Aug. 30, 1927. 1,640,891

H. FRITZEL

GUIDE BODY FOR REACTION ROTORS

Filed Sept. 23. 1925 2 Sheets-Sheet 1

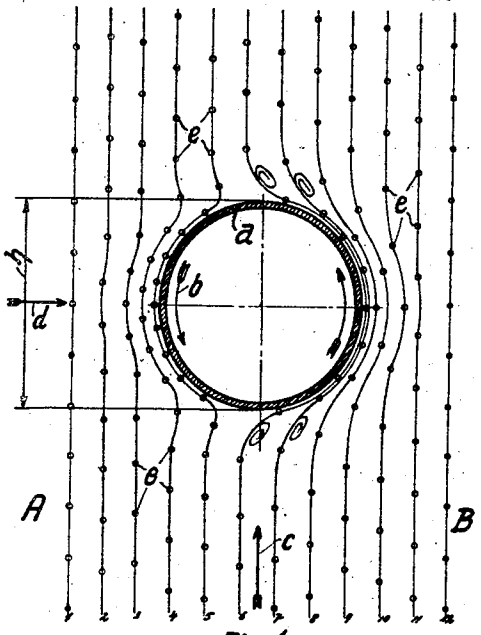


Fig. 1

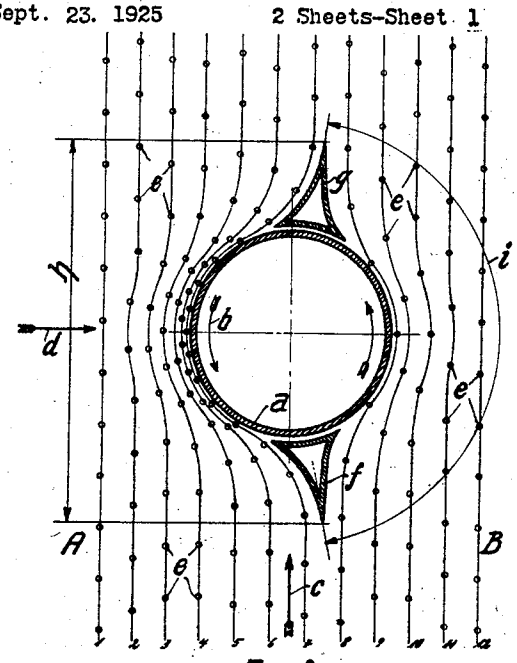


Fig. 2

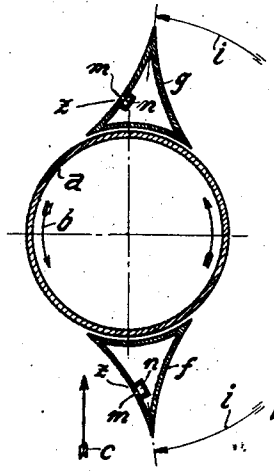


Fig. 4

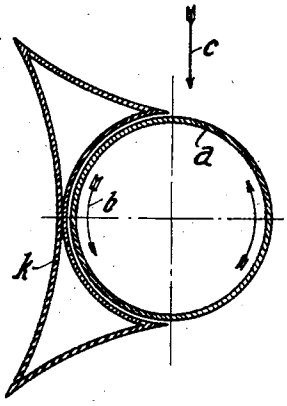


Fig. 3

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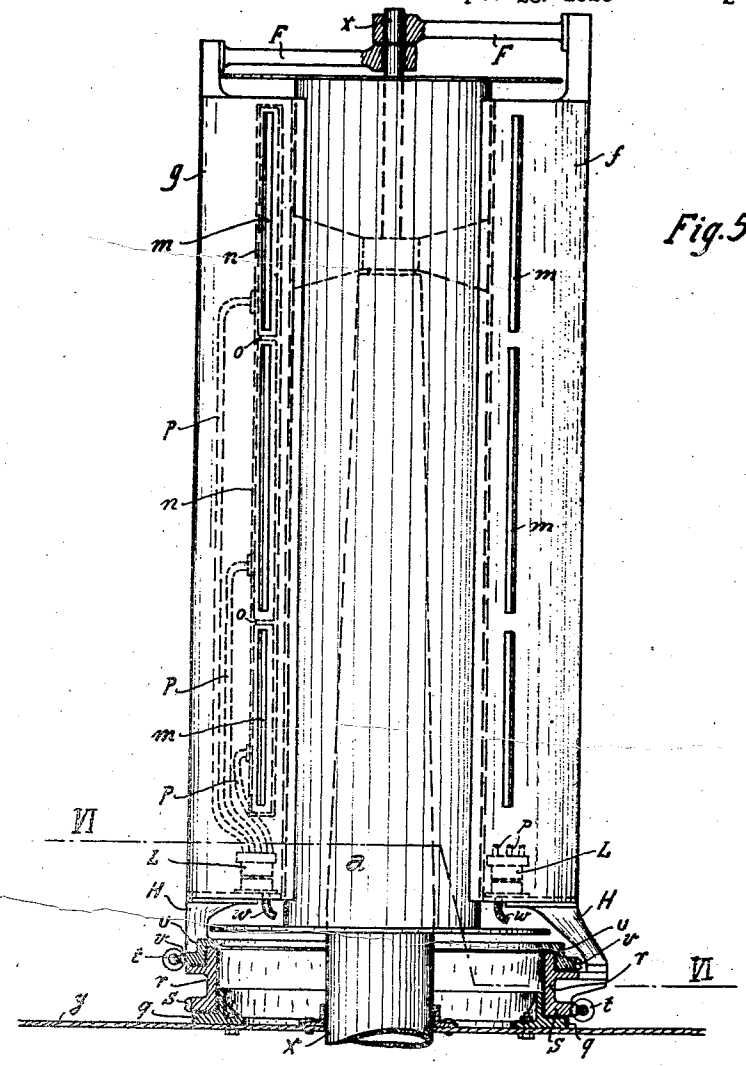


Fig.5

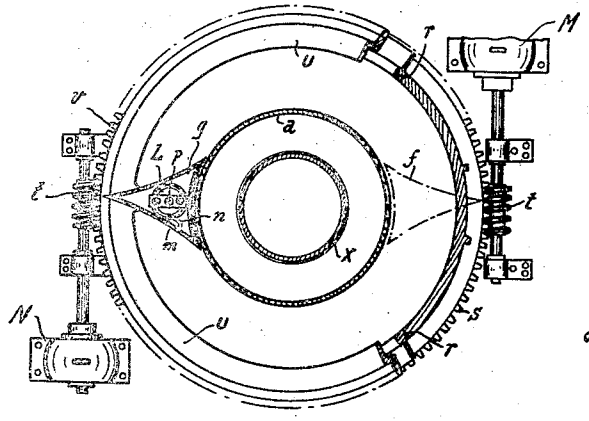


Fig.6

Inventor:
Hugo Fritzel

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UNITED STATES PATENT OFFICE.

HUGO FRITZEL, OF HAMBURG, GERMANY.

GUIDE BODY FOR REACTION ROTORS.

Application filed September 23, 1925, Serial No. 58,129, and in Germany December 12, 1924.

The guide bodies which will be hereinafter described have for their object to obtain an increase of the aerodynamic effect or of a similar hydrodynamic effect of the well known Flettner-rotors, which are here called reaction rotors, and also for other engines of similar types. With this object in view the guide bodies arranged on the rotor are, according to the invention, constructed so that the formation of the braking eddies in the flowing driving medium is prevented, the active pressure surface being enlarged at the same time.

The construction and arrangement of the guide bodies for reaction-rotors and the working process of the same are diagrammatically illustrated, by way of example, on the accompanying drawings, in which

Fig. 1 shows in cross section a rotor of commonly used type without guide body in order to illustrate the prejudicial eddy-currents and the pressure differences in the flowing medium occurring already outside the rotor-projections.

Fig. 2 is a similar view of a reaction rotor with guide bodies.

Fig. 3 shows in cross section a special arrangement of the guide bodies on the reaction rotor.

Fig. 4 shows in cross section a reaction rotor with guide bodies the guiding face of which has special suction slots designed to prevent the formation of damming eddies.

Fig. 5 is a front elevation of the reaction rotor shown in Fig. 4.

Fig. 6 is a cross section on line VI—VI of Fig. 5.

The direction of rotation of the rotors *a* is indicated in the drawing by the curved arrows *b* and the direction of the outflowing medium, for instance air, is indicated by the straight arrows *c*. Arrow *d* indicates the direction of the reaction-component produced. The operative total air current *c* is divided in Figs. 1 and 2 into part currents 1, 2, 3 . . . 12.

In the range of action of the rotating rotor the air particles on the side A of the rotor are retarded by the rotation directed opposite to the direction of the air current *c* and the pressure is consequently increased, this variation of conditions being indicated by the distance of the points *e* marked in the part-currents, which distance is reduced accordingly.

On the other side B of the rotor the air particles are accelerated by the rotation in the same direction, the pressure being reduced at the same time, this variation of condition being indicated by accordingly increased distance between the points *e* marked in the part-currents.

By counting and comparing the points *e* in the region of the useful pressure difference on the over-pressure side and on the under-pressure side a diagrammatic picture of the amount of the useful surplus pressure produced is obtained, the direction of this surplus pressure being indicated in the figures by the arrow *d*.

As can be seen from Fig. 1 the strongest formation of eddies takes place in a rotor *a* which has no guide bodies at those points of the surface of the rotor on which the air current strikes and from which it flows off in approximately radial direction.

Fig. 2 shows in section a rotor *a* with inflow guide-body *f* and outflow guide body *g*. The guide bodies *f* and *g* extend in the axial direction of the rotor over the entire length of the same or only over part of this length, and the shape of the guide faces is preferably adapted to the course of the air current *c* or of the part currents of the same.

The inflow guide body and the outflow guide body are each arranged so that they can be oscillated around the motor axis and so that they can be locked in position. The guide bodies *f* and *g* can be mutually locked by a suitable device and they can be oscillated in this locked position at will around the axis of the rotor and then locked in the adjusted position.

In certain cases, especially when the direction of flow remains with regard to the aggregate permanently or approximately the same, it will not be necessary to make the guide bodies oscillatable.

The position of the guide bodies *f* and *g* in Fig. 2 shows clearly the increase in efficiency obtained by the enlarging of the region *h* of the useful pressure difference.

The part currents and the distance between the points marked on the same give also in Fig. 2 a diagrammatic picture of the conditions in the air current; by counting and comparing the points marked in the enlarged region of the useful pressure difference a clear diagrammatic picture is obtained of the amount of the useful surplus pressure.

Comparison of the results from Fig. 1 and Fig. 2 characterizes the tendency of the effect of the guide bodies.

A considerable portion of the effect of the guide bodies obtained according to Fig. 2 will be obtained if only one guide body *g* or *f* is provided. A single guide body may be used as inflow- or as outflow guide owing to its oscillatability.

If the useful surplus pressure *d* of the rotor fitted with guide bodies has to be obtained in the opposite direction, the direction of rotation *b* of the rotor has to be reversed and the guide bodies *g* and *f* will have to be oscillated at the same time through an angle of 180° and to be locked after oscillation.

The individual oscillatability of each guide body serves for enabling slight regulations of the surplus pressure effect to be obtained this being attained by variation of the arc angle *i* situated between the inflow-edge and the off-flow-edge of the guide-body.

In cases where the regulability of the amount of the total effect, e. g. the variation of the arc angle *i* between the inflow edge and off-flow edge of the guide bodies is not desired the guide body is preferably made, as shown in Fig. 3, in one piece. This guide body *k* forming one continuous piece is then arranged also oscillatable and lockable at will with regard to the rotor axis.

A further improvement of the construction described may be obtained by avoiding the formation of damming up eddies on the surface of the guide body. This improvement is obtained by sucking off a portion of the flowing medium from the points in question of the guide body surface, with which object in view suction slits are arranged in said surface as shown in Figs. 4 and 5.

The portions of the guide-body surface which have been ascertained by experiments as being zones of beginning eddy formation are designated by *z*. At these points a slot *m* extending in the longitudinal direction of the guide body is arranged in the guide faces and underneath the same in the guide body a longitudinal chamber *n*. These chambers *n* are submitted to the action of a suction pump so that it is possible to suck, by means of the suction pump, air from the air current which flows along the guide body through the slot *m* into the chamber *n*.

In order that the strength of the sucking effect may be regulated over the entire length of the guide faces according to requirement the chamber *n* and consequently also the slot *m* are subdivided by cross-partitions *o* so that slot-portions and chamber portions are formed which have each a separate sucking element *p*.

Sucking devices of this type may be provided for the low-pressure side of the guide bodies and for the surplus pressure side of the same if there are zones of an undesirable pressure increase in the flowing medium and if there are produced undesirable eddy formations on the guide faces, which have to be avoided.

The mechanism for oscillating the guide bodies and the suction device for the slots *m* are shown in Figs. 5 and 6. A guide ring *q* is fixed on a base plate *y* (for instance on the deck of the ship) so that it surrounds the axle *x* around which the rotor *o* rotates, a supporting ring *r* for the guide body *f* resting upon said guiding ring *q* so that it can rotate on a horizontal plane. This supporting ring has in the outer circumference of its lower flange teeth *s* with which gears an automatically locking worm *t* driven from a motor N. The supporting rings *r* and *u* have both the same number of teeth. If the two motors M and N are simultaneously started by a common switch the two guide bodies *f* and *g* turn at the same time and at the same speed so that their arc-angle *i* does not alter. As the two worms *t* are automatically blocking they form evidently always a mutual blocking for the two guide bodies. If only one of the motors M and N is started only the corresponding guide body will turn, the other guide body being retained by its worm *t*. If there is only one guide body provided or if the two guide bodies are rigidly connected with one another, the supporting ring *u* alone will be sufficient if it rests rotatably directly upon the guide ring *u*, the one guide body or both guide bodies being fixed upon this ring *u*. The guide bodies are fixed upon the supporting rings *u* and *r* by means of supporting arms H, a separate guide arm F above the rotor body being further provided for each guide body, the bearing lugs of said arms F being loosely mounted on the axle *x* of the rotor.

The pipes *p* for the sucking device are connected in each guide body to a common motor-driven suction pump L which forces the sucked off air out through a pipe *w*. The electric current for operating the suction pump L is supplied by means of a sliding contact of known type so that the suction device in each guide body can turn with said body.

I claim:—

1. A reaction rotor comprising a guide body mounted on the outer surface of the rotor parallel to the axis of the same having guide faces of biconcave shape and joining in a knife edge in order to avoid damming up and formation of eddies.

2. A reaction rotor comprising two guide bodies mounted on the outer surface of the rotor parallel to the axis of the same and displaced at an acute angle the one to the

other having guide faces of biconcave shape and joining in a knife edge in order to avoid damming up and formation of eddies, means for oscillating each guide body around the rotor axis, and means for locking each guide body in the adjusted position so that the arc angle formed by the inflow edge and the outflow edge of each guide body can be adjusted at will.

3. A reaction rotor comprising two guide bodies mounted on the outer surface of said rotor displaced at an acute angle the one to the other having each guide faces of biconcave shape to avoid damming up and formation of eddies and having each longitudinal slots at convenient points, and suitable means for sucking in through said slots a portion of the driving medium.

In testimony whereof I affix my signature.

HUGO FRITZEL.