July 2, 1935. J. G. DINTILHAC 2,007,080

MOTOR COOLING ASSEMBLY

Filed Oct. 11, 1932 2 Sheets-Sheet 1

Fig. 1

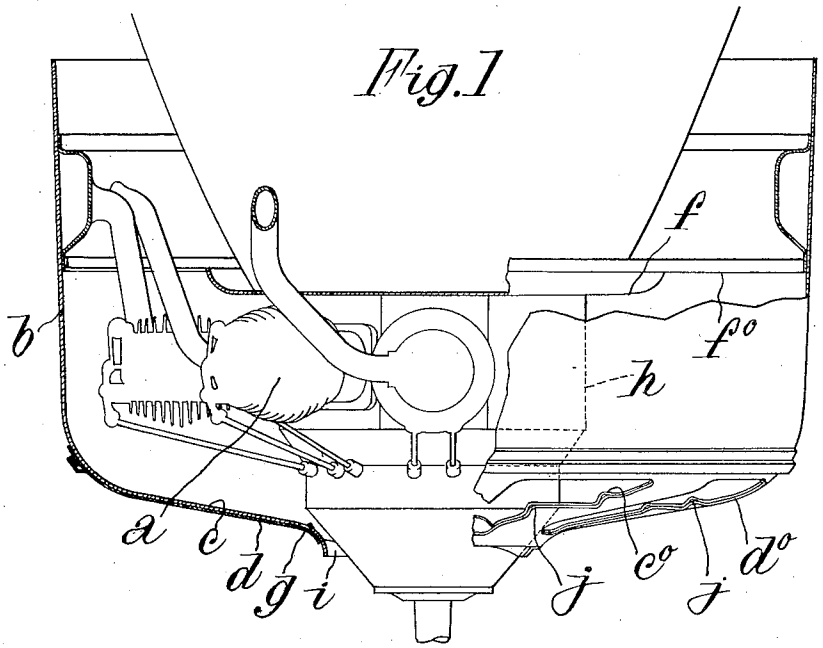
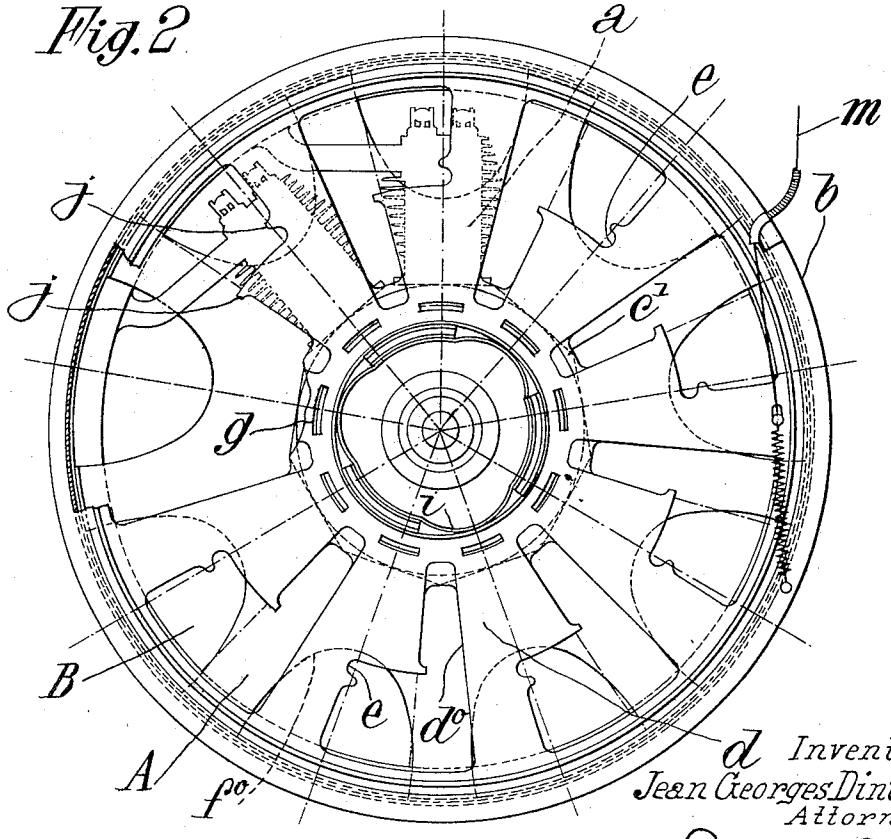


Fig. 2



Inventor:
Jean Georges Dintilhac.
Attorney:
Courtney J. Cox

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Fig.3

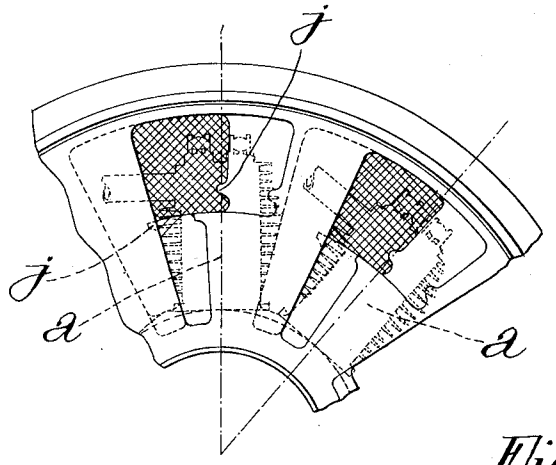


Fig.4

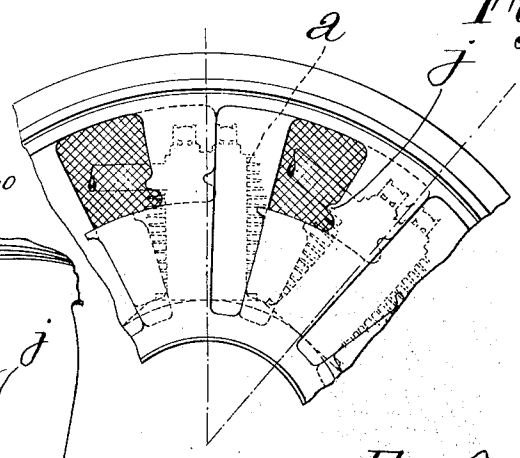


Fig.8

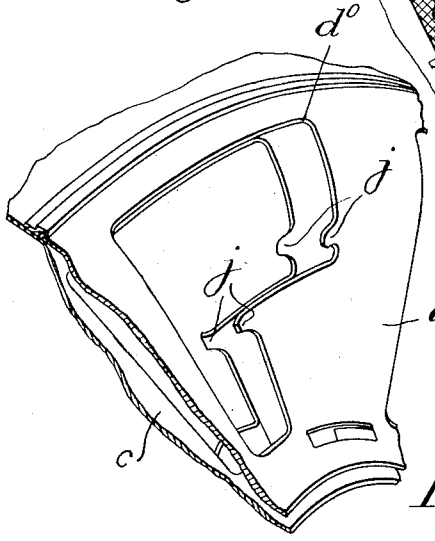


Fig.6

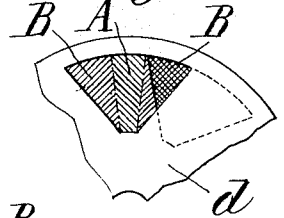


Fig.7

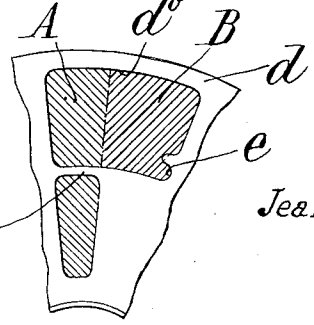
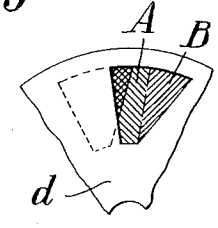


Fig.5



Inventor:
Jean Georges Dintilhac.
Attorney:

Patented July 2, 1935

2,007,080

UNITED STATES PATENT OFFICE

2,007,080

MOTOR COOLING ASSEMBLY

Jean Georges Dintilhac, Paris, France, assignor to Society "Yacco S. A. F.," Paris, France

Application October 11, 1932, Serial No. 637,350
In Belgium September 5, 1932

12 Claims. (Cl. 123—171)

The present invention relates to motor cooling assembles and, more particularly, to those of the type used in aviation motors of the star type.

Up to the present time, it has been the practice to vary the amount of air traversing a star type form of motor by positioning a circular screen in front of the radiator, said screen being provided with openings limited laterally by radial walls. Screens of this type distribute the incoming air substantially uniformly along the whole height of each radially positioned cylinder block.

One of the objects of the present invention is to provide a form of screen capable of distributing the incoming air so that the head end of each cylinder block is cooled more than the lower portion of the latter, whereby a uniform temperature of the cylinder block may be obtained.

Another object is to provide a form of screen capable of being rotated into any one of at least three positions wherein (1) the cylinder head alone receives cooling air (2) cooling air is delivered to both the lower and head portions of the cylinder block, the head portion receiving more than those portions situated below it (3) air is admitted between a pair of adjacent cylinder blocks but only at the upper portions thereof.

Other objects will appear in the course of the detailed description now to be given with reference to the accompanying drawings, in which:

Figure 1 is a section through one illustrative embodiment of the invention;

Figure 2 is a front view of the assembly represented in Figure 1;

Figures 3 and 4 illustrate two different operating positions of the screen shown in Figure 2;

Figures 5 and 6 show, diagrammatically, two possible variants of the assembly represented in Figures 1 to 4;

Figure 7 shows a modification of the form of screen in Figure 2.

Figure 8 is a partial perspective view of the wall and shutter shown for example in Figs. 1 and 2.

Referring to Figures 1 to 4, there is shown a star type aviation motor provided with a plurality of radially positioned cylinder blocks *a* of conventional design mounted inside a hood or casing *b*, the latter being provided with a front wall *c* having a plurality of air inlet orifices c^0 formed therein in a manner to be described further on, a rotatable shutter or screen *d* rotatably mounted in front of wall *c* and provided with orifices d^0 similar to openings c^0, shutter *d* and casing *c* being also provided with registerable openings *g* positioned adjacent motor crank case *h* and serving to direct cooling air against the latter, a flange *i* positioned in spaced relation to the forward part of the motor and serving to direct cooling air against the central portion of the latter, and means for rotating shutter *d* such as a Bowden cable *m* attached to the shutter and acting to rotate the latter against the action of a suitable spring.

Referring now to Fig. 8, the reference character *j* indicates portions which are bent outwardly to prevent jamming of the shutter.

As shown in Figs. 1 and 2 the reference character *f* indicates a shield positioned behind the cylinders of the engine. This shield is stationary and is provided with openings f^0. The shield comprises a deflecting plate for the air currents although the openings f^0 which in each case are directly behind the cylinders, permit some of the air to pass to the rear.

In radiator assemblies hitherto constructed, shutters of the type *d* have been provided with orifices having radial lateral walls limiting areas similar to that marked A in Figure 2. Shutters of this type act to distribute the cooling air substantially uniformly along the whole height of each cylinder block. Inasmuch as the head end of each cylinder block is more highly heated than the other portions thereof and since it is desirable that the head end be more effectively cooled, an additional upper area B (Figure 2) is cut out of the shutter adjacent area A. It will be at once evident that shutters having air inlet orifices of the combined forms A—B act differentially to more effectively cool the cylinder heads than portions of the cylinder blocks situated below the latter. Openings c^0 in wall *c* are given a similar form to those in shutter *d* so that openings c^0 and d^0 may lie in register with one another when shutter *d* is appropriately rotated. Areas A in wall *c* may be positioned to lie in line with the cylinder blocks themselves but, in actual practice it is found to be advantageous to position these areas in line with the spaces between adjacent cylinder blocks. When this is done, it will be seen that shutter *d*, in addition to being capable of occupying a large number of intermediary positions may occupy any one of three characteristic positions. In the first of these positions (the one shown in Figure 2) opening c^0 and d^0 are completely in register and air is not only supplied along the whole height of the space between adjacent cylinder blocks, but also impinges directly on the cylinder heads. In the second position shown in Figure 3, shutter *d* has been rotated so that air no longer flows into the

space between adjacent cylinder blocks, but impinges directly on the cylinder heads. This position yields a moderate cooling effect. If the motor is operating at high altitude or in a cold climate, shutter *d* is turned into the position shown in Figure 4 wherein air no longer impinges on any part of the cylinder block but enters the space between adjacent cylinder blocks only in the outer area defined by portions B.

If the form and position of areas A and B are properly chosen, a cooling effect may be obtained wherein the temperatures at the upper and lower portions of the several cylinder blocks are substantially uniform. Area B should be provided with a recessed portion *e* in line with the spark plugs and permitting access thereto when the latter are to be changed. Shutter *d* is further provided with outwardly turned flanged or projecting portions *j* insuring that shutter *d* ride easily over wall *c* and the orifices in the latter in spite of the jamming effect produced by the wind reacting on the shutter.

The structures shown in Figures 5 and 6 differ from the one already described only in the form and position of area B, the latter having a "trianguloid" shape and either being situated on one (Figure 5) or both sides (Figure 6) of area A. It will be noted that in both of these forms of shutters as well as in the form represented in Figure 2, one of the lateral walls or limits of areas B intersect radii passing through the center of the motor assembly i. e., are nonradial in whole or in part.

It is not necessary that shutter *d* be rotated manually by means of Bowden cable *m*. An automatic system such as that described in the inventor's copending application, for Thermostatic radiator controls, executed Sept. 16, 1932, Serial No. 637,349 filed October 11, 1932 now Patent No. 1,949,009 may act to replace the latter and rotate shutter *d* in accordance with variations in temperature of the lubricating oil, or the temperature of the cylinder walls.

In the modification shown in Figure 7, one of elements *j* in Figures 1 to 4 is replaced by a "bridge" *k* having the same function.

Furthermore, I will call in the claims "angular width" of said opening the magnitude (in angular units) of a circular arc having its center on said axis of revolution and limited by the lateral sides of said opening. It will be readily understood that, according to my invention, the angular width at the peripheral end of opening d^0 (corresponding to the whole of A and B) is much greater than the angular width thereof at the central end of said opening (corresponding only to part A).

What I claim is:—

1. In combination with a cylinder block of a motor, a displaceable screen positioned to control the flow of air to said cylinder block, said screen having an opening formed therein shaped so that when said screen is moved to obstruct the flow of air to the lower portions of said cylinder block, portions of said opening lie in line with the head portion of said cylinder block, whereby cooling air may impinge on the latter.

2. In combination with a pair of cylinder blocks mounted in spaced relation to one another and forming part of a motor assembly, a displaceable screen mounted to control the flow of cooling air to the space between said cylinder blocks, said screen having an opening formed therein positioned and formed so that when said screen occupies a predetermined position, cooling air flows into the space between said cylinder blocks and to the head end of said cylinder blocks but is prevented from impinging on portions of the cylinder block lying below said last named head portion.

3. In combination with a cylinder block of a motor, a casing enclosing a portion of said motor, said casing including a wall having openings therein positioned to permit a flow of cooling air to said cylinder block, and a displaceable screen slidably mounted adjacent the wall of said casing having openings therein, said screen having openings adapted to register with those in the casing wall, the edges of the opening in said screen being bent away from said casing whereby jamming of said screen may be avoided during displacement thereof.

4. A structure as defined in claim 1 in combination with means for changing the position of said screen.

5. An air cooling control device for use in connection with an engine cylinder, which comprises a screen rotatable about an axis intersecting the axis of said cylinder and mounted to control the flow of cooling air to said cylinder, said screen being provided with an opening, a portion of said opening having a certain angular width located opposite the lower portion of the cylinder and another portion having a greater angular width located opposite the head of the cylinder, said two portions being joined on at least one line making an angle with a radius passing through the axis of rotation of said screen.

6. An air cooling control device for use in connection with an engine cylinder, which comprises in combination, two screens slidable with respect to each other located in front of said cylinder and at least one of which is rotatable about an axis intersecting the axis of said cylinder, said screens being each provided with an opening the angular width of which is greater at the peripheral end thereof than at the central end thereof, said openings being so positioned and shaped as to register for certain relative positions of the screens.

7. An air cooling control device for use in connection with a plurality of radially disposed cylinders, which comprises in combination, a cowling located in front of said cylinders and a screen slidable with respect to said cowling and rotatable about the axis around which the cylinders are distributed, said cowling and said screen both being provided with similar openings the angular width of which is greater at the peripheral end thereof than at the central end thereof, said openings being so positioned as to register for certain positions of the rotatable screen with respect to the cowling.

8. An air cooling control device for use in connection with a set of radially disposed cylinders, which comprises in combination a cowling rigidly mounted with respect to said set of cylinders and a screen rotatable around the axis about which the cylinders are distributed slidably mounted adjacent said casing, said cowling being provided with openings located opposite the intervals between the cylinders, said screen being provided with openings adapted to register with those of the cowling for certain positions of the screen with respect to the cowling, the angular width of said openings at their peripheral end being greater than at the central end thereof.

9. A device according to claim 7 in which each opening has a portion of constant or uniform angular width located opposite the lower or inner

portion of the cylinder and a portion having a greater uniform angular width located opposite the head or outer portion of the cylinder, said two portions being joined on at least one line making an angle with a radius passing through the axis of rotation of said screen.

10. A device according to claim 7 in which each opening is limited by lateral sides at least one of which is in the form of a straight line making an angle with a radius passing through the axis of rotation of the screen.

11. A device according to claim 7 in which said opening is limited by lateral sides in the form of straight lines intersecting each other at a point located between the axis of rotation of the screen and the periphery of the opening.

12. An air cooling control device for use in connection with an engine cylinder, which comprises in combination, two screens rotatable with respect to each other mounted to control the flow of cooling air to said cylinder, said screens being provided with respective openings capable of overlapping each other so that cooling air can flow through their common area, the major part of the top and bottom edges of said openings being defined by arcs of circles having their axes coincidental with the axis of the screens, the bottom edge being of less angular dimension than the top edge, side edges connecting the top and bottom edges, one of said side edges of each opening being constituted partly by a single radius passing through the center of rotation of the screens, another part of said side edge being defined by a line which is spaced outwardly from said single radius to enlarge the opening, and an intermediate edge connecting the aforementioned parts of said last named side edge, said openings being so shaped that the height of their common area parallel to the axis of said cylinder varies according to the relative positions of the screens.

JEAN GEORGES DINTILHAC.