The following prior art documents are acknowledged: DE102010011365, DE202009002054, US2011/0167633, DE10118906 and DE19909698.

However, the use of cranes and rigid suspension structures is inefficient as this heavy machinery cannot be straightforwardly and quickly transported between structures in need of maintenance. The production and use of these machines is costly, and a further disadvantage is their own need for expensive and time consuming repair.

Reliance on pre-existing platforms carries the disadvantage that often these are not adjustable and therefore the work that can be carried out from the platform is limited. They are also costly to produce and therefore an alternative which can be cost effectively and speedily deployed is required.

The amount of maintenance work is also limited where individuals use harnesses to scale these large structures. As well as the obvious safety considerations, it is also an inefficient exercise as it takes engineers a considerable time to move around a structure and often they will not be able to take all the required equipment in a single trip.

A further disadvantage with current apparatus is that poor weather conditions can limit the extent to which work can be carried out on a turbine. Heavy wind, cold temperatures, adverse humidity and/or rain can prevent the deployment of these apparatus as, without adequate protection, the repair equipment and section of the turbine to be maintained could be compromised. Maintenance work of a wind turbine blade is also problematic where the ambient temperature of the blade is too low.

The object of the invention is to therefore alleviate at least these problems.

Summary of the Invention

In a first broad independent aspect, the invention provides a temporary maintenance enclosure for the maintenance of at least part of a turbine blade, said enclosure comprising a number of side walls which substantially surround the circumference of a blade in need of maintenance; and a roof extending from said side walls towards said blade; wherein said

roof comprises an aperture through which said blade is received; and wherein said enclosure comprises a platform which is bounded by each of said side walls, and said platform comprises an aperture through which said blade is received; and wherein said side walls are collapsible; and wherein said enclosure is at least partially inflatable.

This configuration provides the advantage of an enclosure where maintenance of a turbine blade can be carried out in poor weather conditions. This improves the safety of maintenance operations and allows time and cost efficient maintenance of a large number of turbine blades.

This configuration provides the advantage of minimising the size of the enclosure when it is not deployed in order to straightforwardly store and transport the enclosure when not in use.

~~Preferably, said enclosure is at least partially inflatable.~~ This configuration provides the advantage of a maintenance structure, which is quick and straightforward to deploy. This way, maintenance/repair work can be swiftly carried out. This configuration also minimises the weight of the enclosure so that it may be easily transported and so that it may cause minimal strain to the turbine when suspended.

Preferably, said roof is inflatable. This configuration provides the advantage of surrounding the circumference of a blade to be maintained without applying excess force against the blade. It also minimises the weight of the enclosure.

Preferably, said platform is inflatable.

Preferably, said roof incorporates a seal for sealing the enclosure to the blade.

Preferably, the seal is inflatable and is located at the aperture of the roof.

Preferably, said seal incorporates a member defining said aperture. This configuration provides the advantage of effectively sealing to a turbine blade to prevent water entry whilst preventing damaging load from being applied to the blade.

Preferably, said member is inflatable. This configuration is particularly advantageous because the inflatable member reduces the risk of damage to the blade.

Preferably, said enclosure further comprises suspension means for suspending said enclosure in position relative to said blade. This configuration provides the advantage of being able to lift the enclosure to an above ground level position so that maintenance work can be carried out on a turbine blade. This configuration also allows the enclosure to be vertically moveable in order for it to be positioned optimally for maintenance work.

Preferably, said side walls and said roof comprise a plurality of inflatable compartments. This configuration provides the advantage of increasing the strength of the enclosure. It also improves the safety of the enclosure because, if a compartment becomes deflated, the overall integrity of the enclosure is maintained.

Preferably, said inflatable compartments have a tubular configuration. This configuration provides the advantage of further increasing the strength of the enclosure.

Preferably, said platform incorporates a barrier, and said barrier is collapsible. This configuration provides the advantage of minimising the size of the enclosure when not in use. When in use, the barrier reduces the risk of harm to operators as they are kept at a safe distance from the blade and, if present, from an aperture on the platform.

In a second broad independent aspect, the invention provides a method of maintaining a turbine blade, comprising the steps of:

- providing a platform on which maintenance of a turbine blade can occur;
- deploying a temporary maintenance enclosure; said enclosure comprising a number of side walls which substantially surround the circumference of a blade; and a roof extending from said side walls towards said blade; said roof comprising an aperture through which said blade is received; and wherein said platform is bounded by each of said side walls, and said platform comprises an aperture through which said blade is received; and wherein said side walls are collapsible;
- at least partially inflating said enclosure.

This method provides the advantage of carrying out maintenance work on a turbine blade even where there are poor weather conditions. This method improves the safety of maintenance operations and allows time and cost efficient maintenance of a large number of turbine blades.

This step provides the advantage of minimising the weight of the enclosure so that strain on the turbine is minimised whilst the enclosure is suspended. It also minimises the overall size of the enclosure when it is not deployed so that it can be straightforwardly transported and stored.

Preferably, said method comprises the step of inflating an inflatable portion of said roof.

Preferably, said method comprises the step of inflating an inflatable portion of said platform.

Preferably, said method comprises the steps of providing a seal at the roof and sealing said enclosure to said blade.

~~Preferably, said method comprises the step of at least partially inflating said enclosure. This step provides the advantage of minimising the weight of the enclosure so that strain on the turbine is minimised whilst the enclosure is suspended. It also minimises the overall size of the enclosure when it is not deployed so that it can be straightforwardly transported and stored.~~

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Brief Description of the Invention

Figure 1 shows a perspective view of a preferred embodiment of the invention.

Figure 2 shows another perspective view of a preferred embodiment of the invention.

Detailed Description of the Invention

The temporary maintenance enclosure of the current invention is shown in figure 1, referenced generally as 10. Maintenance of the wind turbine 14 includes, but not exclusively: repairing, cleaning, inspecting, installing retrofit parts, painting of the turbine and the replacement of parts.

Claims

1. A temporary maintenance enclosure for the maintenance of at least part of a turbine blade, said enclosure comprising a number of side walls which substantially surround the circumference of a blade in need of maintenance; and a roof extending from said side walls towards said blade; wherein said roof comprises an aperture through which said blade is received; and wherein said enclosure comprises a platform which is bounded by each of said side walls, and said platform comprises an aperture through which said blade is received; and wherein said side walls are collapsible; and wherein said enclosure is at last partially inflatable.

~~2. A temporary maintenance enclosure according to claim 1, wherein said enclosure is at least partially inflatable.~~

2. ~~3.~~ A temporary maintenance enclosure according to ~~either~~ claim 1 ~~or claim 2~~, wherein said roof is inflatable.

3. ~~4.~~ A temporary maintenance enclosure according to ~~either~~ claim 1 ~~or claim 2,~~ wherein said platform is inflatable.

4. ~~5.~~ A temporary maintenance enclosure according to any of the preceding claims, wherein said roof incorporates a seal for sealing the enclosure to the blade.

5. ~~6.~~ A temporary maintenance enclosure according to claim 4 ~~5~~, wherein the seal is inflatable and is located at the aperture of the roof.

6. ~~7.~~ A temporary maintenance enclosure according to claim 4 ~~5~~ or claim 5 ~~6~~, wherein said seal incorporates a member defining said aperture.

7. ~~8.~~ A temporary maintenance enclosure according to claim 6 ~~7~~, wherein said member is inflatable.

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8. ~~9.~~ A temporary maintenance enclosure according to any of the preceding claims, wherein said enclosure further comprises suspension means for suspending said enclosure in position relative to said blade.

9. ~~10.~~ A temporary maintenance enclosure according to any of the preceding claims, wherein said side walls and said roof comprise a plurality of inflatable compartments.

10. ~~11.~~ A temporary maintenance enclosure according to claim 9 ~~10~~, wherein said inflatable compartments have a tubular configuration.

11. ~~12.~~ A temporary maintenance enclosure according to any of the preceding claims, wherein said platform incorporates a barrier, and said barrier is collapsible.

12. ~~13.~~ A method of maintaining a turbine blade, comprising the steps of:

a. providing a platform on which maintenance of a turbine blade can occur;
b. deploying a temporary maintenance enclosure; said enclosure comprising a number of side walls which substantially surround the circumference of a blade; and a roof extending from said side walls towards said blade; said roof comprising an aperture through which said blade is received; and wherein said platform is bounded by each of said side walls, and said platform comprises an aperture through which said blade is received; and wherein said side walls are collapsible;
c. at least partially inflating said enclosure.

13. ~~14.~~ A method according to claim 12 ~~13~~, comprising the step of inflating an inflatable portion of said roof.

14. ~~15.~~ A method according to claim 12 ~~13~~ or claim 13 ~~14~~, comprising the step of inflating an inflatable portion of said platform.

15. ~~16.~~ A method according to any of claims 12 ~~13~~ to 14 ~~15~~, comprising the steps of providing a seal at the roof and sealing said enclosure to said blade.

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~~17. A method according to any of claims 13 to 16, comprising the step of at least partially inflating said enclosure.~~