MULTIDISCIPLINARY SCIENTIFIC JOURNAL NÚCLEO DO CONHECIMENTO
REVISTA CIENTÍFICA MULTIDISCIPLINAR NÚCLEO DO CONHECIMENTO
ISSN: 2448-0959 https://www.nucleodoconhecimento.com.br

THEORY OF ENERGY GENERATION THROUGH THE SEPARATION OF FORCES

ORIGINAL ARTICLE

CAETANO, Carlos Manuel Silva[1]

CAETANO, Carlos Manuel Silva. **Theory of energy generation through the separation of forces.** Revista Científica Multidisciplinar Núcleo do Conhecimento. Year 09, Ed. 03, Vol. 02, pp. 88-121. March 2024. ISSN: 2448-0959, Access link: https://www.nucleodoconhecimento.com.br/fisica-en/theory-of-energy-generation, DOI: 10.32749/nucleodoconhecimento.com.br/fisica-en/theory-of-energy-generation

ABSTRACT

Study to Increase the Capacity of Renewable Energy Production. It will be the demonstration of a mechanical movement that, in its design, performs a dynamic utilization of forces in one direction and aerodynamic forces in other directions, but in the continuation of the direction of the original force, there is a particularity. The resulting forces can perform work. With this theory, it could be used to develop mechanisms such as those for producing energy and protecting infrastructures like ships, ports, coastal areas, high-altitude vehicles, etc. Do these theories work exactly in reality? If they don't work one hundred percent, what corrections will be necessary? How many tests are required to obtain satisfactory results? Many simulations should be conducted. To produce energy, it could be from wind power, water such as ocean waves, river currents, and solar wind in space. The representations in various drawings promise good mechanical performance. With mechanical adaptations, it could become a large-scale mechanism. It could be large equipment capable of producing a lot of energy.

Keywords: Energy, Physics, Mechanical Engineering, Technological Innovation, Sustainability.

1. INTRODUCTION

Humanity is moving towards a great demand for energy in meeting the commitments to reduce fossil fuels and the increasing number of electric vehicles to reduce greenhouse gas emissions that cause climate change. One of the solutions is renewable energy.

There are commonly two types of wind turbines used in wind energy: the horizontal-axis wind turbine and the vertical-axis wind turbine. However, there is also the potential to use a turbine that separates forces.

Caetano (2022), in his work "Innovative Theories for Ecologically Producing Energy: Theory of Force Distribution and Others," named this the "force distribution turbine" (P13).

The turbine that separates forces operates with a vertical axis but has a much larger coverage area than other types of turbines (larger sweep) with a higher percentage of utilization (more efficient) and less friction than the currently most used vertical-axis turbine.

According to Caetano (2022):

a ventoinha de distribuição de forças tem de estar direcionada relativamente ao vento porque senão não funciona ou a qualidade de funcionamento é baixa, a ventoinha de eixo vertical funciona com o vento em qualquer direção, mas com muito atrito (perda de rentabilidade).

The force separation turbine can also operate with a horizontal axis, but the research began with the vertical axis.

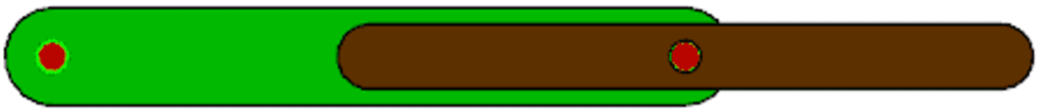
The force separation turbine has advantages that should be studied, simulated, and tested. Extensive and appropriate research will be needed, using different methods, to refine its various applications.

These devices may be larger than the most recent equipment and more efficient.

ISSN: 2448-0959 https://www.nucleodoconhecimento.com.br

2. DEVELOPMENT

Figure 1. Top view of the support and blade

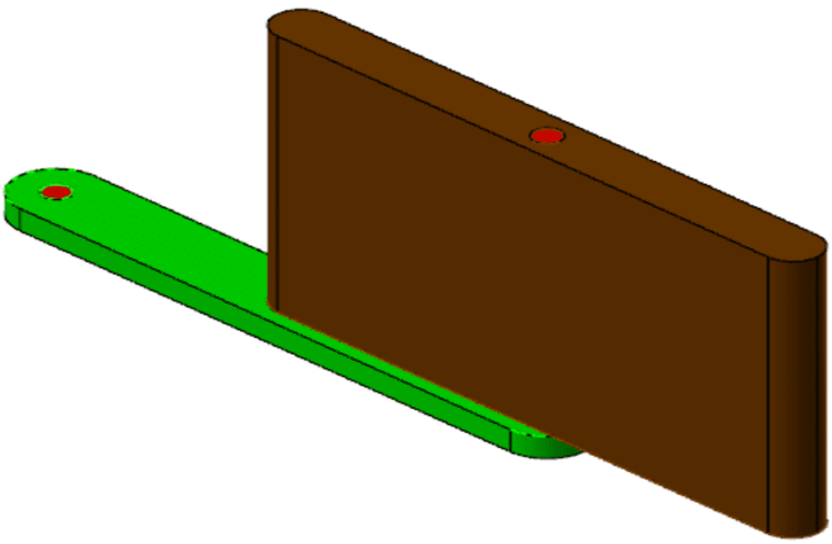


Source: Image by the author, 2023.

Figure 1 has two lines, a green line representing the support, the brown line representing the fan blade, and two red circles representing the axes, the red circle on the green line is the support axis, the red circle on the brown line is the blade axis.

Figure 1 shows only one support and one fan blade, viewed from the top, to continue explaining in the other figures. This type of fan cannot operate with only one blade; the other blades are not represented in Figure 1 and Figure 2.

Figure 2. Isometric view of the support and blade

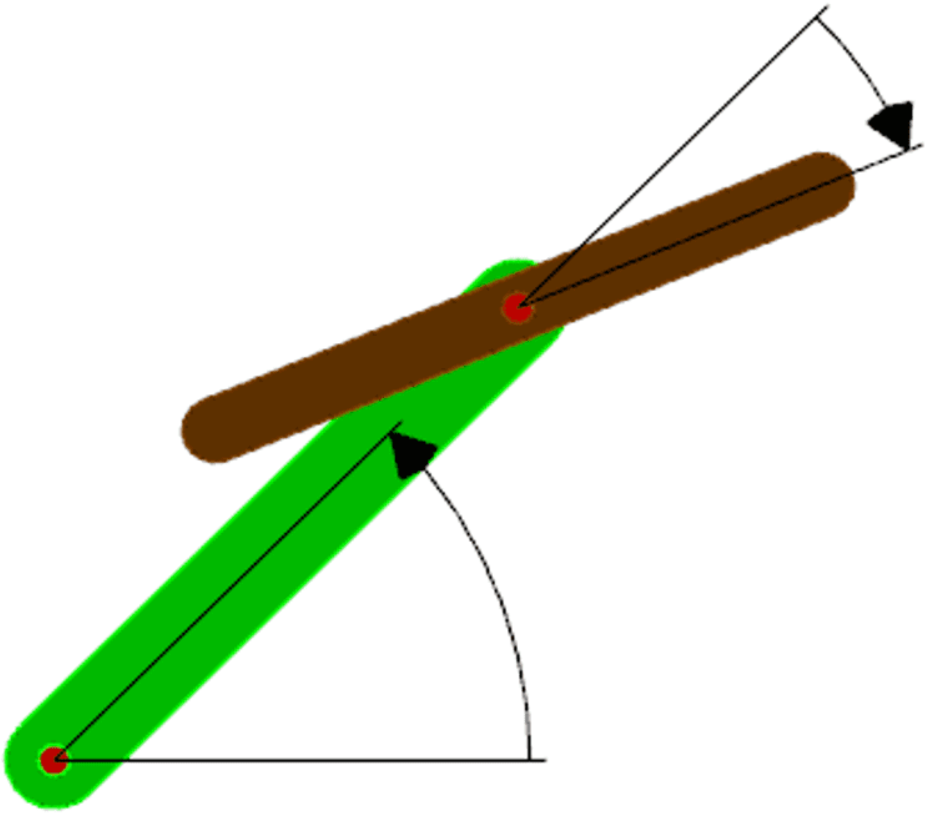


Source: Image by the author, 2023.

ISSN: 2448-0959 https://www.nucleodoconhecimento.com.br

In figure 2, the support and blade are shown in an isometric view for better understanding.

Figure 3. The direction of rotation

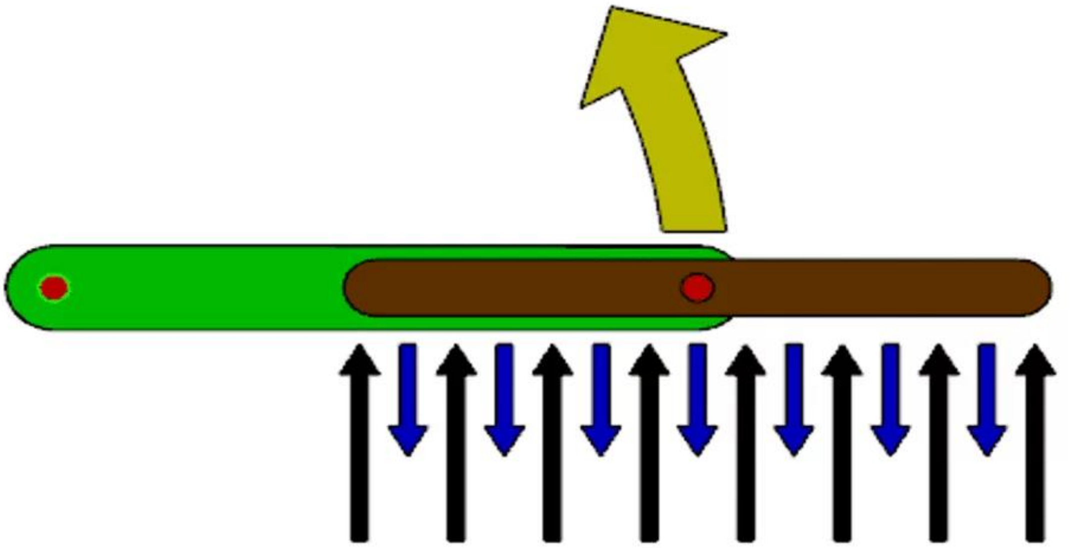


Source: Image by the author, 2023.

In figure 3, the green line rotates at an angle counterclockwise, while the brown line rotates half of the green line's rotation but in a clockwise direction.

In the example of figure 3, the green line can rotate in any direction, and the brown line must rotate half of the green line's rotation but in the opposite direction. This creates a dynamic in the application of forces that can generate energy or provide protection to structures in some cases.

Figure 4. The start of the rotations



Source: Image by the author, 2023.

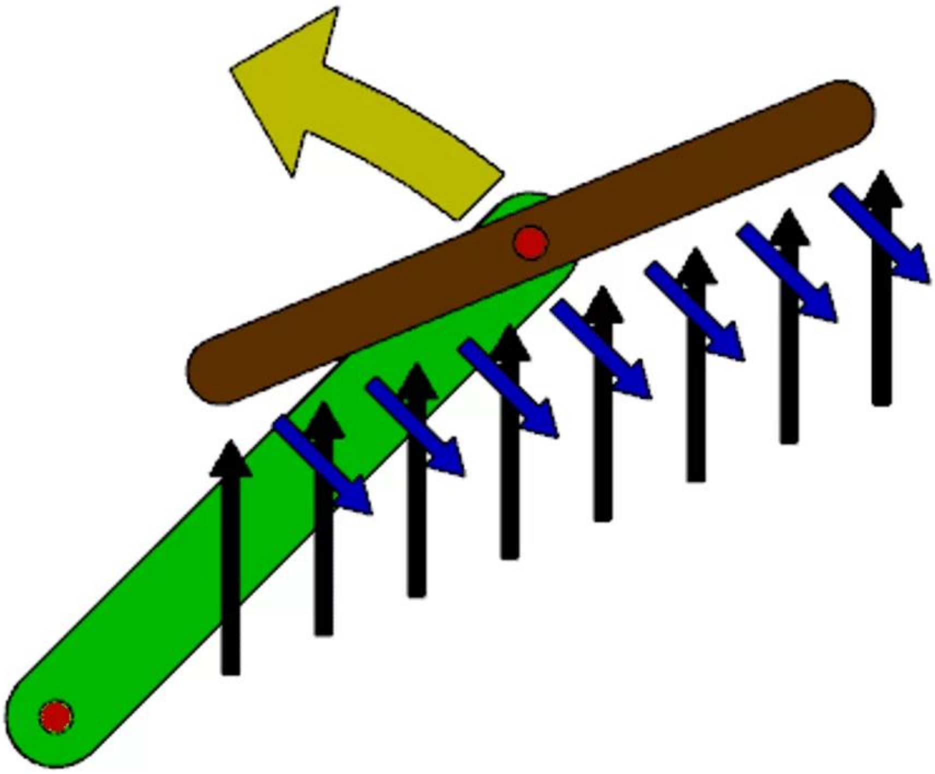
In figure 4, it is the beginning of a demonstration of how forces act in this type of fan. The blade support is at the zero-degree rotation position on its axis, marking the start of a stage.

The black arrows represent the forces applied as fluids, such as gaseous fluids in the case of wind, liquid fluids like seawater or rivers, and particle fluids like solar wind in space.

The blue arrows represent aerodynamic forces.

The yellow arrow represents the displacement of the support and blade; it is the force that performs work, the resulting force.

Figure 5. The 45-degree rotation of the support



Source: Image by the author, 2023.

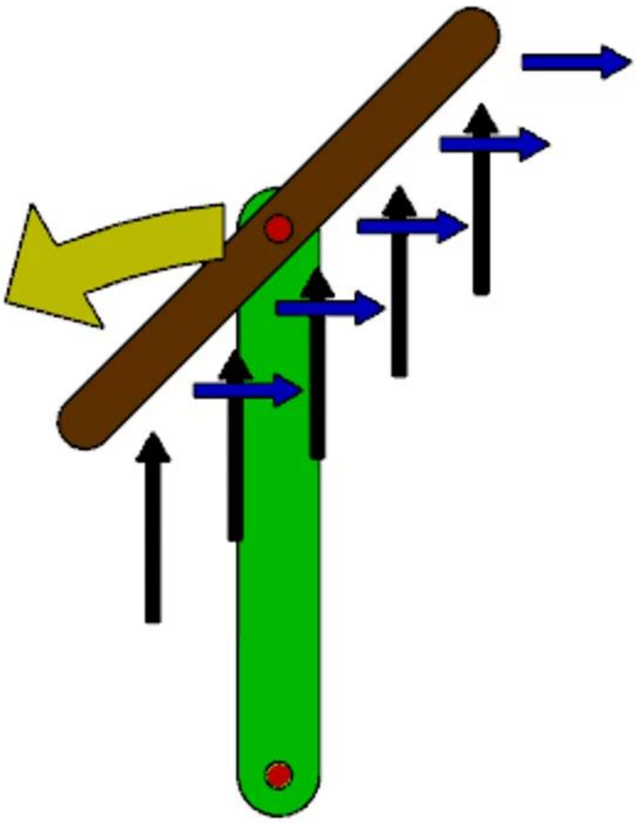
In figure 5, the support has rotated 45 degrees from figure 4 on the support axis counterclockwise, and the blade has rotated 22.5 degrees on the blade axis clockwise.

The black arrows representing the applied forces remain in the same direction and sense. The blue arrows representing the aerodynamic forces change their direction relative to figure 4, and the yellow arrow representing the resulting force continues to perform its task.

According to Marcelo (1972) in his work "Physics: A University Course," "any force can be the result of another force or a set of other forces."

ISSN: 2448-0959 https://www.nucleodoconhecimento.com.br

Figure 6. The 90-degree rotation of the support



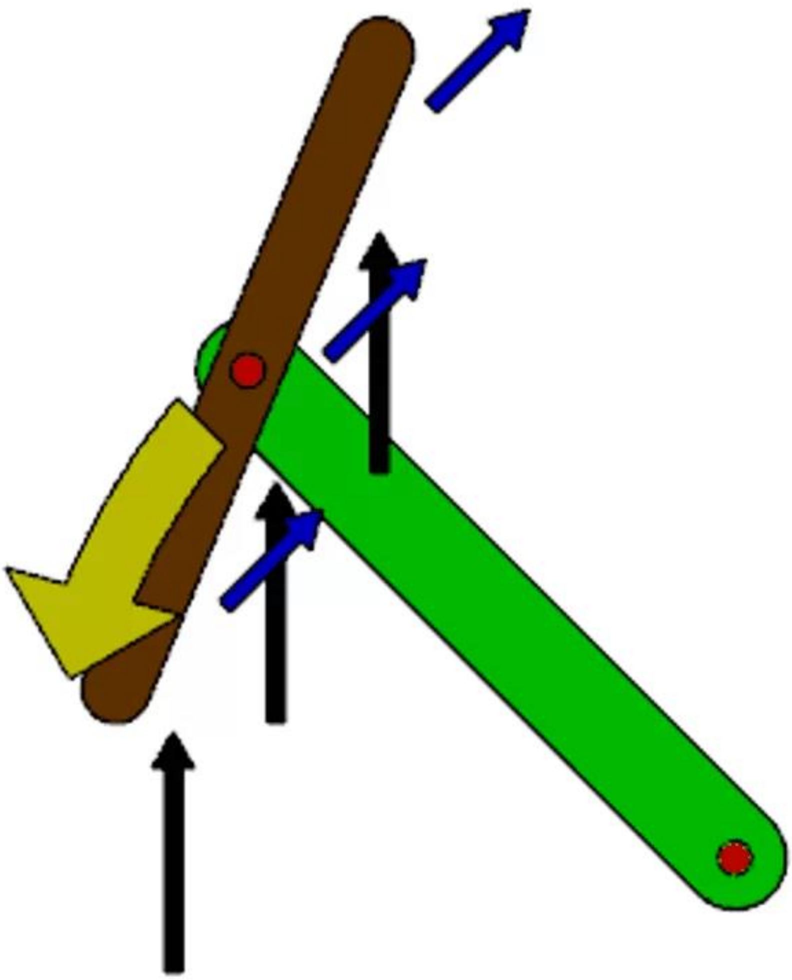
Source: Image by the author, 2023.

In figure 6, the support has rotated 90 degrees counterclockwise from figure 4, and the blade has also rotated 45 degrees clockwise from figure 4.

The applied forces remain in the same direction, although over a smaller area due to the blade's rotation. The aerodynamic forces, represented by the blue arrows, change their direction more relative to figure 5, and the resulting force, represented by the yellow arrow, continues to propel the movement.

ISSN: 2448-0959 https://www.nucleodoconhecimento.com.br

Figure 7. The 135-degree rotation of the support



Source: Image by the author, 2023.

In figure 7, the support has rotated 135 degrees counterclockwise, and the blade has rotated 67.5 degrees clockwise from figure 4.

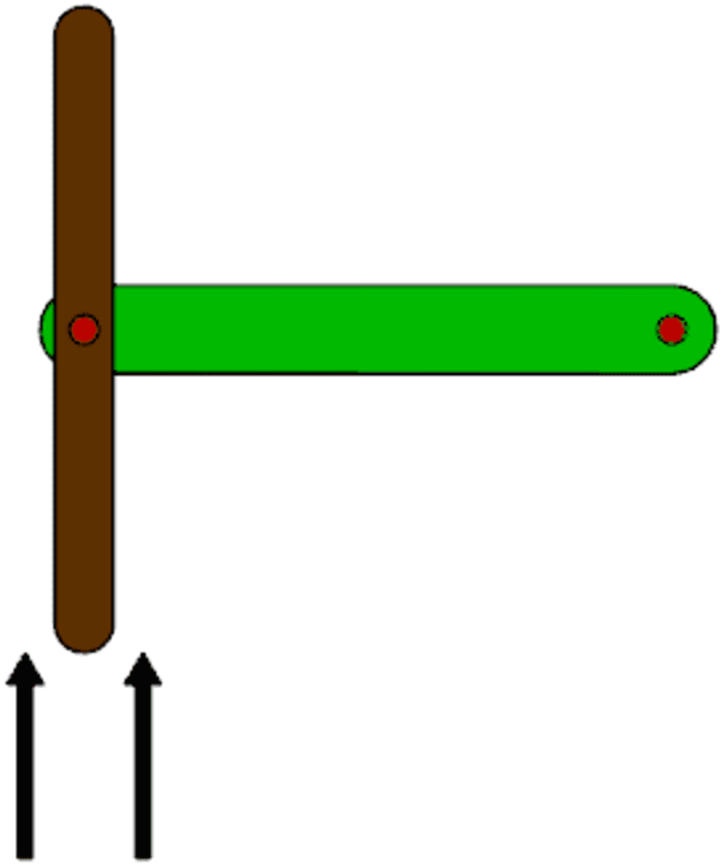
Pereira (1996, p. 13) in his work "General Physics, Support Notebook," states that "the work of external forces is always equal to the variation of the mechanical energy of the system."

In figure 7, the applied forces are smaller due to the blade's rotation, the aerodynamic forces are more directionally deflected and smaller, and the resulting force,

ISSN: 2448-0959 https://www.nucleodoconhecimento.com.br

represented by the yellow arrow, is consequently smaller along the same circular path compared to figure 6.

Figure 8. The 180-degree rotation of the support



Source: Image by the author, 2023.

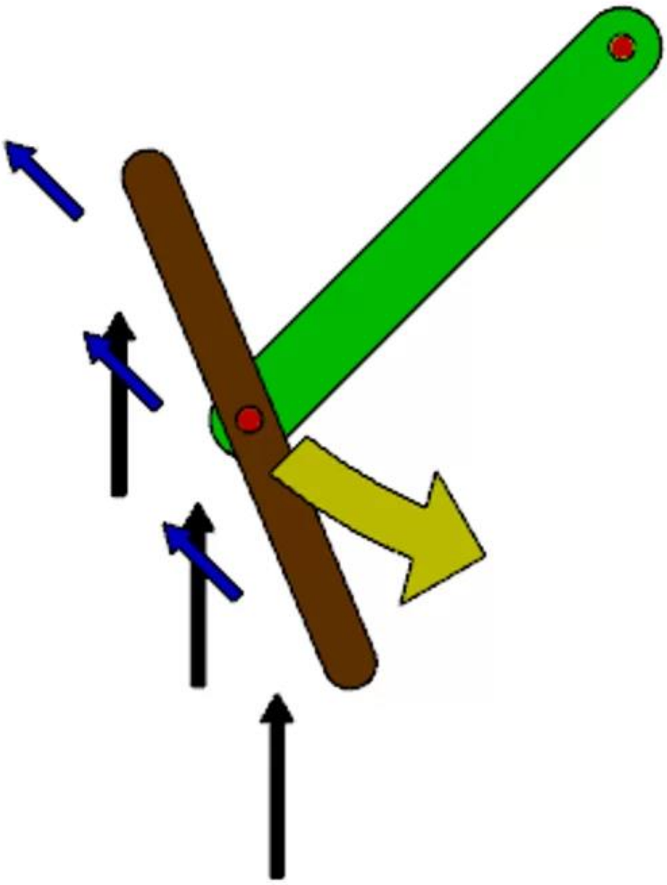
In figure 8, the support has rotated 180 degrees counterclockwise, and the blade has rotated 90 degrees clockwise from the position in figure 4.

In the position of figure 8, there is a particularity: only the applied forces are present, and they are much smaller, with only minimal friction. If there is any aerodynamic force, it continues in the direction and sense of the applied forces. There is no resulting force in the position of figure 8; the blade in this position requires assistance from the other blades in other distributed positions in the mechanism. Only one blade is represented in the figures for a better representation of the forces (better simplification).

RC: 152950
Available in: https://www.nucleodoconhecimento.com.br/fisica-en/theory-of-energy-generation

ISSN: 2448-0959 https://www.nucleodoconhecimento.com.br

Figure 9. The 225-degree rotation of the support



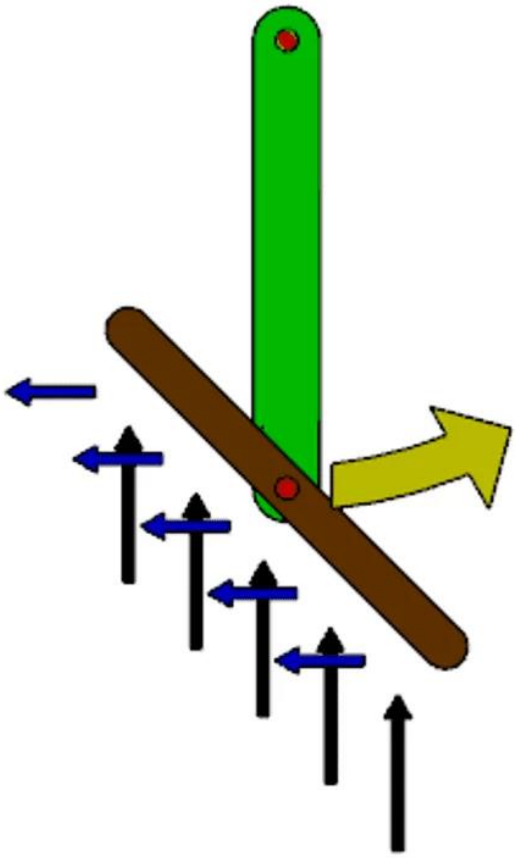
Source: Image by the author, 2023.

In figure 9, the support has rotated 225 degrees counterclockwise, and the blade has rotated 112.5 degrees in the opposite direction from figure 4. Even with the blade in front of the support, the mechanism continues to operate. The aerodynamic forces are redirected in another direction, and the resulting force gains more strength than in figure 8.

RC: 152950
Available in: https://www.nucleodoconhecimento.com.br/fisica-en/theory-of-energy-generation

ISSN: 2448-0959 https://www.nucleodoconhecimento.com.br

Figure 10. The 270-degree rotation of the support



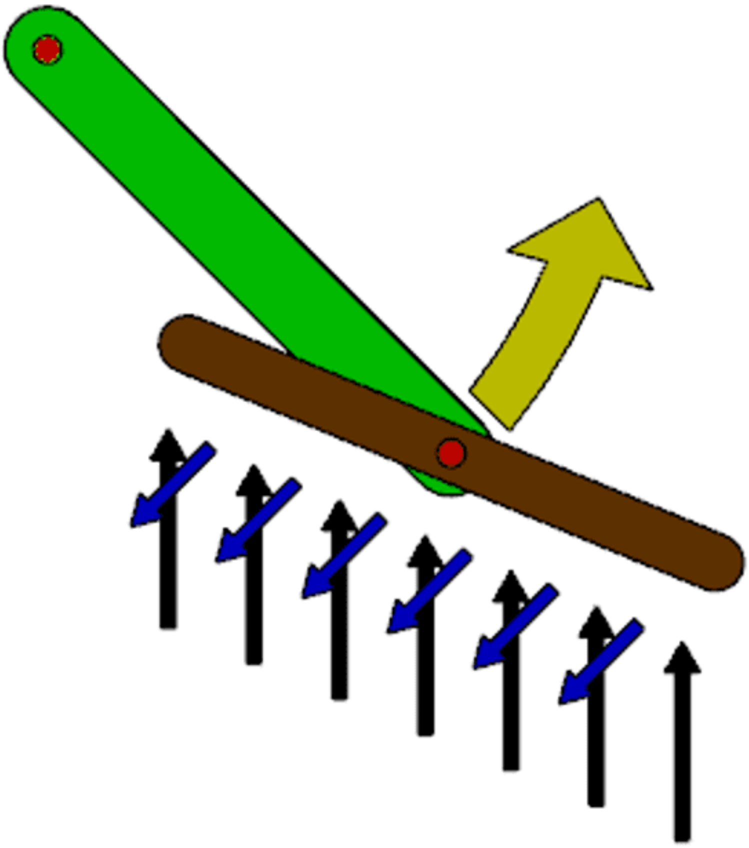
Source: Image by the author, 2023.

In figure 10, the support has rotated 270 degrees counterclockwise, and the blade has rotated 135 degrees in the opposite direction from figure 4. The blade is further ahead of the support and continues to drive the rotation of the equipment.

RC: 152950
Available in: https://www.nucleodoconhecimento.com.br/fisica-en/theory-of-energy-generation

ISSN: 2448-0959 https://www.nucleodoconhecimento.com.br

Figure 11. The 315-degree rotation of the support



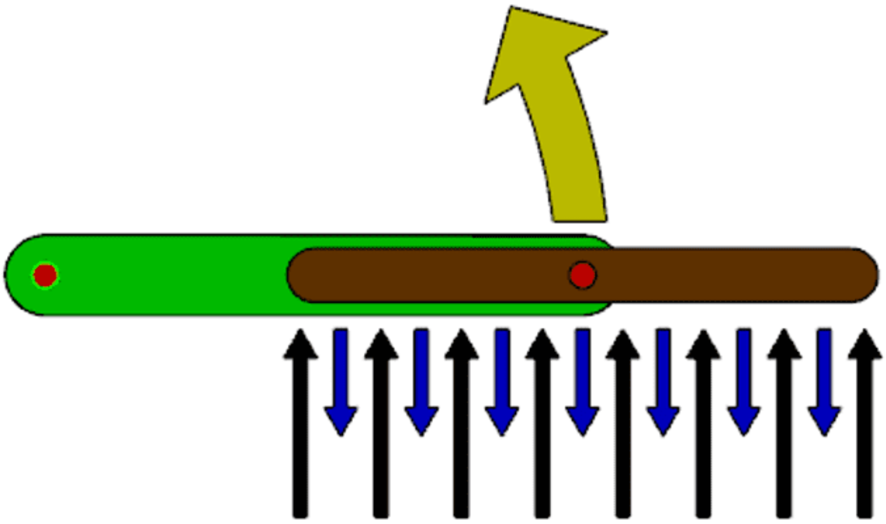
Source: Image by the author, 2023.

In figure 11, the support has rotated 315 degrees counterclockwise, and the blade has rotated 157.5 degrees in the opposite direction from the support since figure 4. The applied forces have increased, the aerodynamic forces have shifted, and the resulting force continues along a circular path.

RC: 152950
Available in: https://www.nucleodoconhecimento.com.br/fisica-en/theory-of-energy-generation

ISSN: 2448-0959 https://www.nucleodoconhecimento.com.br

Figure 12. The 360-degree rotation of the support



Source: Image by the author, 2023.

In figure 12, the support has rotated 360 degrees counterclockwise, and the blade has rotated 180 degrees in the opposite direction from figure 4, completing one cycle. If the blade had two different images on each side, every time the support completes a full rotation, the blade would change its image.

Figure 12 is identical to figure 4. When the support completes two full rotations, the blade completes one full rotation, maintaining continuous movement.

This type of movement, discovered by Caetano (2022) and mentioned in the book titled "Innovative Theories for Ecologically Producing Energy," involves the blade moving half the angular movement of the support in the opposite direction for each angular movement of the support.

The applied forces are equal to the sum of the aerodynamic forces and the resulting force. Since the resulting force is much greater than the aerodynamic forces, the mechanism functions similarly to the forces acting on a vertical-axis wind turbine.

The movement of boat sails is similar to this type of blade that separates forces, although with some differences. The movement of a boat sail could be improved to be

RC: 152950
Available in: https://www.nucleodoconhecimento.com.br/fisica-en/theory-of-energy-generation

ISSN: 2448-0959 https://www.nucleodoconhecimento.com.br

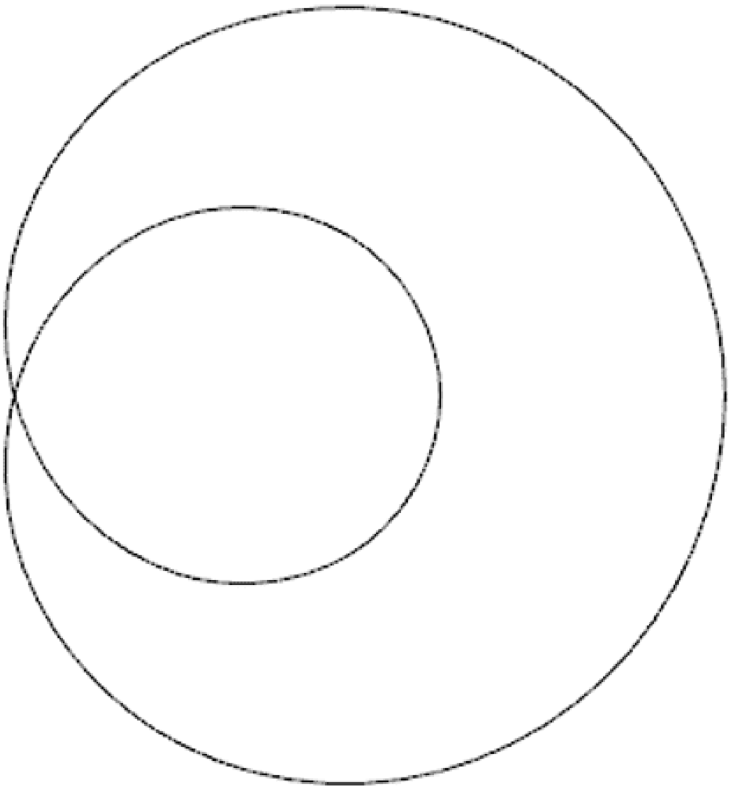
similar to this type of blade by attaching a rope to the boat anchored at a point in the middle of the water, serving as the axis for the circular movement of the boat. The boat sail would then resemble the blade of this type of force-separating fan.

To cause this blade movement in the fan, it can be achieved by transmission, belt and pulley systems, or by controlled electric motors.

In the previous drawings, the blade is shown above the support, but the blade can be positioned below the support or in two parts connected by the blade axis.

If there were a marker at the tip of the blade below the support in the lower part of the blade, tracing on a plane would mark the pattern shown in figure 13.

Figure 13. The trace of the blade's tip



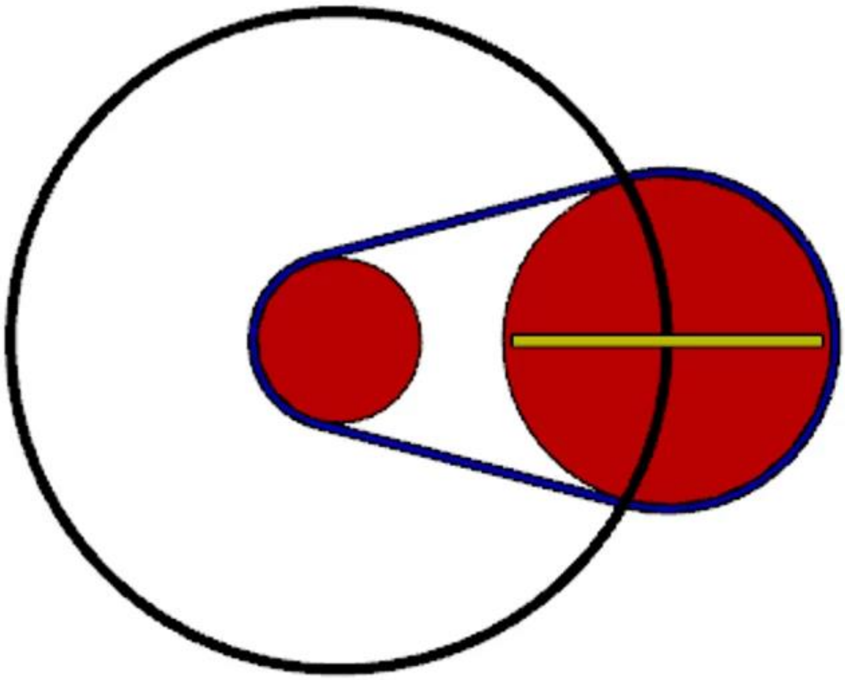
Source: Image by the author, 2023.

ISSN: 2448-0959 https://www.nucleodoconhecimento.com.br

Figure 13 has a path that can be used for the construction of conductors such as protruding profiles or channels with mechanical parts sliding on the profile of figure 13, which can cause the blade to rotate in the exact position.

Figure 13 is evidence of the continuity of this type of fan because the circuit is closed.

Figure 14. Simulation of the blade circuit



Source: Image by the author, 2023.

In figure 14, a set of belt and disc assemblies is represented. The belt is blue and acts on the discs, which are the red circles. The larger red disc orbits around the smaller red disc along the trajectory of the black circumference. The yellow dash represents the position of the fan blade.

As the larger red disc orbits around the smaller red disc, the yellow dash also rotates and aligns with the position of the blade. With this procedure, the blade movement can be generated.

There is one set of these elements from figure 14 for each blade.

ISSN: 2448-0959 https://www.nucleodoconhecimento.com.br

The larger red disc has twice the diameter of the smaller red disc.

The blade orientation can also be controlled by a motor on the blade axis.

There are at least three methods to guide the blade.

1. transmission.
2. belt and pulley assembly.
3. controlled motors.

The driving method is more precise, there are fewer misalignments, but the mechanics are more complex.

The belt and pulley assembly might be simpler, but less precise, and with continued operation, it may become misaligned, often requiring corrections to the movement.

The controlled motor could be a good option, but it has consumption and friction issues.

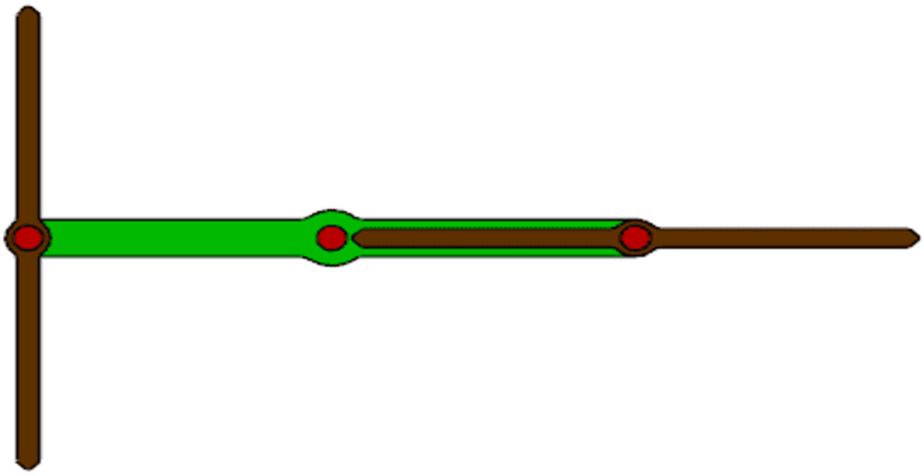
Perhaps the combination of the belt and pulley assembly with the controlled motor is the best option, but it needs to be analyzed, tested with various experiments, and adapted to the operational cases.

The fan must have at least two blades to function due to the situation in figure 8; it is in this position that the blade needs assistance from another blade in a different position.

RC: 152950
Available in: https://www.nucleodoconhecimento.com.br/fisica-en/theory-of-energy-generation

ISSN: 2448-0959 https://www.nucleodoconhecimento.com.br

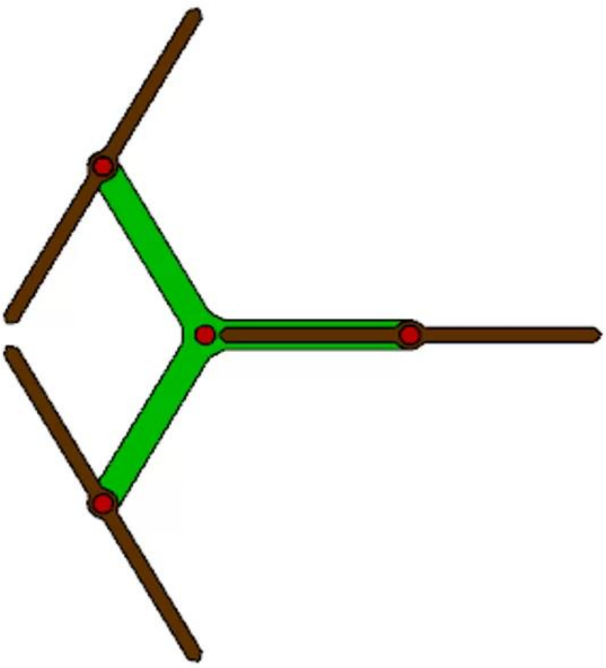
Figure 15. Two-blade fan



Source: Image by the author, 2023.

In figure 15, there is a two-blade fan with blades that are long, almost reaching the support axis.

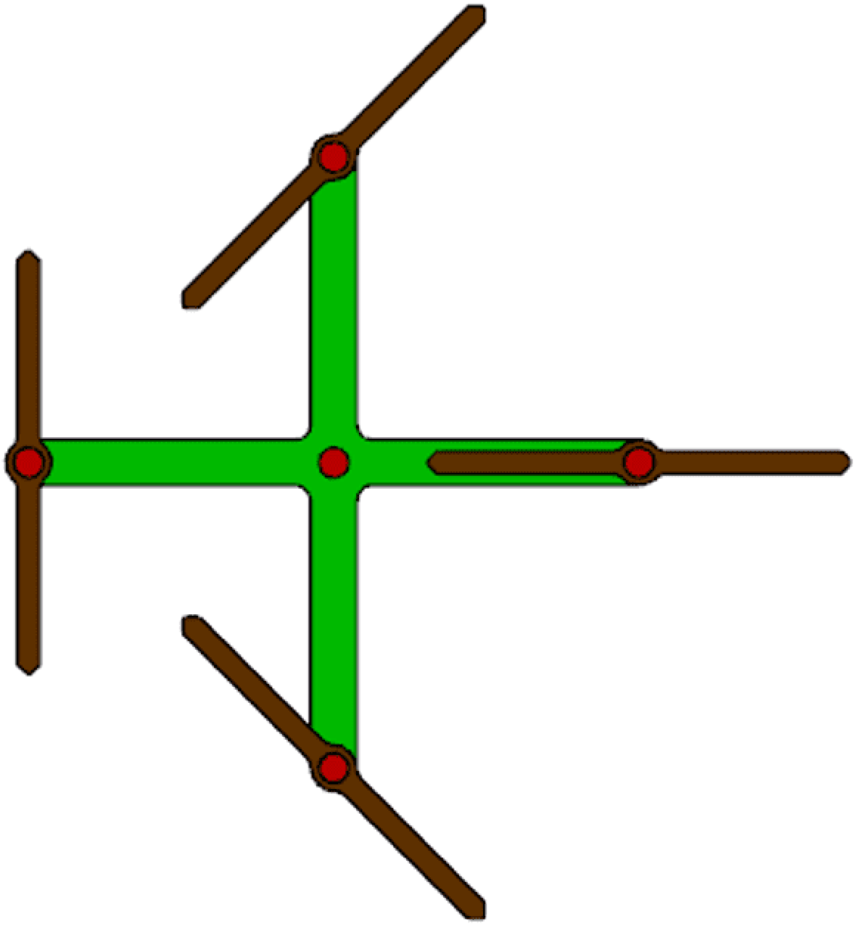
Figure 16. Three-blade fan



Source: Image by the author, 2023.

Figure 16 depicts a three-blade fan, where the blades are long and almost reach each other when in motion.

Figure 17. Four-blade fan

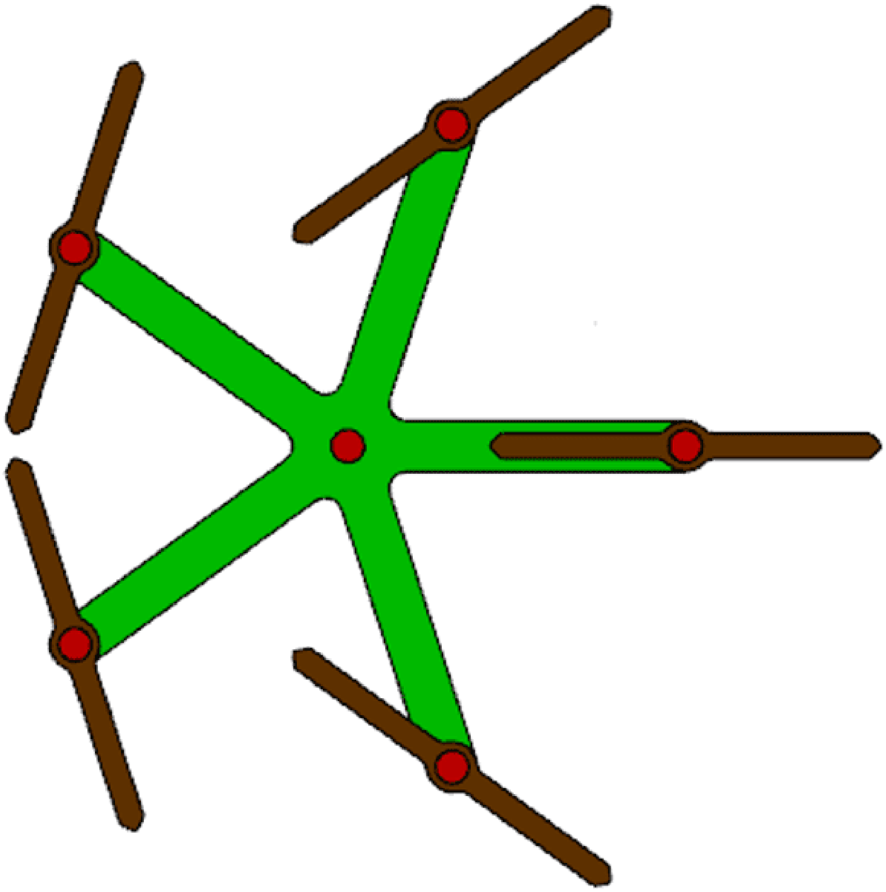


Source: Image by the author, 2023.

Figure 17 depicts a four-blade fan, where the blades are less extensive than those of the two- and three-blade fans because to allow the operation of a four-blade fan, they must be less extensive.

ISSN: 2448-0959 https://www.nucleodoconhecimento.com.br

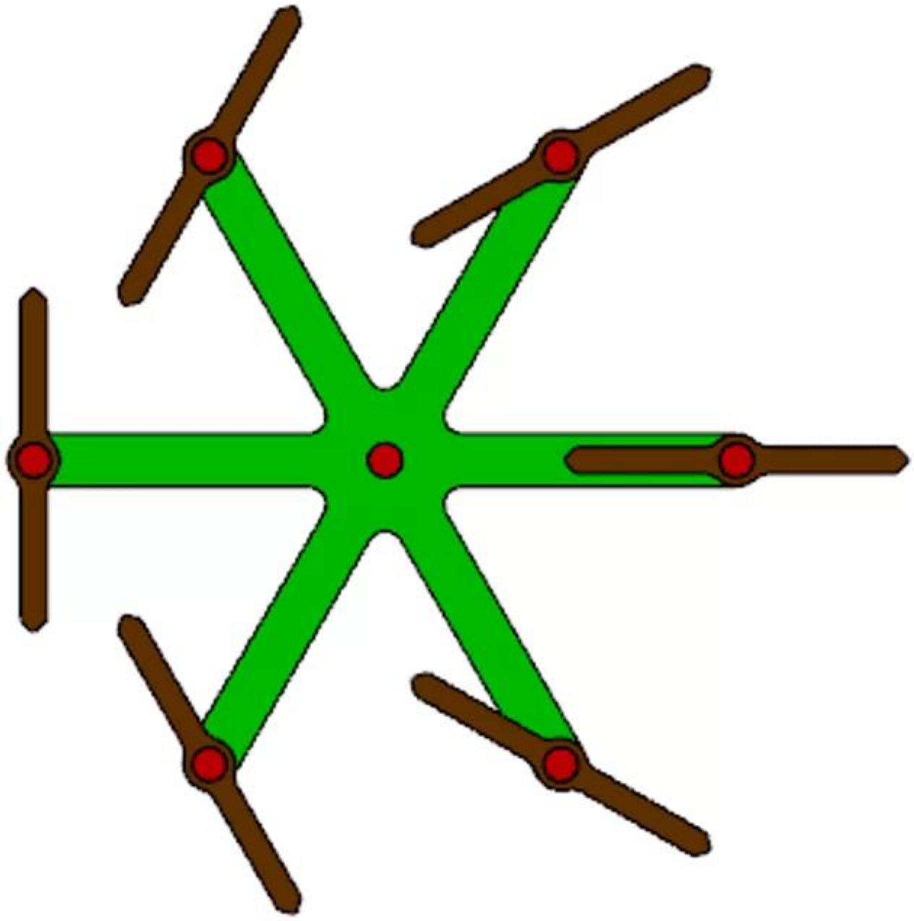
Figure 18. Five-blade fan



Source: Image by the author, 2023.

Figure 18 depicts a five-blade fan, where the blades are less extensive than those of the four-blade fan to function.

Figure 19. Six-blade fan



Source: Image by the author, 2023.

Figure 19 depicts a six-blade fan, where the blades are less extensive than those of the five-blade fan.

Fans with fewer blades have more extensive blades than fans with more blades.

Studies need to be conducted to determine the best option for the number of blades to use in the force distribution fan, taking into consideration that more blades also mean more weight for the blade supports. Studies are also needed for differences in sound levels, noise levels in the case of wind?

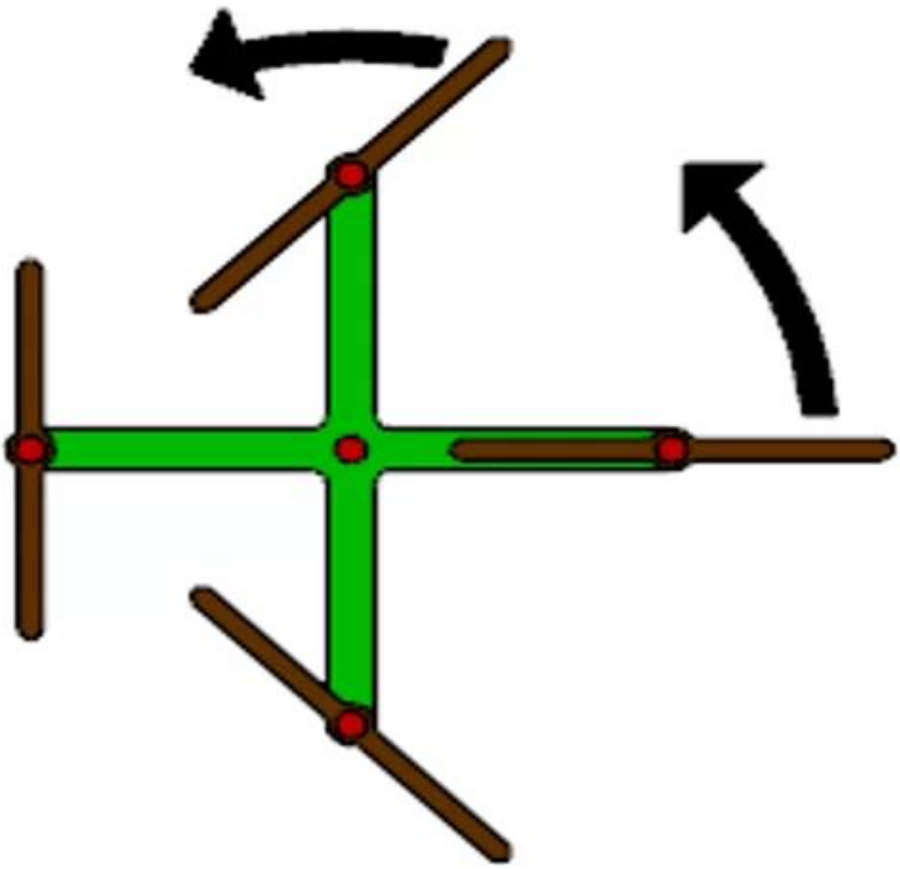
How do aerodynamic forces behave with a high number of blades and with ocean waves?

Does a high number of blades hinder the operation of the fan in space with solar wind due to aerodynamic forces?

Various parameters need to be analyzed, simulated, and tested.

The fan tends to rotate the entire mechanism to the less efficient side. One of the strategies to correct this situation is the positioning of the fan in a mechanical effort, which is not the best but can work. When the applied forces change direction, such as with wind or water, it must be corrected, which logically requires mechanical action.

Figure 20. The mechanical effort of the fan

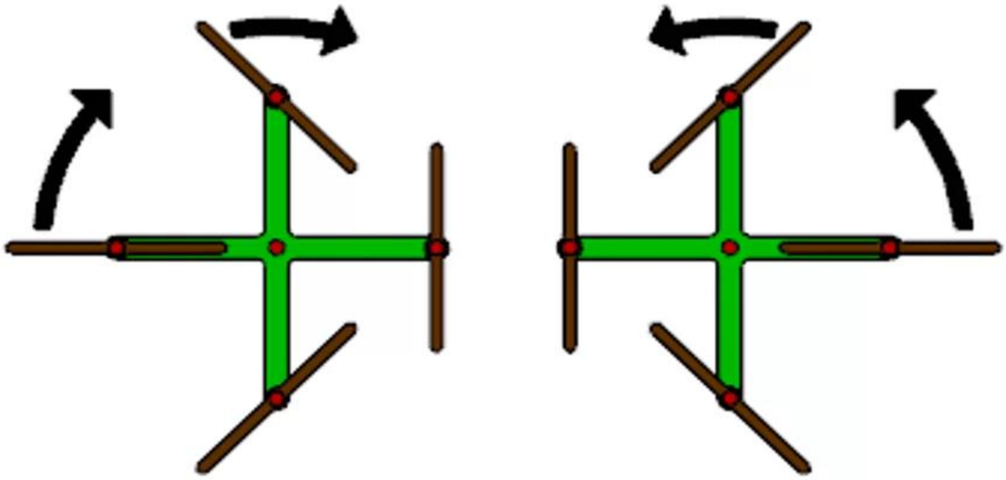


Source: Image by the author, 2023.

ISSN: 2448-0959 https://www.nucleodoconhecimento.com.br

Figure 20 shows with black arrows the tendency of rotation of the entire mechanism, which weakens the fan's operation.

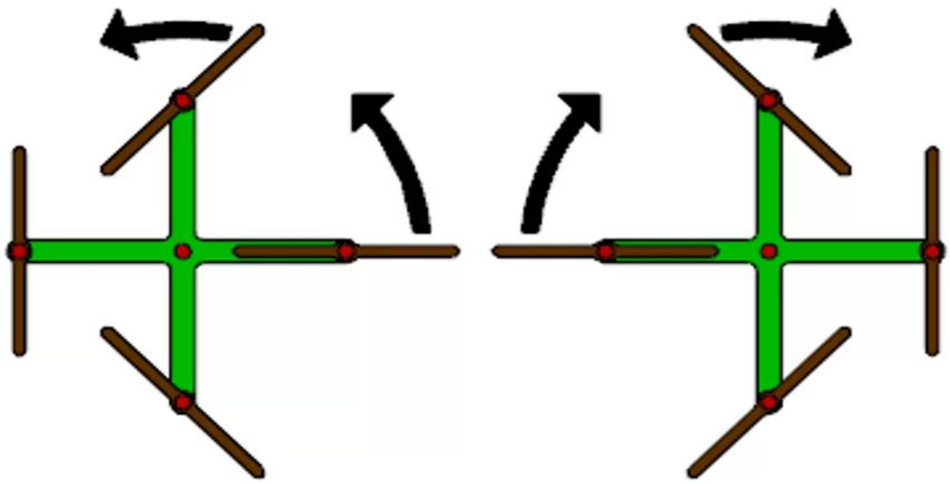
Figure 21. The mechanical effort canceled in a mounting system



Source: Image by the author, 2023.

Figure 21 has the two symmetrical mirrored fans, adding fixed mechanical connections to the two fans, the tendency forces of the mechanism's rotation cancel each other out, thus increasing productivity and requiring less mechanical effort to direct the fans.

Figure 22. Another mounting system



Source: Image by the author, 2023.

RC: 152950
Available in: https://www.nucleodoconhecimento.com.br/fisica-en/theory-of-energy-generation

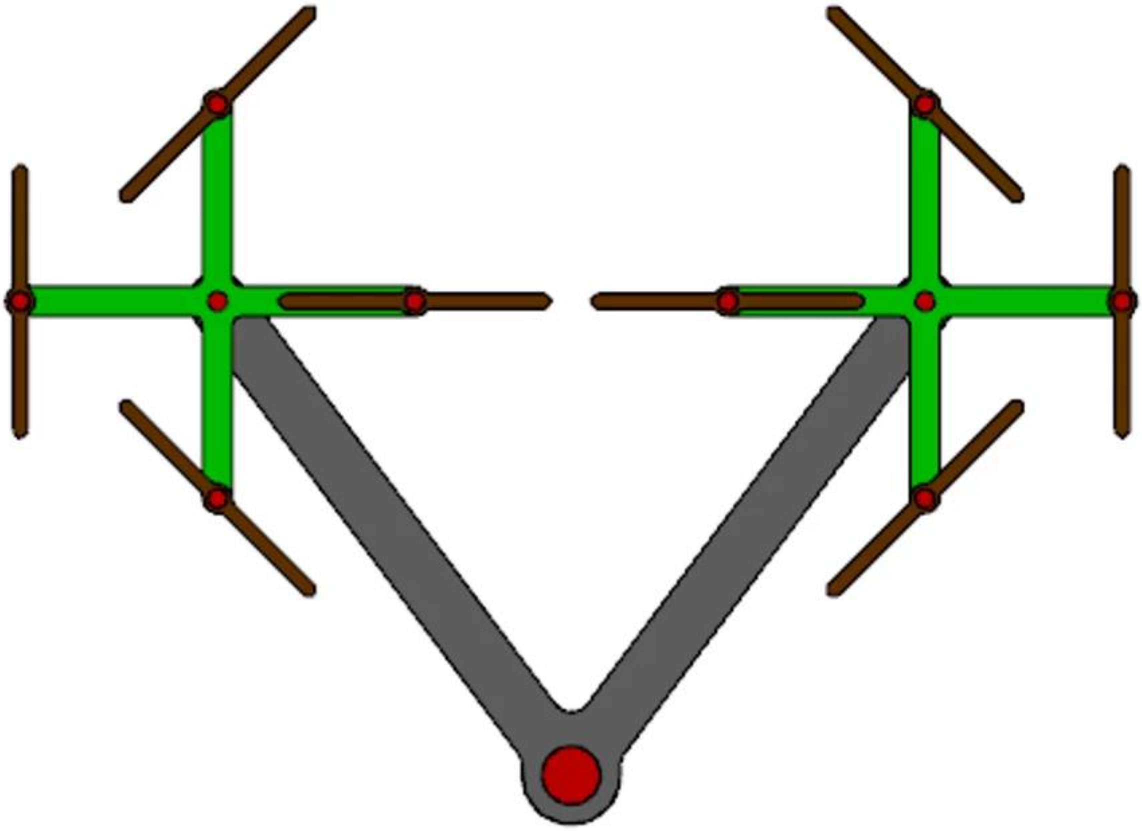
ISSN: 2448-0959 https://www.nucleodoconhecimento.com.br

Figure 22 has the symmetry of the mirrored fans different from figure 21, the operating system of figure 22 creates higher pressure between the fans, and the more protruding blades help steer the fan assembly.

In figure 21, there is a lot of passage of the applied force between the fans (less pressure), and the more protruding blades help reposition the fan assembly when there is a change in the direction of the applied force, such as wind or water flow.

It will need to be analyzed and simulated which of the mechanisms from figures 21 and 22 has the best functionalities.

Figure 23. A shaft helps to direct the pair of fans



Source: Image by the author, 2023.

ISSN: 2448-0959 https://www.nucleodoconhecimento.com.br

Figure 23 shows one of the possible mechanical connections, which is in gray with a rotating shaft, represented by the larger red circle. The rotating shaft is used to rotate the fan assembly around it, positioning the fans in the direction of the energy flow.

The mechanical connections in figure 23 take up a lot of space but facilitate in the orientation for energy capture. To save space, there could be mechanical connections only between the fans and the rotating shaft, with the directional orientation of the fans controlled by more powerful programmed motors. This approach needs to be researched and adapted to different scenarios.

This type of fan only has more advantages in producing energy than other types of fans if you want to maximize energy capture in a small area or if the fan is large. Due to the complexity of this fan, these conditions are necessary.

This type of fan captures energy in a frontal area relative to the wind in a rectangular shape, compared to horizontal-axis fans in a round shape and vertical-axis fans in a square or rectangular shape, but with less than 50% efficiency due to significant friction.

The placement of the alternators can be one on each support axis or a single alternator on the rotating shaft. Having an alternator on each support axis adds weight to the fan assembly when changing direction, while having an alternator on the rotating shaft requires a belt or metal chains from the support axes to the rotating shaft. The placement of the alternators needs to be analyzed according to the options and dimensions of the fans.

To increase the size of the fan, a crankshaft can be attached to transfer the motion system, such as the positioning of the blades, further away, increasing the capture area with long connecting rods.

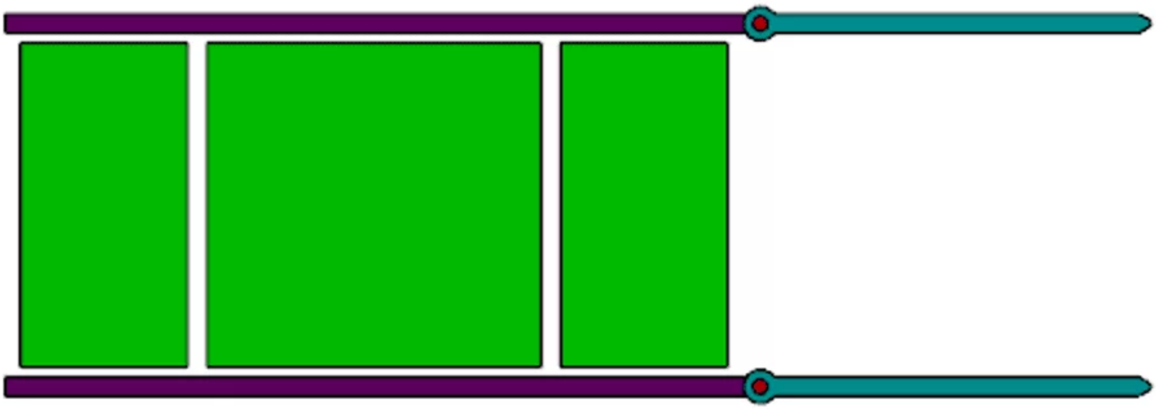
In horizontal-axis fans, lengthening the blades significantly increases the weight and wind vibration on the blade axis, requiring the tower and its foundations to be extended further.

The force distribution fan, being flatter and able to have several pillars, does not have these disadvantages.

Symmetrically paired force distribution fans with area enlargement equipment can form a fan block with dimensions in hundreds of meters. In space, this can reach one or two or several kilometers, but the possible dimensions need to be studied.

This fan system also has the possibility of having a terrace on top that can have solar panels, extracting both wind and solar energy on a large scale from the same location, which is not possible with horizontal-axis fans.

Figure 24. The doors in the normal flow opening

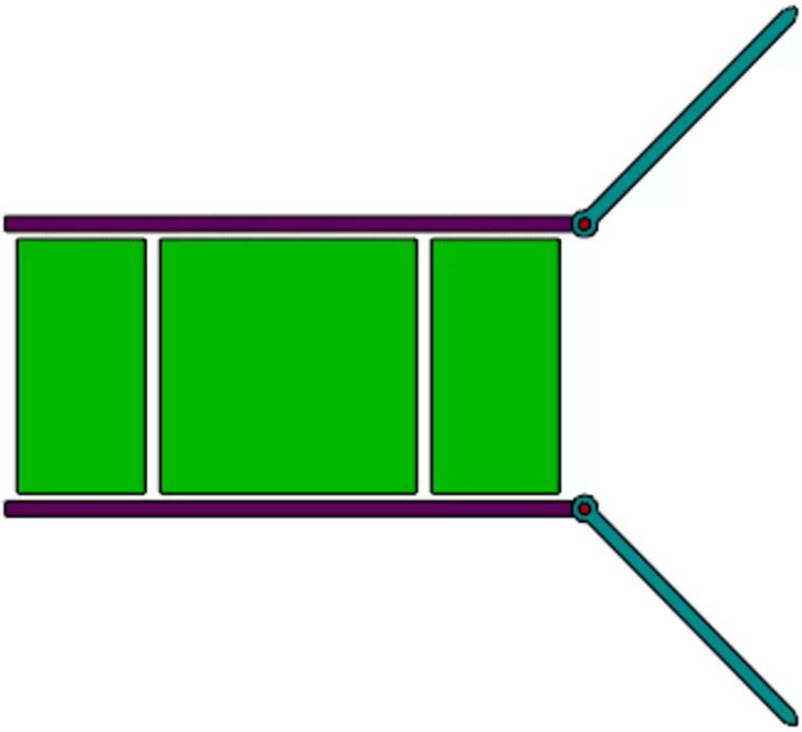


Source: Image by the author, 2023.

Figure 24 represents the fans between the stage and the terrace, the green surfaces are the blades, the doors are connected, one to the stage and the other to the terrace, by a shaft which is the small red circle. The doors are in a normal opening, in the case of wind, its speed is predominant in passing through the fans.

ISSN: 2448-0959 https://www.nucleodoconhecimento.com.br

Figure 25. The doors in the maximum opening

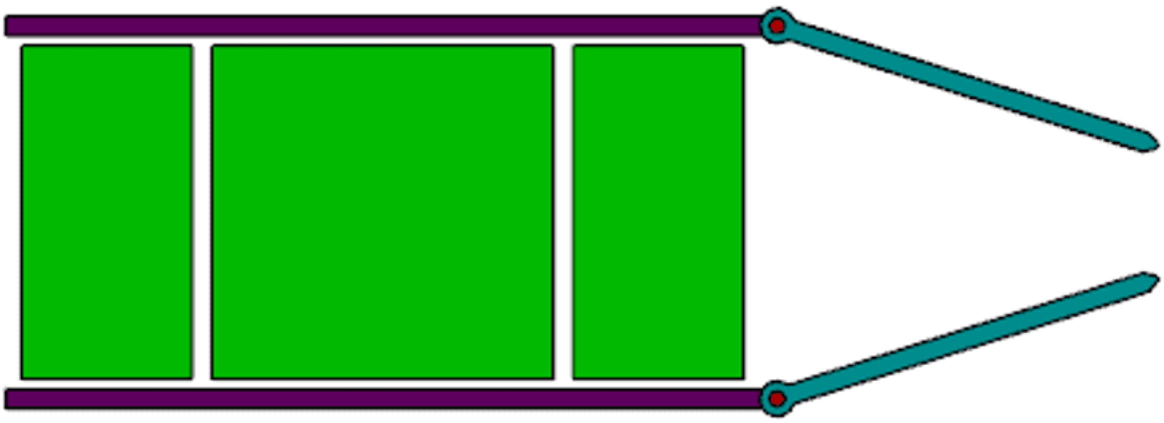


Source: Image by the author, 2023.

In figure 25, the doors are in a wide opening. In the case of weak wind, it increases speed as it passes through the fan. When the wind is less intense, this can increase productivity. The stage door can be used to match the height of the sea waves.

ISSN: 2448-0959 https://www.nucleodoconhecimento.com.br

Figure 26. The doors in the reduced opening



Source: Image by the author, 2023.

Figure 26 has the doors in a reduced opening to protect the fans from very strong winds, and the fans only produce normal energy. If the winds are very aggressive, the doors can close completely.

If there are also doors at the exit of the fans, the wind speed can be better controlled because there is less wind return under the stage and above the terrace.

The doors are controlled by servo motors.

In the horizontal axis fan, the speed of the wind on the blades cannot be controlled. However, in the distribution of forces fan, the rotation can be controlled by another system, opening and closing an orifice in the blades.

The blades of the distribution of forces fan can have artistic or advertising images around the orifice. In the horizontal axis fan, the images rotate and would be much narrower.

This type of fan of force distribution can be placed in front of ships when the sea is very rough with giant waves that sometimes damage the ships themselves. As this type of force-separating fan could protect the ships, the fans were only placed in front of the ship in case of sea agitation. If the fans are always kept, it makes it difficult to maneuver

ISSN: 2448-0959 https://www.nucleodoconhecimento.com.br

the ship and detracts from the aesthetics of the ship. However, these operations should be investigated.

Studying the use of this type of fan at the front of ports when ships are not allowed to enter due to sea agitation, and the behavior of the sea waves after passing this type of fan is unknown. How do aerodynamic forces deviate in all directions and the effect of quantities of blades?

Does it remove waves from surfers at the site?

When a vehicle coming from space enters the high atmosphere, it heats up in front of the vehicle. If it has a pair of this type of fan with plates on the blades in front, as the blades rotate on their axis, they are either heating up in high pressure or cooling down in low pressure. The plates function as a door movement to touch and move away from the blades, combined with high and low pressure, helping to dissipate heat, but this needs to be carefully analyzed.

This type of fan on a vessel instead of sails transmitting energy to the propeller of the vessel, the pair of fans is more efficient against the wind because it adds the wind speed to the speed of the vessel, just like airplanes take off better against the wind. The vessel with the fans against the wind does not need to divert directions in zigzag as sailing vessels do.

This type of fan could operate in space with mirrored blades like a solar sail. The fans would have to be gigantic, some fans side by side orbiting a planet like Earth. It would be necessary to know if the planet's gravity is sufficient to hold the fan assembly because the solar wind could displace the fans in the direction of the solar wind. The fans on Earth's surface are fixed in space, subject to existing forces. It is necessary to know if some ionic motor or laser beam must be applied to hold the remaining force that would displace the fan assembly. The energy produced by the set of fans would be transported to the earth when that technology is safe or energy for the laser beam to drive vehicles with solar sails in interplanetary travel to be faster and perhaps more economical.

The set of fans in the spacecraft in place of the solar sail to move against the solar wind, thus avoiding the zigzag path like sailing vessels in water.

The spacecraft with the pair of this type of fan and the laser beam hitting the blades, the laser beam must scan the blades of the fans completely for the fans to work correctly. The force applied to the fan blades must be homogeneous like the solar wind.

In space, should fans with fewer blades work better due to the reflection and mirroring of the solar wind?

Should fans in terrestrial space work better at high latitudes of the Earth, near the auroras borealis, where more energy circulates?

According to Kilmister (1974) in his work "The Nature of the Universe," "when the solar wind reaches the high atmosphere layer of the earth near the poles, it generates the aurora borealis."

This knowledge is still very theoretical, and many simulations with software are necessary to choose the best options for each situation.

3. CONCLUSION

This type of fan, which can be large and requires extensive study, could be used in various situations such as industrial and commercial structures, the upper space of large parking lots, building terraces to generate energy on-site, produce green hydrogen, biofuels, fertilizers, the cement industry, among others. It could be used to reverse water flow in dams, capture carbon dioxide, desalinate seawater, and transport water to dry climate areas. The forces of wind and sea are very powerful, so techniques to harness them must be developed, and the theory of force separation could be one of the solutions.

BIBLIOGRAPHIC REFERENCES

CAETANO, Carlos Manuel silva. **teorias inovadoras de produzir energia ecologicamente:** teoria de distribuição de forças e etc**.** SEATTLE: Amazon, 2022.

Disponível em: <https://www.amazon.co.uk/TEORIAS-INOVADORAS-PRODUZIR-ENERGIA-ECOLOGICAMENTE-ebook/dp/B0BK7984SW>. Acesso em: 19 mar. 2024.

KILMISTER, Clive. **A natureza do universo**. LISBOA: Verbo, 1974.

MARCELO, Alonso Edward J. Finn. **Física um curso universitário Volume 1 Mecânica**. SÃO PAULO: Edgard blucher Ltda., 1972.

PEREIRA, Alda Valadares Jorge. **Física Geral, caderno de apoio.** LISBOA: Graforim, universidade aberta, 1996.

Material received: September 12, 2023.

Material peer-reviewed: January 23, 2024.

Edited material approved by authors: March 18, 2024.

[1] High School, Henrique Sommer Secondary School. ORCID: 0009-0001-8286-6224. E-mail: carloscaetanovdf@sapo.pt.