Elimination of blade tip vortices of aircraft propellers and wind turbines

Due to centrifugal force, the “winglet” used on wings moving in a linear direction cannot be used in the case of a rotating system.

- **The technical solution** provides an approach to eliminate blade tip losses.
- The elimination of turbulence causing energy loss on the blade tips means greater drag force, torque, and efficiency.
- Vortex interference is used to eliminate vortices and turbulence that cause losses at the blade tips.

TECHNOLOGY/PRODUCT OVERVIEW

‘Widening’ the blade tips increases the possibility of greater power and performance, however, at the same time, the vortex losses generated at the blade tips increase drastically. The solution currently used to reduce the vortices of the blade tips is reducing the angle of attack close to the blade tip. This is how it tries to avoid significant losses. At the same time, naturally, the drag force or the transmittable power decreases. In the case of horizontal axis wind turbines, the classic, pointed shape have to be used in order to ensure, among other things, the noise level.

Blade tip vortex is a powerful phenomenon that develops very quickly.

Eliminating or reducing blade tip losses (eliminating vortices around the blade tip) means significant energy savings and increased efficiency, especially when using wide blade tips.

The elimination of blade tip loss reduces vibrations, thus reducing internal friction of the structure’s material, thereby increasing lifespan. This results in significant financial savings, e.g. in the case of a modern wind turbine’s blade.

TECHNOLOGY/PRODUCT FEATURES, TECHNICAL DATA AND BENEFITS

These newly developed propellers eliminate harmful turbulence at the tip of the propeller blade. The resulting benefits provide many possibilities for keeping and moving aircrafts and drones in the air:

For airplanes:

- fuel can be saved,
- range can be greater,
- time spent in the air can be more,
- vibration generated by the propeller can be reduced,
- lifespan of the propeller can be increased,
- number of propeller blades can be reduced.

For drones, due to the favorable features of the propellers:

- range can be greater,
- operation can be quieter,

- there can be more favorable flight characteristics,
- energy consumption can be reduced,
- own weight/liftable payload ratio can increase positively.

The innovative solution opens up many new possibilities in structural and industrial design. Extreme shapes may be created more easily. There are more possibilities regarding the number, location and operation of engines, movement, and hovering. Drones may fly for several hours or can have a greater range.

Helicopters:

- thanks to the new design, the rotor can be more efficient and quieter,
- it can be particularly beneficial for smaller vehicles: calmer and more silent operation and speed,
- efficiency, range, and cost-effectiveness can also increase in the case of large, cargo vehicles.

Wind turbines:

- Wind turbine blades are exposed to countless physical, mechanical and chemical stresses during operation.
- Wind turbine blades are currently dimensioned based on S. Goldstein's fluid mechanics theory. Therefore, the tip of the blades cannot be wide. They are relatively quiet, but the usable power is lower.
- The elimination of blade tip loss reduces vibrations, thus reducing internal friction of the structure's material, thereby increasing lifespan. This results in significant financial savings, e.g. in the case of a modern wind turbine's blade.

POTENTIAL APPLICATIONS

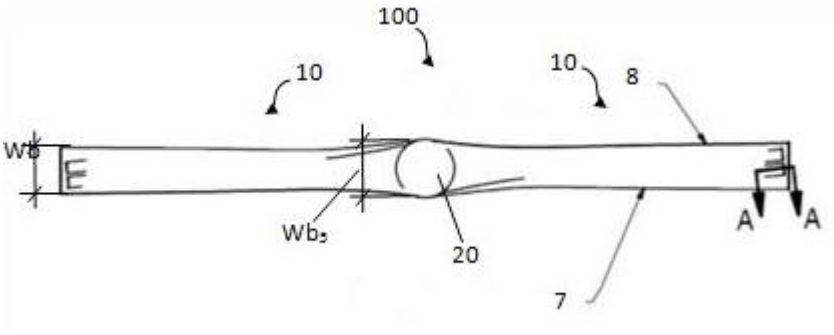
For airscrews:

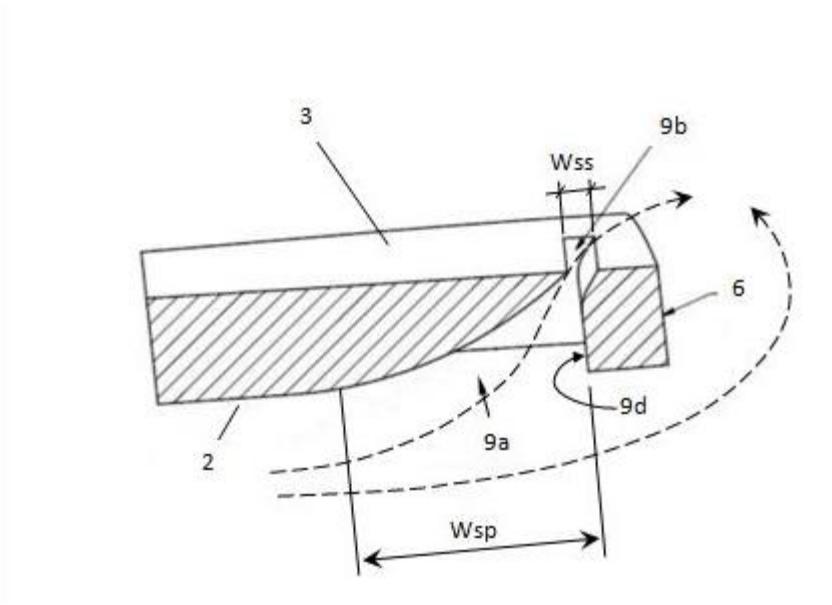
- Airplanes
- Drones
- Helicopters

TECHNOLOGY/PRODUCT READINESS LEVEL

The technology was tested on an airplane in flight. Comparative measurements were used. TRL 7

IMAGE OF THE PRODUCT





TYPE OF COLLABORATION:
Licensing

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