

Technical Disclosure Commons

Defensive Publications Series

May 2021

FAN WITH VARIOUS BLADE THICKNESS

HP INC

Follow this and additional works at: https://www.tdcommons.org/dpubs_series

Recommended Citation

INC, HP, "FAN WITH VARIOUS BLADE THICKNESS", Technical Disclosure Commons, (May 11, 2021)
https://www.tdcommons.org/dpubs_series/4290



This work is licensed under a [Creative Commons Attribution 4.0 License](https://creativecommons.org/licenses/by/4.0/).

This Article is brought to you for free and open access by Technical Disclosure Commons. It has been accepted for inclusion in Defensive Publications Series by an authorized administrator of Technical Disclosure Commons.

Fan with Various Blade Thickness

In recent years, laptop fan blade density is increased continually to provide higher pressure capability which could be used to overcome high system impedance inside a slim laptop system. This dense design pushes the acoustic energy emission toward to high frequency range. Typically, a laptop fan is designed with uniform blade thickness and uniform blade-to-blade interval distance, which generates period flow pattern when fan is operating. This periodic flow filed characters and high frequency acoustic energy emission leads to annoying high pitch noise and impact customers' experience.

One solution to address this acoustic issue is to partially seal fan inlet opening to reduce high pressure concentration zone and further reduce noise, but this approach also reduces the amount of intake air and generally impact performance by 10%. The other solution is to change attach angle for each blade to break the period flow pattern, but this design requires complex calculation while energy concentration on high frequency band still exists.

This publication reveals a solution to mitigate this acoustic issue, by using non-uniform blade thickness and blade interval distance design to break the period pattern and surprise noise energy on high frequency range, while keeps the fan performance as required to handle system heat dissipation. An example is provided below with detail design steps and illustration pictures.

- 1) Divide the fan into several sections, below take 4 sections for example**
- 2) For each section, the blade shape keeps to the same for each blade but with thickness difference, below take 3 different blade thickness for example**
- 3) For each section, determine the number of each blade thickness randomly but maintain the section weight for fan balance control**
- 4) Once the blade number of different thickness is selected, randomly arrange the sequency to break any periodic behavior during fan operation, to reduce the energy concentration on high frequency area**

$$W_{\frac{1}{4}} = T_1 n_1 + T_2 n_2 + T_3 n_3$$

$W_{\frac{1}{4}}$: One quart of total fan weight

$$W_{\frac{1}{4}} = T_1 m_1 + T_2 m_2 + T_3 m_3$$

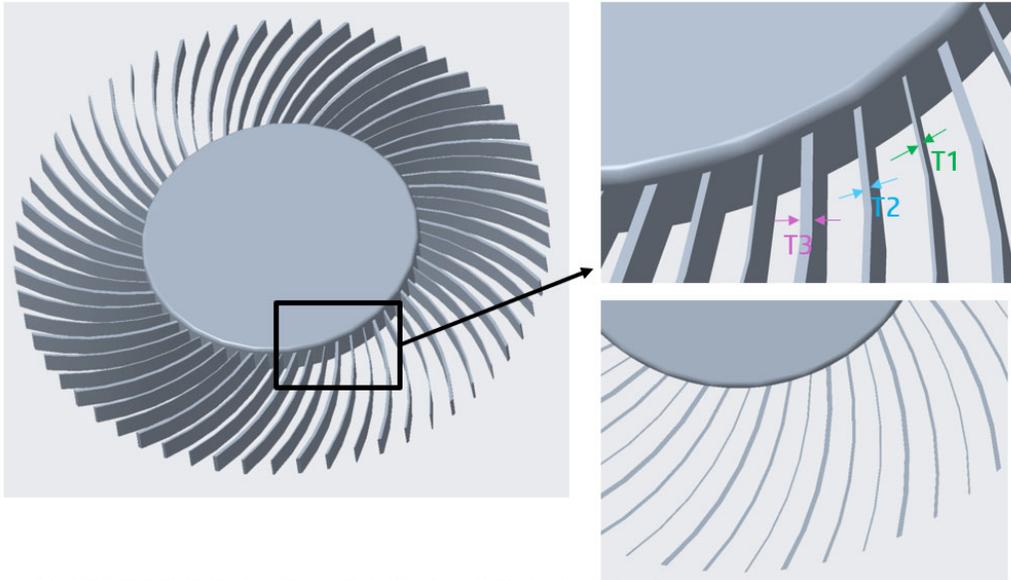
$T_{1,2,3}$: Blade thickness T

$$W_{\frac{1}{4}} = T_1 n'_1 + T_2 n'_2 + T_3 n'_3$$

$n_{1,2,3}$: Blade number of each thickness T in section 1

$$W_{\frac{1}{4}} = T_1 m'_1 + T_2 m'_2 + T_3 m'_3$$

$m_{1,2,3}$: Blade number of each thickness T in section 2



Disclosed by Owen Chang, Rock Li, Jimmy Chen, HP Inc.