

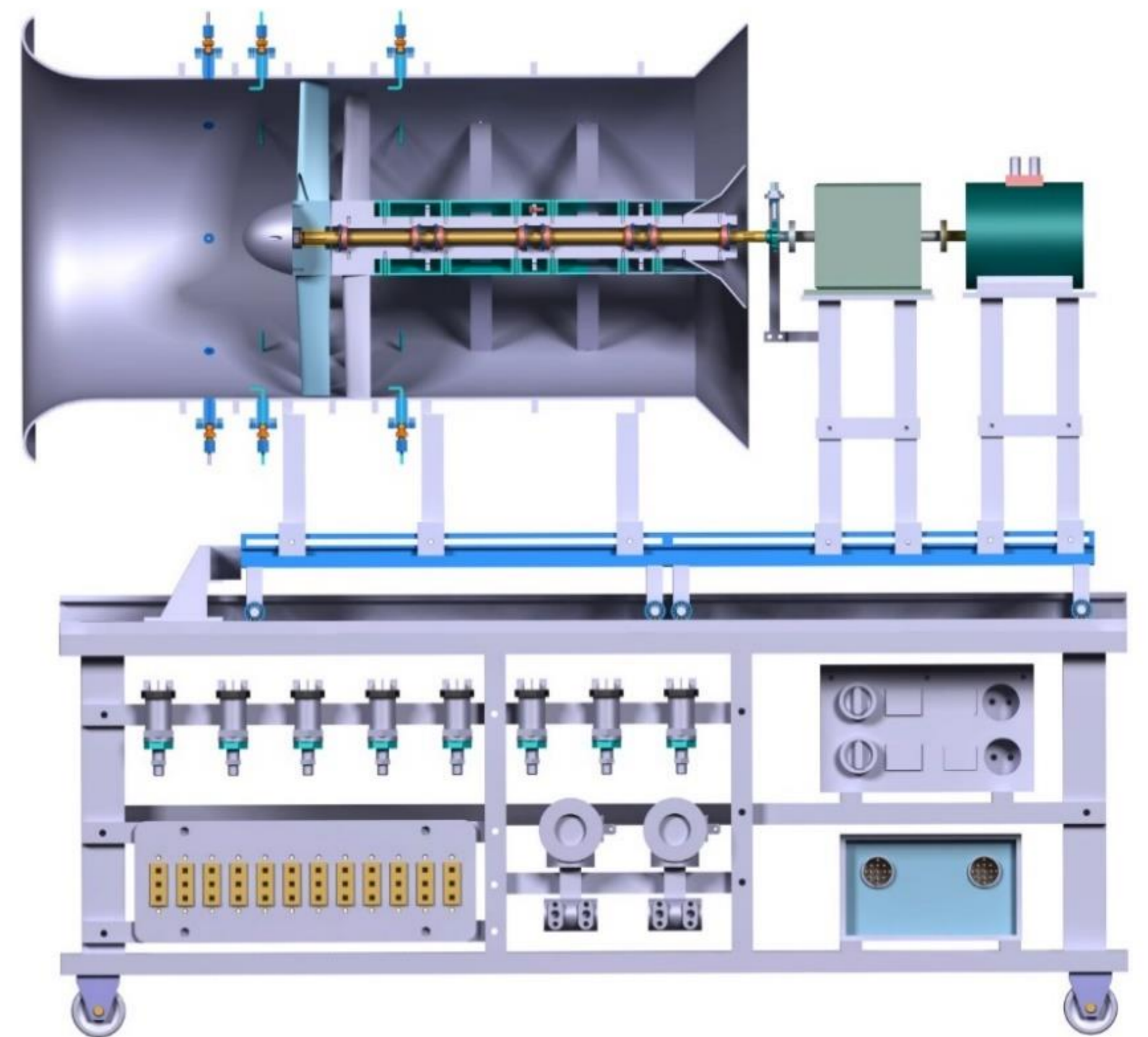
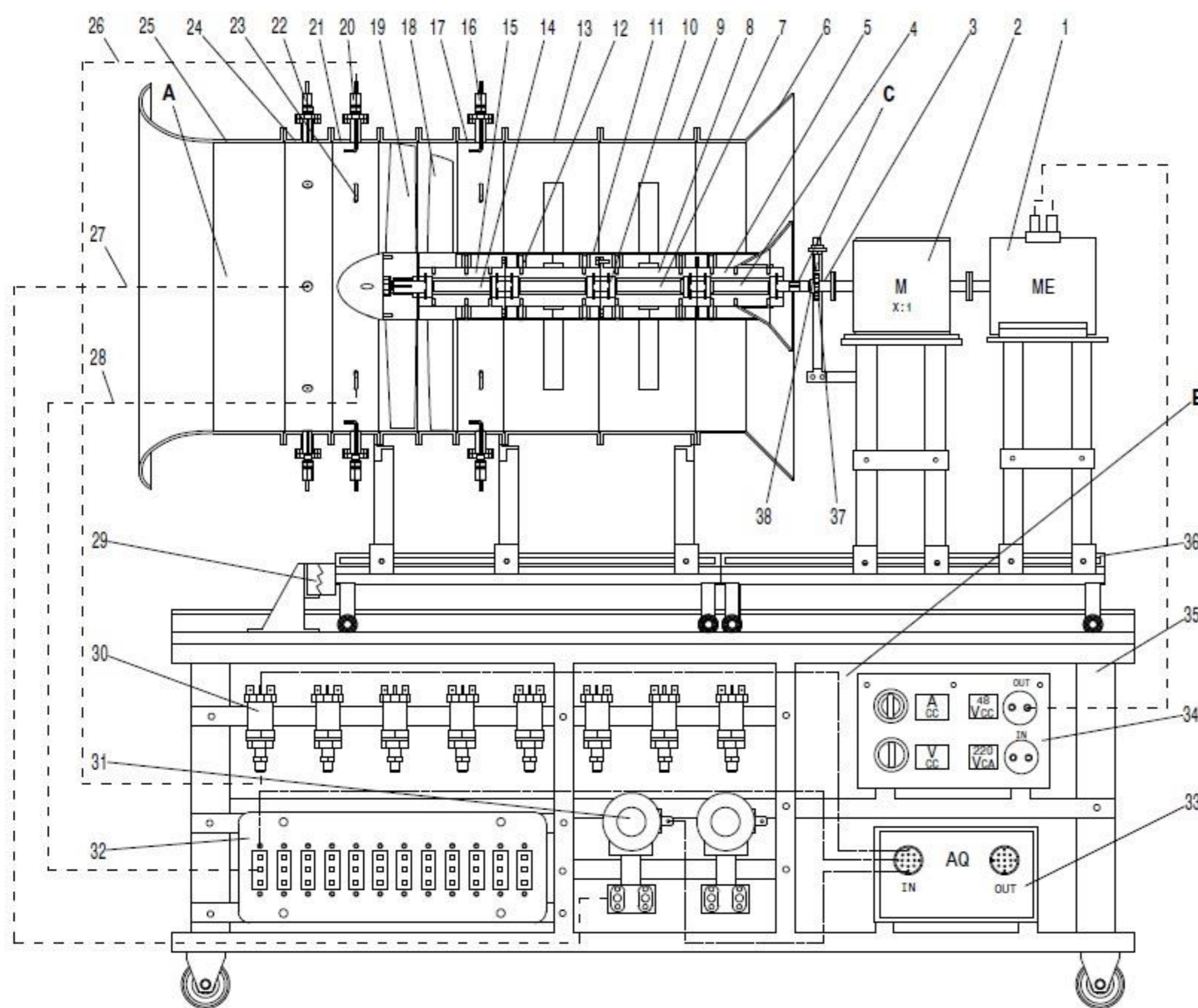
General Description:

The invention is referring to a mobile test bench, designed at a reduced scale, dedicated to experimental research of a fan stage, with fix and variable pitch blades, for turbofan engines, through which the fan stage performances are determined, as air mass flow, overall pressure ratio, actual rotor work, adiabatic efficiency and fan thrust, in order to optimize the fan and to reduce the fuel consumption of turbofan

Technical Description:

The mobile test bench of testing fans for turbofan engines contains a fan assembly **A**, consisting of a fan stage, with rotor **19** and stator **18**, and a series of sectors for strength **13, 9**, for instrumentation **24, 21, 17**, and for fan inlet **25** and fan outlet **6**. The fan rotor **19** is driven by an electric motor **1**, through a speed gear multiplication **2**, part of transmission module **C**, from an adjustable electric power source **34**, and by an instrumentation system **B**, consisting of instrumentation probes, **23, 22, 20, 16**, measuring sensors **30, 31, 32**, and data acquisition module **33**, air pressure and temperature in front and back of the fan stage are measured.

The fan assembly has the ability to adjust the hub fan diameter of the section flow, by mounting some cylindrical parts **11** on interior sectors **5, 15**, of the strength sectors **13, 9**. The experimental data are used in a model calculation to determine the characteristic fan stage performances, to evaluate the fan working regimes.



Particularities:

- 1.The turbofan working regimes analysis is performed by a turbo machinery specific law, named similarity law.
- 2.By similarity low the electric motor parameters, as voltage and current, are converted into turbofan engine main parameters.
- 3.In this case the voltage is similar with the engine shaft speed and the current consumption is similar with the engine fuel consumption.
- 4.The test for variable pitch fan blades is not adjustable in real time (it is performed by installing several identical rotors, but with different stagger angle blades, and a series of tests are executed at the same working regime).

Advantages: This mobile test bench provides significant advantages, without modifying the constructive configuration, as follows:

- 1.Allows to install and to test different geometry of fans, because it has a variable hub diameter of fan flow section.
- 2.Allows to install diverse electric motors and speed gear multiplication, to extend the power and speed working limits.
- 3.The instrumentation probes are interchangeable and have adjustable radial position, that allow to extend measuring data limits.
- 4.Allows a configurable and adaptable instrumentation, depending on experimental application request.
- 5.The mobile test bench is also valid and can be used for compressor stage experimental tests and aerodynamic analysis.