Embodiments~~It is consequently an object~~ of the present invention seek to address one or more of the above mentioned problems.

In accordance with a first aspect of the invention, there is provided a fuel cell assembly mechanism for transferring a flexible sheet material from a first substrate to a second substrate, the mechanism having a head rotatable and translatable relative to the first and second substrates, the head comprising a cylindrical curved portion having an outer face across which are provided openings configured to apply air pressure to sheet material contacting the outer surface such that the head is adapted to transfer the sheet material from the first substrate to the second substrate by a combination of rotation and translation of the head, wherein the cylindrical curved portion of the head is rotatable relative to a central portion of the head, the central portion of the head comprising a first port for applying negative pressure to the openings with the curved portion in a first rotated position relative to the central portion and a second port for applying a positive pressure to the openings with the curved portion in a second rotated position relative to the central portion.

Embodiments of t~~T~~he present invention may solve~~s~~ the problems associated with possible inclusion of air when transferring the sheet material on to the second substrate. This is particularly advantageous when applying the invention to assembly of fuel cells, where the sheet material is an adhesive gasket material. Embodiments of t~~T~~he invention may also allow~~s~~ for the sheet material to be lifted away from the first substrate in a controlled manner, thereby minimising or avoiding distortion.

The mechanism is preferably configured to lift the sheet material from the first substrate by applying a negative air pressure to the openings while rotating the head during translation of the head relative to a surface of the sheet material.

The head may be configured to be rotatable and translatable relative to fixed first and second substrates, although in certain embodiments a portion of the relative translation of the head may be achieved by translation of the first or second substrate.

The mechanism may also be configured to apply the sheet material to the second substrate by combined rotation and translation of the head across a surface of the second substrate.

The mechanism may be configured to apply a positive air pressure to the openings during or after application of the sheet material to the surface of the second substrate.

The mechanism may be configured to apply mechanical pressure to the second substrate across the thickness of the sheet material during application of the sheet material to the surface of the second substrate.

In preferred embodiments, the cylindrical curved portion of the head is rotatable relative to a central portion of the head, the central portion of the head comprising a first port for applying negative pressure to the openings with the curved portion in a first rotated position relative to the central portion and a second port for applying a positive pressure to the openings with the curved portion in a second rotated position relative to the central portion.

The first and second ports and the openings in the curved portion may be configured to sequentially apply air pressure to the openings as the curved portion is rotated relative to the central portion.

The central portion of the head may comprise a first plenum connected to the first port extending circumferentially around a first part of the central portion of the head and a second plenum connected to the second port extending circumferentially around a second part of the central portion of the head. The first and second plenums are thereby configured to apply the positive and negative pressures to selected openings on the curved portion of the head according to the rotational position of the curved portion relative to the central portion.

According to a second aspect of the invention there is provided a fuel cell assembly method for transferring a sheet material from a first substrate to a second substrate using thea ~~pick-and-place~~ mechanism according to the first aspect of the invention, the method comprising the steps of:

positioning the curved portion over the sheet material on the first substrate;

rotating and translating the curved portion across the sheet material while applying a negative air pressure to the openings in the outer face of the curved portion;

translating the sheet material on the head from the first substrate to thea second substrate; and

applying the sheet material to the second substrate by rotating and translating the curved portion across surface of the second substrate.