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**Alexander et al.**

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(54) **METHOD AND APPARATUS FOR TRAVERSING CORNERS OF A FLOORED AREA WITH A ROBOTIC SURFACE TREATMENT APPARATUS**

(58) **Field of Classification Search**  
CPC ..... G01C 21/36; G05B 19/0426; G05B 2219/45083; B25J 9/1666; B25J 9/1664; G06N 3/008; A47L 9/2805; A47L 9/2842; A47L 9/2847; A47L 2201/00; A47L 2201/04  
See application file for complete search history.

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(56) **References Cited**  
U.S. PATENT DOCUMENTS

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4,119,900 A 10/1978 Kremnitz  
6,605,156 B1 8/2003 Clark et al.  
7,441,298 B2 10/2008 Svendsen et al.  
2008/0276407 A1 11/2008 Schnittman et al.  
2010/0037418 A1 2/2010 Hussey et al.  
2011/0202175 A1 8/2011 Romanov et al.

(\* ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

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(57) **ABSTRACT**

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A robotic surface treatment apparatus treats corners of rooms more effectively through intricate guidance of the apparatus through inside and outside corners. In one aspect, contact and/or non-contact sensors provide information to one or more on-board processors on the apparatus to enable selective overriding of obstacle avoidance program code and allow the apparatus to get closer to walls to facilitate treatment. In another aspect, the sensors provide information to the on-board processors to control backup motion of the apparatus to cover previously-missed areas when turning corners. In yet another aspect, the apparatus is shaped to have its treatment mechanism positioned more closely to the front of the apparatus to enable treatment more closely to walls near corners. In one embodiment, the robotic surface treatment apparatus is a robotic vacuum. The vacuum may have its cleaning brush positioned near a flat front portion of the apparatus.

**Related U.S. Application Data**

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(51) **Int. Cl.**  
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CPC ..... **A47L 11/4011** (2013.01); **G05D 1/0219** (2013.01); **G05D 2201/0203** (2013.01); **G05D 2201/0215** (2013.01)

**30 Claims, 7 Drawing Sheets**

