. Sept. 16, 1952 J. VALENSI 2,610,570

SMOKE STACK IN PARTICULAR FOR LAND VEHICLES AND SHIPS

Filed Feb. 12, 1948 2 SHEETS—SHEET 1

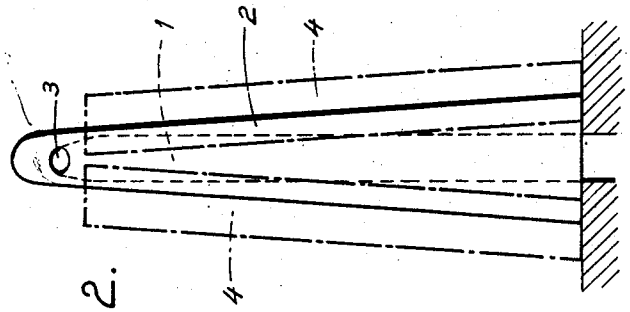


FIG. 2.

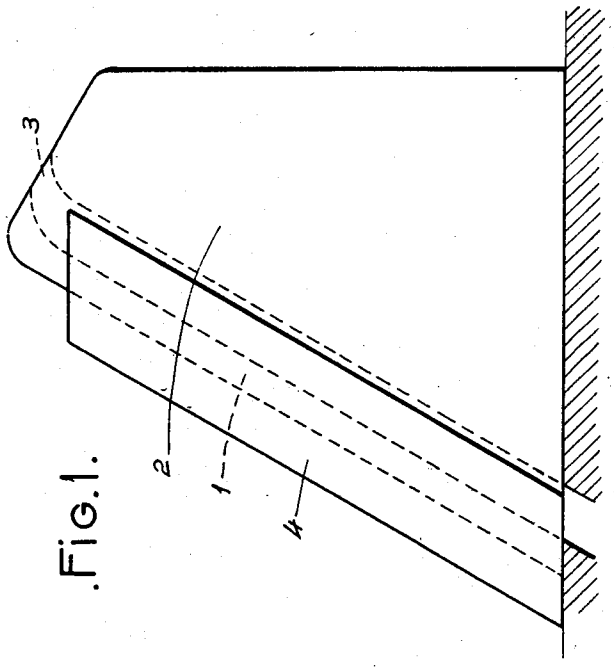


FIG. 1.

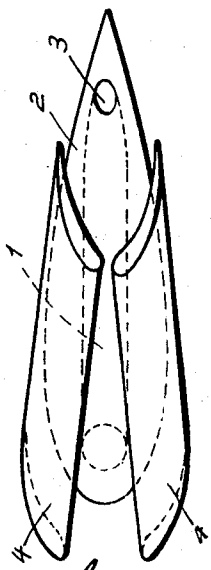


FIG. 3.

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SMOKE STACK IN PARTICULAR FOR LAND VEHICLES AND SHIPS

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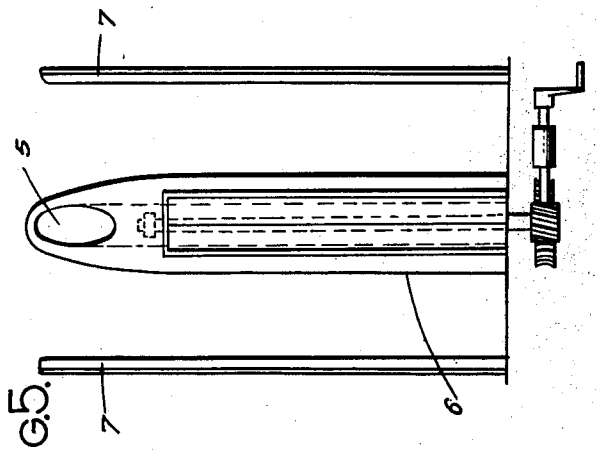


Fig.5.

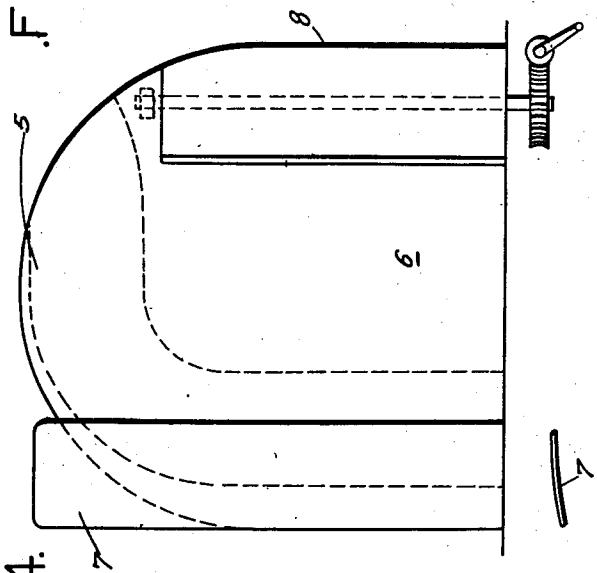


Fig.4.

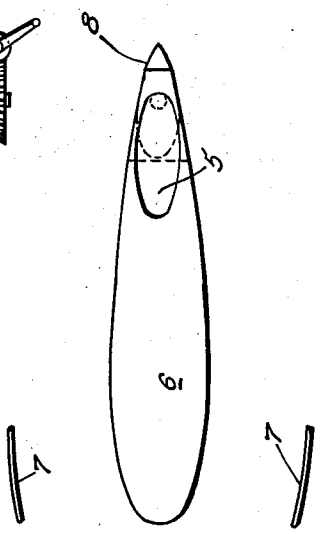


Fig.6.

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SMOKE STACK IN PARTICULAR FOR LAND VEHICLES AND SHIPS

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5 Claims. (Cl. 98—60)

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My invention relates to smoke stacks which in use are exposed to a relative wind, and it is more particularly concerned with land and seagoing vehicles driven by heat engines, such as locomotives, steam-ships and the like.

Smoke stacks, flues or funnels are already known which are constituted by a cylindrical smoke flue surrounded by a fairing shaped shell or casing of uniform cross section and of more or less oval or elliptic profile terminating at its top in a flat section, which is straight or slightly inclined and generally open.

The purpose of such a fairing is to reduce to some extent the resistance or drag of the smoke flue, moreover it improves the appearance. However its influence on the smoke at the outlet of the flue is detrimental under the conditions in which it is generally applied, because the said fairing produces a diffused vortex the effect of which is to flatten down the smoke in large curls, this being particularly objectionable, in the case of a ship, for any passengers who may happen to be on the aft decks.

The essential object of my invention is to overcome this drawback.

It is known in aerodynamics that certain types of streamlined bodies such in particular as aircraft wings possess the property of generating at their free ends, when exposed to a relative wind, a concentrated so-called "wing-tip" vortex the essential characteristic of which is to contain a core portion in which there prevails a substantial suction; the presence of such a wing-tip vortex is connected to the occurrence of a so-called "circulation," as well-known in aerodynamics, around the various sections of the fairing.

My invention essentially consists of creating in the area of the exit of the smoke-stack of flue a "wing-tip" vortex into the core of which the smoke is forced, the smoke jet being in this way guided, at its discharge from the smoke flue outlet, as if it were in a duct or pipe.

In one embodiment of my invention the smoke flue, is surrounded by a fairing in the shape of half an aircraft wing, preferably of generally trapezoidal elevational outline, the root of which forms the base of the fairing and the end of which being tapered, so that there is generated in said area under the effect of the relative wind, a wing tip vortex which extends in the manner of an actual substantially cylindrical sheath parallel to the general direction of the relative flow of the air filaments. The smoke flue or flues open into the area from which the core of the vortex sheds.

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It should be observed that it is convenient to use all means adapted to produce around the craft or vehicle deprived of its smoke stack, a general air flow wherein the lines of flow passing through the area in which the top of the stack is located do not sweep the surfaces which it is desired to maintain clear from smoke.

In this manner, the outgoing smoke stream (the velocity of which may be smaller than, equal to or greater than that of the relative wind) is literally sheathed by the vortex and will not sweep the deck areas located between the funnel and the stern of the ship, for instance, which areas in the case of a passenger ship are generally arranged as promenade decks for the passengers.

Furthermore the aerofoil section form imparted to the fairing is adapted to reduce the drag of the projecting portion of the funnel.

In view of the above, the fairing may be designed according to various forms of embodiment, which in particular differ from each other in the shape of their apparent contours and their profiles.

In the accompanying drawings there are diagrammatically illustrated, in a purely illustrative and in no restrictive sense, two such embodiments.

Figs. 1, 2 and 3 are a side elevation, a front elevation and a plan view respectively of a ship funnel designed according to a first form of embodiment of the invention.

Figs. 4, 5 and 6 are corresponding showings of a modified embodiment.

Referring to the drawings, reference 1 indicates the smoke flue or conduct and 2 is the fairing surrounding it. Said fairing is symmetrically bi-convex, its maximum thickness may be about 15 to 30% of its length dimension and its maximum cross section is at about 30% from the leading edge thereof.

Its leading edge is raked, itst railing edge being approximately vertical: both edges are connected by a straight line sloping downwardly and rearwardly as shown in Figs. 1, 2 and 3 and by a convex line as shown in Figs. 4, 5 and 6.

The smoke flue 1, opens as above mentioned, into the area from which the core of the wing-tip vortex sheds.

The best location for the outlet of the smoke flue is obviously such, according to the invention, that it will substantially coincide with the cross-section of the core of the above-described wing-tip vortex which, as described above, extends horizontally from the fairing in the direction of the relative wind, in other words, the outlet of

the smoke flue 3 should preferably be so formed that the projection of said outlet on a vertical plane transverse to the longitudinal direction of the fairing will be a circumference substantially equal in diameter to the core of said vortex. Experience has shown that this diameter is in the range of from about 1/8 to 1/20 of the chord of the airfoil fairing section, or, if said chord is varied over the vertical extent of the fairing (upwardly tapered fairing), 1/8 to 1/20 of the average value of said chord as taken over said vertical extent.

It should be noted that the desired smoke concentrating effect is increased as the intensity of the vortex is greater, that is to say when the direction of relative wind does not lie in the plane of symmetry of the fairing. This, moreover, will be found to be the general condition for a ship or a locomotive for example, because of the wind component supplied by the natural wind. However, as the angle of incidence increases, the vortex is eventually destroyed above a limiting value of about 25°, unless special provision is made for maintaining, for incidence angles above said value, a "circulation" around the fairing (such means involving the use of slots, slotted aileron, baffles, means for blowing or sucking the boundary layer, adjustment of the angular position of the fairing and so on).

A design including slots is shown in Figs. 1, 2 and 3 (the surfaces 4 have been indicated in dot-and-dash lines in Fig. 2 for the sake of clarity).

Figures 4, 5 and 6 show another design for the fairing including two fore slots and a slotted aileron.

The smoke duct is shown at 5, the streamlining at 6, the auxiliary wings to be used to build up the fore slots at 7 and the slotted aileron at 8.

The cross section of the fairing is a biconvex symmetrical profile, of 20% maximum thickness ratio at 30% from the leading edge (the lengths are referred, as usual, to the chord of the profile).

As shown in Figs. 4 and 6, there is an aileron or flap 8 arranged at the trailing edge of the fairing, preferably equivalent in longitudinal extent to about 25% of that of the fairing, and rotatable about a vertical axis X—X, about which it may be adapted to be driven through any suitable mechanical means, manually or automatically controlled in response to the direction of the relative wind. As shown more particularly in Fig. 6, the configuration of said flap and the location of its axis of rotation are such that any deviation of said flap from alignment with the structure will produce a substantial gap between the rear edge of the structure and the front edge of the flap, thus opening up the desired slot in the profile for the purpose described.

Leading and trailing edges are straight and upright in most of their length, and when viewed in elevation, the upper part of the fairing is a circle. The figure shows the height of the aileron, which is approximately equal to three quarters of the maximum height of the streamlining.

The fairing is slightly tapered in its upper part, as shown in the figure. Such a design may render necessary a swelling of the fairing around the smoke duct exit, following the size of this exit and in order to keep circular the upper part of the streamlining as viewed in elevation.

When trimmed, the slotted aileron together with the fore slots improve the maximum lift coefficient of the fairing. Thus the tip vortex may remain undestroyed, even at very high incidences; it prevents also the smoke from being beaten down, for an incidence of 90°, as would happen with a plane aerofoil.

The aileron may be driven by hand or automatically by a vane.

Finally, to provide for the operation of the smoke stack when the vehicle is stationary and there is no relative wind or also when the relative wind blows from the rear to the front of the ship, there may be provided within the fairing 6 an additional outlet for the flue 5, said outlet which is controlled by means of a valve, making it possible to discharge the smoke upwards.

It will appear, as moreover it has already been mentioned, that the invention is in no way restricted to the particular uses or to the specific embodiments of its component parts which have been more particularly illustrated and described; the invention includes within its scope all modifications and variations in such uses and in the construction of the various devices. In particular the profiles of the fairing may be dissymmetrical. Also the above described arrangements may be applied to a smoke stack pivotally mounted on a fixed structure to be suitably rotated in response to the direction of the relative wind.

What I claim is:

1. Smoke-stack which comprises a flue and a fairing structure surrounding said flue of teardrop transverse cross-section, said structure having substantially upstanding leading and trailing edges and an upwardly-convex top connecting said edges, and the outlet of said flue being located in the rearwardly and downwardly extending portion of said convex top toward said trailing edge.

2. Smoke-stack which comprises a flue and a fairing structure surrounding said flue of teardrop transverse cross-section, said structure having a leading edge and a trailing edge, said leading edge rearwardly raked, and a top connecting said leading and trailing edges said top having a rearwardly-downwardly extending portion merging with said trailing edge, the outlet of said flue being located in said last-mentioned portion of the top and directed towards said trailing edge.

3. Smoke-stack which comprises a flue and a fairing structure surrounding said flue of teardrop transverse cross-section, said flu having an outlet located adjacent the top of the trailing edge of said structure and directed rearwardly, and means spaced from said structure and extending parallel thereto adjacent the leading edge thereof and rearwardly along a portion of each side of said structure to define a pair of air circulating slots with the sides of said structure, for increasing the circulation of air around said structure as created by relative wind.

4. Smoke-stack as in claim 3 wherein said means spaced from said structure comprises an upstanding flap extending said structure at the trailing edge thereof, and means for rotating said flap about an axis intermediate the length thereof and parallel with said trailing edge, so that any deviation of said flap about said axis from alignment with the structure will create a substantial slot between said trailing edge and said flap.

5. Smoke-stack as in claim 4 wherein the longitudinal extent of said flap is about 25% of the extent of said fairing structure.

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(References on following page)

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,830,857	Schmidt	Nov. 10, 1931
1,910,800	Kiesel, Jr.	May 23, 1933
1,939,254	Dyer	Dec. 12, 1933
1,950,743	Parkin et al.	Mar. 13, 1934

FOREIGN PATENTS

Number	Country	Date
347,566	Great Britain	Apr. 30, 1931
387,393	Great Britain	Feb. 6, 1933
643,156	France	Oct. 27, 1927
647,743	Germany	July 12, 1937