H. W. WEBB & E. H. STICKELS.

MIXER FOR GASEOUS FLUIDS.

APPLICATION FILED AUG. 20, 1910.

976,415.

Patented Nov. 22, 1910.

Fig. 1,

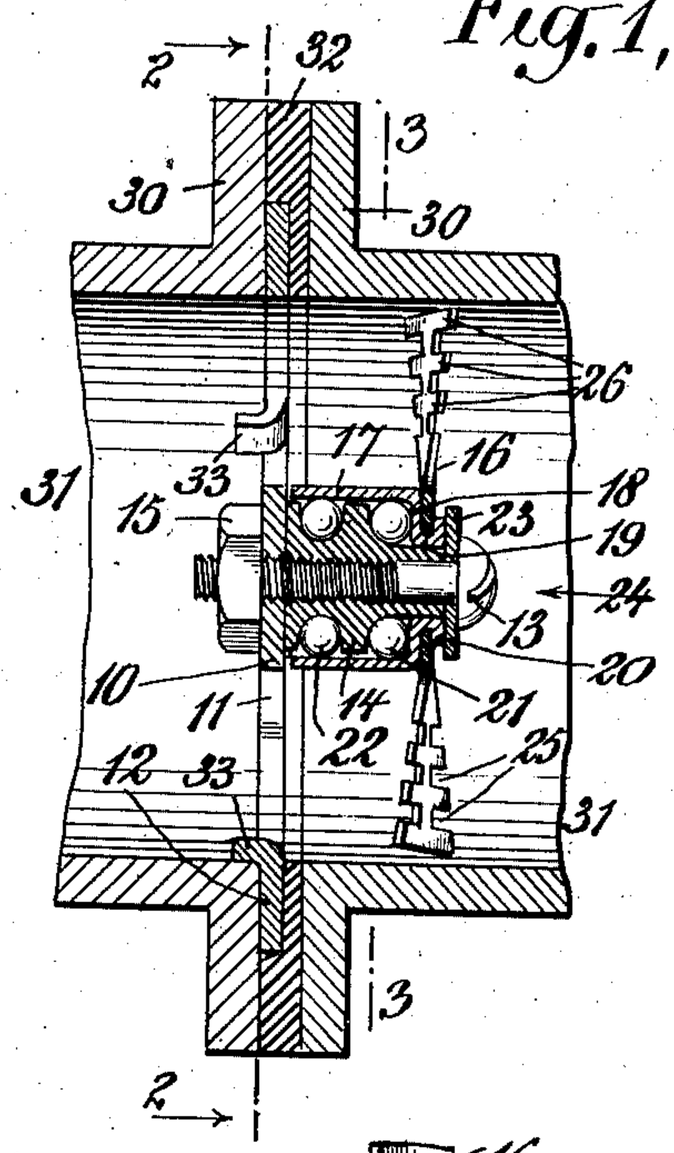


Fig. 2,

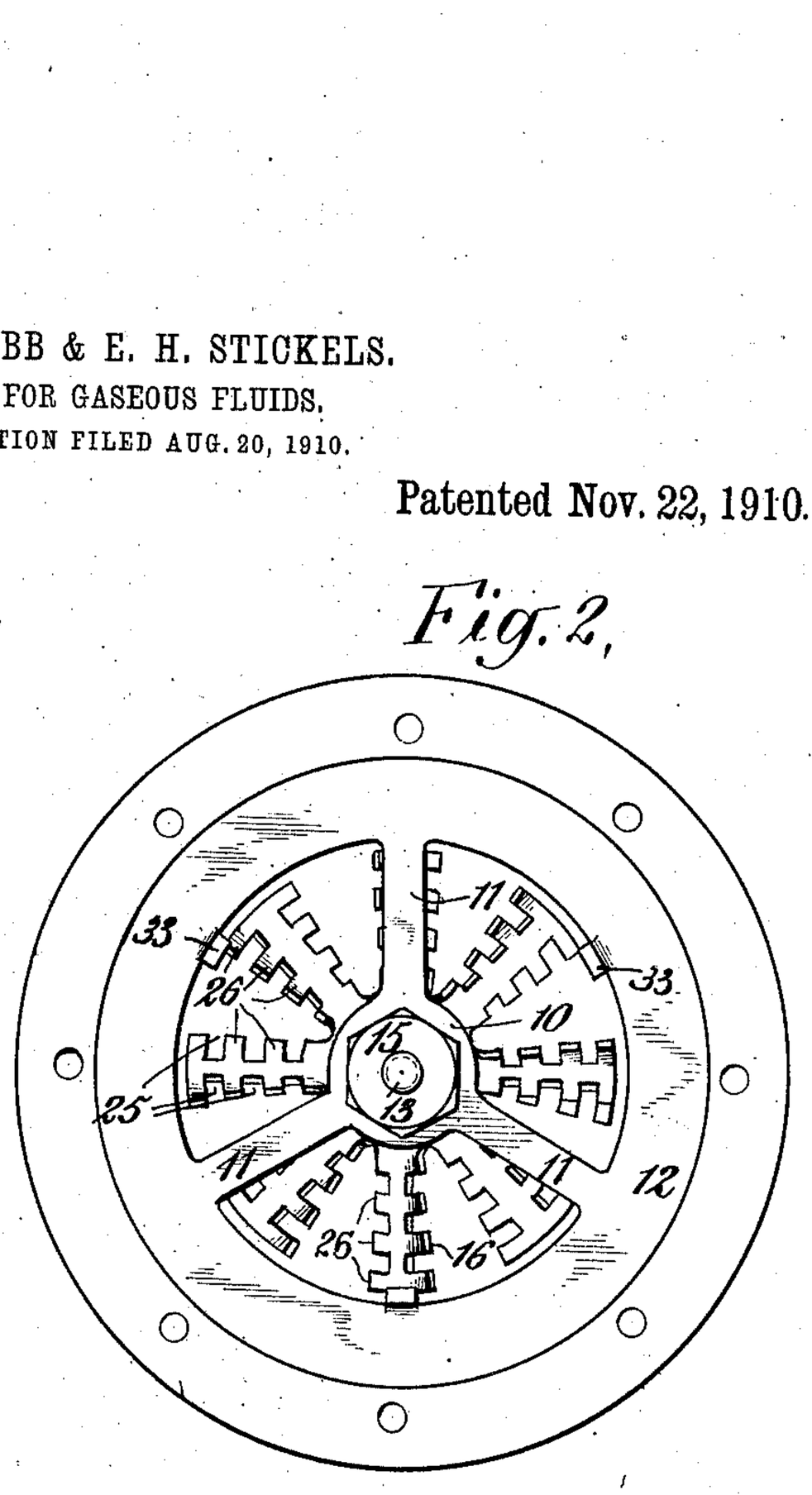


Fig. 3,

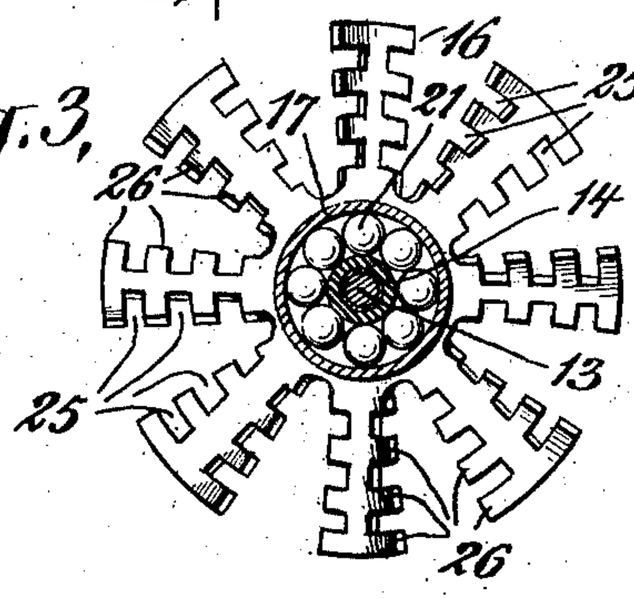


Fig. 5,

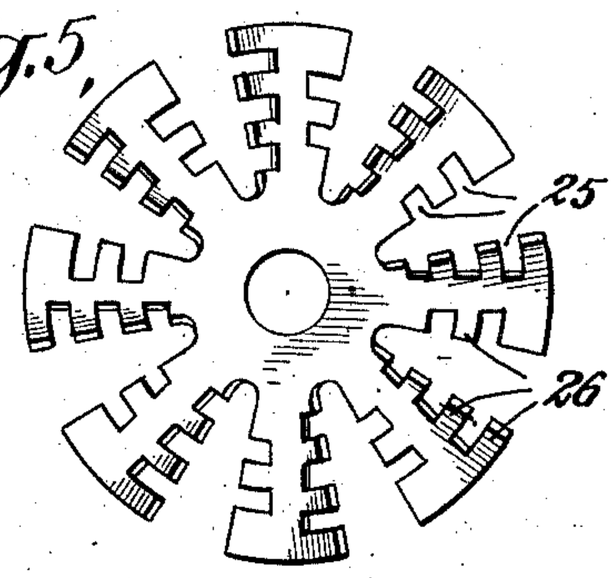


Fig. 6,

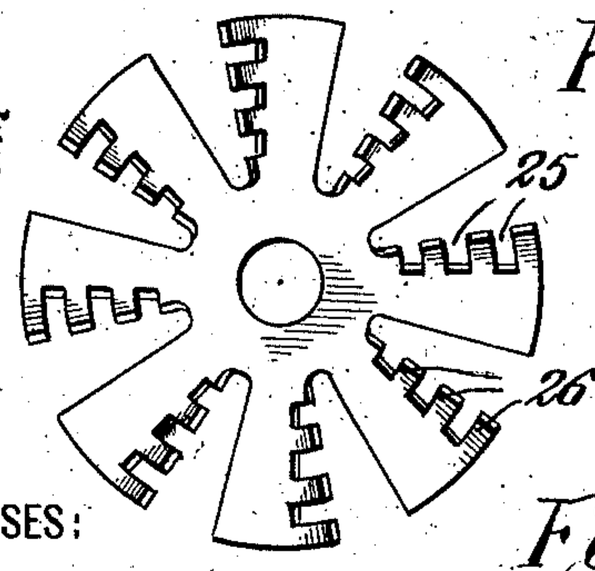


Fig. 7,

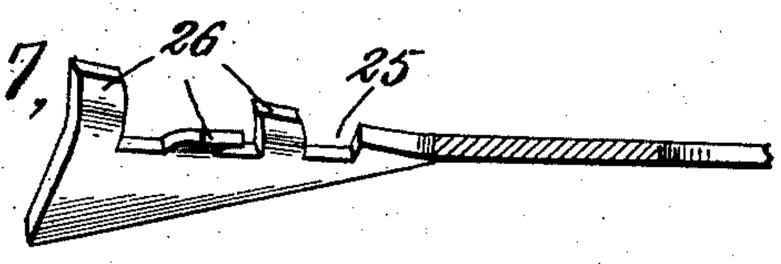


Fig. 8,

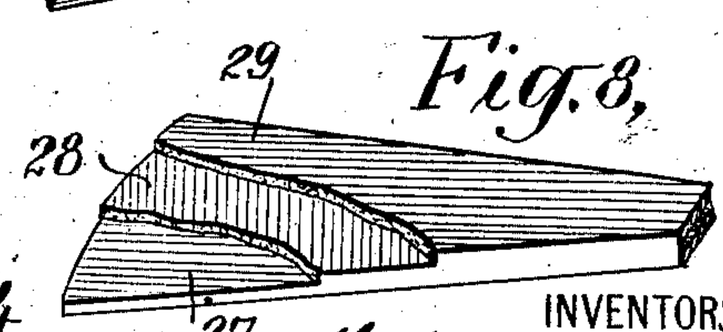
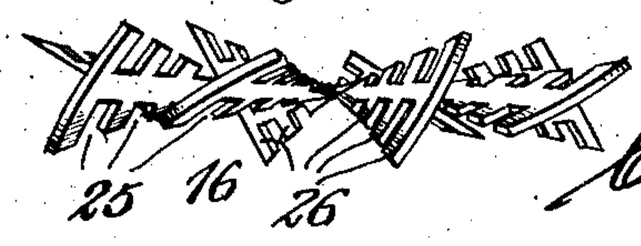


Fig. 4,



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UNITED STATES PATENT OFFICE.

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MIXER FOR GASEOUS FLUIDS.

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Application filed August 20, 1910. Serial No. 578,200.

To all whom it may concern:

Be it known that we, HARTWELL W. WEBB, a citizen of the United States of America, and a resident of Cresskill, county of Bergen, and State of New Jersey, and EDWARD H. STICKELS, a citizen of the United States of America, and a resident of Edgewater, county of Hudson, and State of New Jersey, have invented certain new and useful Improvements in Mixers for Gaseous Fluids, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

Our invention relates to mixers for gaseous fluids and particularly to mixing devices adapted to be employed in conjunction with a carbureter for preparing a gaseous charge for fuel, motive fluid, and similar purposes.

Our invention consists in certain novel features of construction and arrangement of parts, as will presently be explained and particularly in a novel form and construction of the rotary paddle or fan wheel employed.

In order that our invention may be thoroughly understood, we will now proceed to describe an embodiment thereof, having reference to the accompanying drawings illustrating the same, and will then point out the novel features in claims.

In the drawings: Figure 1 is a view in central vertical longitudinal section through a gas mixer constructed in accordance with our invention, showing the same as supported between the flanged connections of pipes. Fig. 2 is an end view thereof. Fig. 3 is a transverse sectional view of the gas mixer upon the plane of the line 3—3 in Fig. 1. Fig. 4 is an edge view of the paddle or fan wheel. Fig. 5 is a face view of a slightly modified form of paddle or fan wheel employed. Fig. 6 is a similar view of a further modification. Fig. 7 is a detail view in side elevation of a single paddle or fan wheel blade of further modified form. Fig. 8 is a detail view showing the laminated structure of which the paddle or fan wheel is preferably formed.

The gas mixer as a whole comprises generally two elements,—a stationary support and a rotatable element including fan or paddle blades. The stationary element in the present instance comprises a central hub 10, spider arms 11 projecting radially therefrom, and a ring 12 to which the outer ends of the spider arms are connected. The hub 10, spider arms 11, and ring 12 are conveniently formed from a flat sheet, constituting an ordinary flat metal stamping, as will be readily understood by reference to the drawings. Secured to the hub 10 by means of a central bolt or stud 13 is a bearing element 14. As a matter of construction the threaded portion of the stud 13 is preferably tapped into the hub 10 of the support, and a lock nut 15 is employed to lock the parts in their assembled position.

The rotating element comprises a paddle or fan wheel 16 and a hub 17 secured thereto and constituting a bearing element complementary to the bearing element 14. The hub 17 is cup-shaped, being formed with a base 18 or shouldered portion which bears against the rear face of the fan blade, and with a reduced neck 19 arranged to be received within a central opening in the paddle or fan wheel. After the parts have been so assembled the extremity of this reduced neck portion is turned over as appears at 20 in the drawings, the hub and paddle wheel being thereby securely fastened together.

Before the hub is mounted in position upon the bearing element 14 two sets of balls 21—22 are mounted in position, the bearing surfaces of the element 14 constituting cones for the said balls, and the interior face of the hub 17 constituting raceways therefor, whereby an efficient ball bearing is provided about which the fan or paddle wheel may rotate.

A flange or washer 23 is disposed between the head of the stud or bolt 13 and the rotating element, whereby the same may be confined in its position after the parts have been properly assembled. This washer has a further function as will presently appear, viz., to prevent dust and dirt being carried into the ball bearing by and with the gaseous currents which flow in the direction of the arrow 24 in Fig. 1.

The blades of the paddle or fan wheel are arranged oblique with respect to the plane of rotation of the wheel, but preferably the obliquity of the several blades is not alike. Conveniently the blades may comprise two sets, the blades of which alternate with each other, all of the blades of each set being similar but arranged at a different angle to the blades of the other set, for instance, in an

eight bladed wheel, four of the blades may be set at an angle of 60° with respect to the axis of rotation, while the other four, and which are arranged alternately with the first four, may be set at an angle of 30° with respect to the axis of rotation.

In addition to the foregoing the edges of the blades are preferably serrated as appears in 25 in the drawings. This leaves projecting portions or teeth 26 between the serrations which in the rotation of the fan or paddle wheel serve to break up the particles upon which the fan or paddle wheel is acting, whereby to cause a more intimate and complete mixture as is desirable. In Figs. 1, 2, and 3 we have shown these teeth and notches or serrations as regularly disposed, while in Fig. 5 we have shown them in staggered relation upon opposite sides of each of the blades. In Fig. 6 we have shown the serrations as upon the forward edges of the blades only as we find that it is at this point that the serrations or teeth have the greatest efficiency. In Fig. 7 we have shown a further modification in which the teeth 26 between the notches or serrations 25 are bent outward in opposite directions. Various other forms and arrangements of these serrations and teeth will of course suggest themselves to those skilled in this art.

While it is exceedingly advantageous that the various blades have different obliquities it is nevertheless a fact that there are many advantages which follow from the use of a serrated edged blade even where the blades are of the same obliquity throughout, and for purposes of illustration we have shown the structures of Figs. 5 and 6 as provided with blades having the same obliquity throughout. It will, of course, be understood that in any of the forms the blades may have the same obliquity or different obliquities within the spirit and scope of our invention. We have found in practice that these teeth or blades are subjected to a great strain in use and that when stamped up from sheet metal as is desirable, there is a tendency for them to split in directions parallel with the fibers of the material of which they are made. To obviate this we preferably employ a laminated structure as is shown in the fragmentary view Fig. 8, three layers 27—28—29 for instance, being employed, the grain of contiguous layers being arranged to run in opposite directions. The three layers are of course firmly united by any of the well known methods in use at the present day and we find that employing such a structure the desired strength is obtained without sacrificing lightness or increasing cost of manufacture to a prohibitive extent.

In use the device is intended to be located in a pipe or conduit through which currents of gaseous fluids are passing. In Fig. 1 we have shown the ring 12 of the supporting structure as disposed between the flanges 30—30 of pipe sections 31—31, a gasket 32 being employed between the two flanges to make a tight joint as is usual. In order to properly centralize the device we preferably provide the supporting structure with lugs 33 such as may be struck up from the blank from which the ring 12, spider arms 11, and hub 10 are formed; the said lugs being disposed in such positions as to engage the interior surfaces of one of the pipe sections as will be readily understood by reference to Figs. 1 and 2 of the drawings. The pipes 31 may lead directly from the carbureter upon one side, to the point of use, as for instance an internal combustion engine, upon the other side. The gaseous currents passing therethrough in the direction of the arrow 24 in Fig. 1 will impinge upon the face of the paddle or fan wheel and will cause the same to be rotated at a high rate of speed,—the ball bearing being almost frictionless and the whole device being very light there will be but little to oppose such a movement of the fan wheel. The paddle or fan wheel in its rotation will agitate the gases and the minute liquid particles held in suspension therewith so as to cause a thorough and complete intermixing thereof. The efficient mixing action of the fan or paddle wheel is largely due to the peculiar arrangement of the blades and to the peculiar formation of the forward edges thereof. The irregular teeth or projections formed between the notches or serrations tend to attack the currents at a large number of points as the wheel revolves which, it will be readily seen, is far more effective than if the edge were a straight or continuous one such as is ordinarily true of fan or paddle blades. In the latter case the edge of the blade has the effect of cleaving a narrow path for itself while in the former a broad path is torn out, as it were.

While it is, of course, true that the obliquity of the various blades tends to reduce the speed at which the wheel is revolved, yet this is unimportant as it enormously increases the tendency thereof as a mixing device. It thereby renders it impossible for the wheel to cut a path through the currents equal to the thickness only of the blades as would happen if the angular advance of the wheel multiplied by the pitch were just equal to the speed of the gaseous currents. With the blades having unequal pitches the foregoing condition is impossible.

The gaseous currents necessarily carry a certain quantity of very fine solid matter therewith in addition to the fine particles of liquid, and it is highly desirable that the solid matter in any event be kept from entering the ball bearings. The flange or washer 23 acts as an efficient guard for this purpose

as it overhangs to considerable extent the joint formed between the neck 19 of the hub and the rearward extension of the bearing element 14. A guard of this character has been found to be very essential as otherwise the ball bearings cut out in a very short time.

What we claim is:

1. In a mixer for gaseous fluids, the combination with a supporting element, of a fan or paddle wheel mounted to rotate freely with respect thereto, the said fan or paddle wheel having a plurality of obliquely disposed blades having different pitches.

2. In a mixer for gaseous fluids, the combination with a supporting element, of a fan or paddle wheel mounted to rotate freely with respect thereto, the said fan or paddle wheel having two sets of obliquely disposed blades arranged alternately with respect to each other, the blades of one set having different pitches to the blades of the other set.

3. In a mixer for gaseous fluids, the combination with a supporting element, of a fan or paddle wheel mounted to rotate freely with respect thereto, the said fan or paddle wheel having obliquely disposed blades provided with serrated edges.

4. In a mixer for gaseous fluids, the combination with a supporting element, of a fan or paddle wheel mounted to rotate freely with respect thereto, the said fan or paddle wheel having a plurality of obliquely disposed blades having different pitches, the edges of the said blades being serrated.

5. In a mixer for gaseous fluids, the combination with a supporting element, of a fan or paddle wheel mounted to rotate freely with respect thereto, the said fan or paddle wheel having obliquely disposed blades the side edges of which are notched to form teeth between them, the teeth upon opposite sides of the said blades being in staggered relation with each other.

6. In a mixer for gaseous fluids, the combination with a support which includes a central bearing element having two bearing ball runways, of a fan or paddle wheel comprising obliquely disposed blades struck up from a single sheet of metal, and a hub composed of a tubular portion and a reduced neck upon which the blades are mounted, the extremity of the said neck being bent over to secure the said hub and fan blades together, the tubular portion of the hub being arranged to surround the central bearing portion and to constitute a race ring, and two sets of balls disposed between the said central bearing element and the race ring.

7. The combination with a support including a central bearing element 14 arranged to project in the direction opposite to that in which the gaseous currents with which the device is to be employed are moving, the said central element having two ball cone surfaces also pointing in such direction, of a fan or paddle wheel provided with a hub having a tubular portion 17, a shouldered part 18, a reduced neck 19, the extremity of which is turned over to secure the blades of the fan or paddle wheel to the hub, the tubular portion 17 of the said hub being arranged to surround the bearing element 14 and the interior thereof to constitute bearing ball raceways, two sets of ball bearings 21—22 disposed between the cone surfaces of the said central bearing 14 and the interior of the tubular portion 17 of the hub, and an extending flange or washer 23 arranged to overhang the joint between the moving part of the hub and the stationary part of the bearing element, whereby the said washer or flange will act as a wind guard at this point.

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