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Van Kesteren et al.

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(54) **SENSOR FOR DETERMINING CONCENTRATION OF GAS**

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See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,041,932 A * 8/1977 Fostick A61B 5/14552 600/326
4,274,418 A 6/1981 Vesterager
(Continued)

FOREIGN PATENT DOCUMENTS

EP 0008460 A2 3/1980
RU 2336859 C2 10/2008
(Continued)

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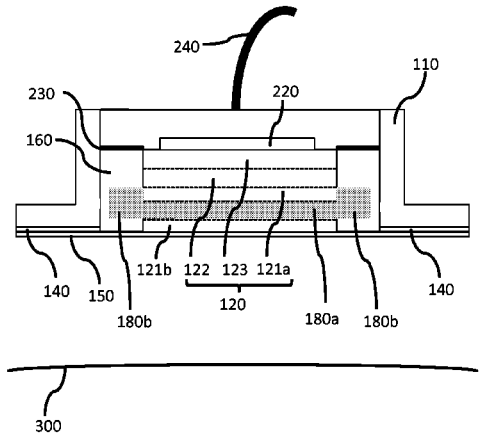
(57) **ABSTRACT**

An optical sensor unit (**10**) for measuring a concentration of a gas is provided, comprising at least one sensing layer (**122**) adapted to be irradiated with a predetermined radiation; at least one gas-permeable layer (**121**) adjacent to one side of the at least one sensing layer (**122**) and adapted to pass gas which concentration is to be measured through the gas-permeable layer (**121**) towards the sensing layer (**122**); a removable protective layer (**150**) covering at least the gas-permeable layer (**121**) and adapted to be removed before use of the optical sensor unit (**10**), wherein the optical sensor unit (**10**) is adapted to measure an optical response of the at least one sensing layer (**122**), which optical response depends on the concentration of the gas.

19 Claims, 7 Drawing Sheets