. 6.

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## UNITED STATES PATENT OFFICE

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DEVICE FOR CONTROLLING THE PASSAGE  
OF A FLUID

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The present invention relates to a device for controlling the passage of a fluid of the type comprising a member presenting a passage and a member for closing this passage.

The device according to the invention is characterized in that at least one of these two members is grooved in the direction of the flow of the fluid.

The annexed drawing represents, in the way of examples, various embodiments of the device to which the present invention relates.

Figure 1 is a large-scale axial section of a first embodiment;

Figure 2 is a plan of the seat of the same embodiment;

Figure 3 is an axial section of the second embodiment;

Figure 4 is a plan of the seat of the second embodiment;

Figure 5 is an axial section of an alternative form of closing member; and

Figure 6 is an axial section of a still further embodiment.

The device for controlling the passage of a fluid which is exemplified in Figure 1 comprises a member 1 forming part of the body of the device and which presents a cylindrical passage 2 for the fluid. This device includes a closing member 3 presenting a joint 4 intended to bear against the truncated-cone-shaped seat 5 that the member 1 presents at the outlet end of the passage 2.

As is seen in the drawing, the surface of the passage 2 is grooved, the rectilinear grooves 6, extending from the inlet end 7 of the passage 2 right to its outlet end 8 against which the closing member 3, 4 comes to bear for closing the passage. As is seen, the outlet end of the passage 2 constitutes a surface forming a seat for the closing member. This surface presents a flat annular portion 9 in which the grooves terminate, the width of this portion 9 being equal to the depth of these grooves, as Figure 2 shows. This width may be slightly larger than the said depth. The circular ridge marking the intersection of the flat annular surface 9 and the truncated-cone-shaped surface 5 is indicated at 10.

In the embodiment according to Figure 3, the closing member 3 also presents a joint 4, but it is further fitted with a shaped teat 11 which fits into the passage 2 when the latter is being closed. The member 1 consists, in this second embodiment, of a piece which screws on to the body (not shown) of the device. The passage 2 includes an inlet part 12 which gradually tapers

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and a narrowed cylindrical part 13 extending from the neck 14 to the outlet end 8 of the passage 2.

In this second example, the grooves 6, which are rectilinear, begin beyond the entry neck 14 of the passage; they extend, as in the first embodiment, right to the outlet 8. The outlet end of the passage terminates in a face forming a seat for the closing member, this face consisting of two truncated-cone-shaped surfaces, the outer one 5 being convex and the inner one 15 being concave. The circular ridge of intersection of these two surfaces 5 and 15 is indicated at 16. The bottom of every groove terminates flush with the intersection 16 of the outlet end 8.

It has been observed that, by providing grooves running in the direction of the flow of the fluid, as has been described with reference to the previous two embodiments, the whistling noise which is generally produced when ordinary similar devices are functioning and the fluid is flowing through the passage 2 is practically completely eliminated. The flow of fluid is divided by the grooves into fine streams and the vibrations, if any, of these streams are out of phase so that any noise due to these vibrations is effectively minimized and practically prevented.

In Figure 5, a closing member similar to the one shown in Figure 3 has been represented but it differs from the latter in that the teat 11 presents grooves 17 running in the direction of the flow of the fluid.

The closing member according to Figure 5 may, in a variant of the examples previously described, be employed with the member 1 according to Figure 1 or in conjunction with the member 1 according to Figure 3.

It will be observed that, in the example according to Figure 5, the grooves extend from the base 18 of the teat 11 to close to its top 19.

As shown in Figure 6, it may further be provided that the grooves in the passage and the grooves in the teat be helically inclined in opposite directions to one another.

Although the invention has been described for the case where the seat with which the closing member co-operates presents a conical surface 5 allowing of terminating at the line of closing and to have nevertheless a good closing, the invention is not limited to this case and could also be applied to different types of construction.

What I claim is:

1. A valve structure, comprising, in combination, a tubular valve body formed with an elongated passage extending axially therethrough, said valve body having a valve seat located about

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said passage at an extreme outer end thereof, said valve seat being in a plane which is substantially perpendicular to the longitudinal axis of said passage, and the wall of said passage being formed with a plurality of grooves which are parallel to each other and extend substantially along the length of said passage, the said grooves each terminating at one end in said valve seat, and said valve body having at said outer end thereof an annular conical end face having an inner periphery located at said one end of each groove and an outer periphery located between the extreme ends of said valve body; and a valve member adapted to be moved toward and away from a closing position where it abuts against said valve seat, said grooves decreasing any noise due to the flow of fluid through the valve structure.

2. A valve structure comprising, in combination, a valve body formed with a bore passing therethrough, said bore being conically flared at one end thereof, the outer wall of said body adjacent said conically flared portion having an oppositely disposed conical surface, and the adjacent extremities of said conical surfaces coinciding to form a sharp edge seating surface, and the wall of said bore being formed with a plurality of grooves which are parallel to each other and extend substantially along the length of said bore, said grooves each terminating at one end in said conically flared portion and having at said one end a depth substantially equal to the width of said conically flared portion; and a valve member adapted to be moved toward and away from a closing position where it abuts against said seating surface, said valve member comprising a portion of resilient material confronting and adapted to bear against said sharp edge seating surface so as to effectively close the valve structure, said grooves decreasing any noise due to the flow of fluid through the valve structure.

3. A valve structure comprising, in combination, a valve body formed with a bore passing therethrough, said bore being conically flared at one end thereof, the outer wall of said body adjacent said conically flared portion having an oppositely disposed conical surface, and the adjacent extremities of said conical surfaces coinciding to form a sharp edge seating surface, and the wall of said bore being formed with a plurality of grooves which are parallel to each other and extend substantially along the length of said bore, said grooves each terminating at one end in said conically flared portion; and a valve member adapted to be moved toward and away from a closing position where it abuts against said seating surface, said valve member comprising a portion of resilient material adapted to bear against said sharp edge seating surface so as to effectively close the valve structure and a projection mounted on said valve member concentrically with and confronting said bore, the largest transverse dimension of said projection being substantially smaller than the diameter of said bore and said projection being of substantially less length than said bore, so that when said valve member is in valve closing position said projection only extends part way through said bore and has its entire outer surface spaced from the wall of said bore, said grooves decreasing any noise due to the flow of fluid through the valve structure.

4. A valve structure comprising, in combination, a valve body formed with a bore passing therethrough, said bore being conically flared at one end thereof, the outer wall of said body ad-

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jacent said conically flared portion having an oppositely disposed conical surface, and the adjacent extremities of said conical surfaces coinciding to form a sharp edge seating surface, and the wall of said bore being formed with a plurality of grooves which are parallel to each other and extend in a direction which is substantially parallel to the longitudinal axis of said bore, said grooves each terminating at one end in said conically flared portion and having at said one end a depth substantially equal to the width of said conically flared portion; and a valve member adapted to be moved toward and away from a closing position where it abuts against said seating surface, said valve member comprising a portion of resilient material adapted to bear against said sharp edge seating surface so as to effectively close the valve structure and a projection mounted on said valve member concentrically with and confronting said bore, the largest transverse dimension of said projection being substantially smaller than the diameter of said bore and said projection being of substantially less length than said bore, so that when said valve member is in valve closing position said projection only extends part way through said bore and has its entire outer surface spaced from the wall of said bore, said extension having its surface formed with grooves which are parallel to each other and which extend in a direction substantially parallel to the longitudinal axis of said cylindrical bore, said grooves decreasing any noise due to the flow of fluid through the valve structure.

5. A valve structure comprising, in combination, a valve body formed with a bore passing therethrough, said bore being conically flared at one end thereof, the outer wall of said body adjacent said conically flared portion having an oppositely disposed conical surface, and the adjacent extremities of said conical surfaces coinciding to form a sharp edge seating surface, and the wall of said bore being formed with a plurality of grooves which are parallel to each other, said grooves each terminating at one end in said conically flared portion of said bore and having at said one end a depth substantially equal to the width of said conically flared portion of said bore; and a valve member adapted to be moved toward and away from a closing position where it abuts against said sharp edge seating surface, said valve member comprising a portion of resilient material adapted to bear against said seating surface to effectively close the valve structure and a projection mounted on said valve member concentrically with and confronting said bore, the largest transverse dimension of said projection being substantially smaller than the diameter of said bore and said projection being of substantially less length than said bore, so that when said valve member is in valve closing position said projection only extends part way through said bore and has its entire outer surface spaced from the wall of said bore, said extension having its surface formed with grooves which are parallel to each other, said grooves in said bore wall and said extension being inclined only to the extent that they are almost parallel to the axis of said bore, and the direction of inclination of the grooves in said extension being opposite to the direction of inclination of the grooves in said bore wall, said grooves decreasing any noise due to the flow of fluid through the valve structure.

6. A valve structure comprising, in combination, a valve body formed with a bore passing

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therethrough, said bore being conically flared at one end thereof, the outer wall of said body adjacent said conically flared portion having an oppositely disposed conical surface, and the adjacent extremities of said conical surfaces coinciding to form a sharp edge seating surface, and the wall of said bore being formed with a plurality of grooves which are parallel to each other, said grooves each terminating at one end in said conically flared portion and having at said one end a depth substantially equal to the width of said conically flared portion and said grooves each terminating in another end portion which is located substantially midway between the ends of said bore; and a valve member adapted to be moved toward and away from a closing position where it abuts against said seating surface, said valve member comprising a portion of resilient material adapted to bear against said sharp edge seating surface so as to effectively close the valve structure and a projection mounted on said valve member concentrically with and confronting said bore, the largest transverse dimension of said projection being substantially smaller than the diameter of said bore and said projection being of substantially less length than said bore, so that when said valve member is in valve closing position said projection only extends part way through said bore and has its entire outer surface spaced from the wall of said bore, said extension having its surface formed with grooves which are parallel to each other, said grooves in said bore wall and said extension being inclined only to the extent that they are almost parallel to the axis of said bore, and the direction of inclination of the grooves in said extension being opposite to the direction of inclination of the grooves in said bore, said grooves decreasing any noise due to the flow of fluid through the valve structure.

7. A valve structure comprising, in combination, a valve body formed with a bore passing therethrough, said bore being conically flared at one end thereof, the outer wall of said body adjacent said conically flared portion having an oppositely disposed conical surface, and the adjacent extremities of said conical surfaces coinciding to form a sharp edge seating surface, and the wall of said bore being formed with a plurality of grooves which are parallel to each other, said grooves each terminating at one end in said conically flared portion and having at said one end a depth substantially equal to the width of said conically flared portion and said grooves each terminating in another end portion which is located substantially midway between the ends of said bore, said flared portion being located at the exit end of said bore so that the latter is filled with fluid when the valve structure is closed; and a valve member adapted to be moved toward and away from a closing position where it abuts against said seating surface, said valve member comprising a portion of resilient material adapted to bear against said sharp edge seating surface so as to effectively close the valve structure and a projection mounted on said valve member concentrically with and confronting said bore, the largest transverse dimension of said projection being substantially smaller than the diameter of said bore and said projection being of substantially less length than said bore, so that when said valve member is in valve closing position said projection only extends part way through said bore and has its entire outer surface spaced from the wall of said bore, said ex-

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tension having its surface formed with grooves which are parallel to each other, said grooves in said bore wall and said extension being inclined only to the extent that they are almost parallel to the axis of said bore, and the direction of inclination of the grooves in said extension being opposite to the direction of inclination of the grooves in said bore wall, said grooves decreasing any noise due to the flow of fluid through the valve structure.

8. A valve structure comprising, in combination, a tubular valve body formed with an elongated passage extending axially therethrough, said valve body having a valve seat located about said passage at an extreme outer end thereof, said valve seat being in a plane which is substantially perpendicular to the longitudinal axis of said passage, and the wall of said passage being formed along its entire circumference with a plurality of narrow, closely spaced grooves extending substantially along the length of said passage, the said grooves each terminating at one end in said valve seat, and said valve body having at said outer end thereof an annular conical end face having an inner periphery located at said one end of each groove and an outer periphery located between the extreme ends of said valve body; and a valve member adapted to be moved toward and away from a closing position where it abuts against said valve seat, said grooves decreasing any noise due to the flow of fluid through the valve structure.

9. A valve structure comprising in combination, a tubular body formed with an elongated passage extending axially therethrough, said valve body having a valve seat located about said passage at an extreme outer end thereof, said valve seat being in a plane which is substantially perpendicular to the longitudinal axis of said passage, and the wall of said passage being formed along its entire circumference with a plurality of closely spaced striae extending substantially along the length of said passage, the said striae each terminating at one end in said valve seat, and said valve body having at said outer end thereof an annular conical end face having an inner periphery located at said one end of each striae and an outer periphery located between the extreme ends of said valve body; and a valve member adapted to be moved toward and away from a closing position where it abuts against said valve seat, said striae decreasing any noise due to the flow of fluid through the valve structure.

10. A valve structure, comprising in combination, a tubular valve body formed with an elongated passage extending axially therethrough, said valve body having a valve seat located about said passage at an extreme outer end thereof, said valve seat being in a plane which is substantially perpendicular to the longitudinal axis of said passage, and the wall of said passage being formed along its entire circumference with a plurality of grooves which extend in a direction substantially parallel to the longitudinal axis of said passage and which are spaced from each other by a distance which is substantially equal to the depth of said grooves, the said grooves each terminating at one end in said valve seat, and said valve body having at said outer end thereof an annular conical end face having an inner periphery located at said one end of each groove and an outer periphery located between the extreme ends of said valve body; and a valve member adapted to be moved toward and away from

a closing position where it abuts against said valve seat, said grooves decreasing any noise due to the flow of fluid through the valve structure.

11. A valve structure comprising, in combination, a tubular valve body formed with an elongated passage extending axially therethrough, said valve body having a valve seat located about said passage at an extreme outer end thereof, said valve seat being in a plane which is substantially perpendicular to the longitudinal axis of said passage, and the wall of said passage being formed along its entire circumference with a plurality of grooves which extend in a direction substantially parallel to the longitudinal axis of said passage and which are spaced from each other by a distance which is less than the depth of said grooves, the said grooves each terminating at one end in said valve seat, and said valve body having at said outer end thereof an annular conical end face having an inner periphery located at said one end of each groove and an outer periphery located between the extreme ends of said valve body; and a valve member adapted to be moved toward and away from a closing position where it abuts against said valve seat, said grooves decreasing any noise due to the flow of fluid through the valve structure.

12. A valve structure comprising, in combination, a tubular valve body formed with an elongated passage extending axially therethrough, said valve body having a valve seat located about said passage at an extreme outer end thereof, said valve seat being in a plane which is substantially perpendicular to the longitudinal axis of said passage, and the wall of said passage being formed along its entire circumference with a plurality of grooves each of which has a depth which is less than one ninth of the diameter of said passage and each of which extends in a direction substantially parallel to the longitudinal axis of said passage and which are spaced from each other by a distance which is substantially equal to the depth of said grooves, the said grooves each terminating at one end in said valve seat, and said valve body at said outer end thereof an annular conical end face having an inner periphery located at said one end of each groove and an outer periphery located between the extreme ends of said valve body; and a valve member adapted to be moved toward and away from a closing position where it abuts against said valve seat, said grooves decreasing any noise due to the flow of fluid through the valve structure.

13. A valve structure comprising, in combination, a tubular valve body formed with an elongated passage extending axially therethrough, said valve body having a valve seat located about said passage at an extreme outer end thereof, said valve seat being in a plane which is substantially perpendicular to the longitudinal axis of said passage, and the wall of said passage being formed along its entire cir-

cumference with a plurality of grooves each of which has a maximum depth which is less than one ninth of the diameter of said passage and each of which extends substantially along the length of said passage and which are spaced from each other by a distance which is substantially equal to the maximum depth of said grooves, the said grooves each terminating at one end in said valve seat, and said grooves each having sides which are inclined with respect to each other and which converge toward the bottoms of said grooves; and a valve member adapted to be moved toward and away from a closing position where it abuts against said valve seat, said grooves decreasing any noise due to the flow of fluid through the valve structure.

14. A valve structure comprising, in combination, a tubular valve body formed with an elongated passage extending therethrough, said valve body having a valve seat located about said passage at an extreme outer end thereof, said valve seat being in a plane which is substantially perpendicular to the longitudinal axis of said passage, and the wall of said passage being formed along its entire circumference with a plurality of grooves each of which has a maximum depth which is less than one ninth of the diameter of said passage and each of which extends substantially along the length of said passage and which are spaced from each other by a distance which is substantially equal to the maximum depth of said grooves, the said grooves each terminating at one end in said valve seat, and said grooves each having sides which are inclined with respect to each other and which meet at the bottoms of said grooves; and a valve member adapted to be moved toward and away from a closing position where it abuts against said valve seat, said grooves decreasing any noise due to the flow of fluid through the valve structure.

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