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Giordano

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(54) **METHOD FOR FABRICATING
ENDODONTIC ORTHODONTIC AND
DIRECT RESTORATIONS HAVING INFUSED
CERAMIC NETWORK**

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patent is extended or adjusted under 35
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08/854,805, filed on May 12, 1997, now Pat. No. 5,843,348,
which is a continuation of application No. 08/307,455, filed
on Sep. 19, 1994, now abandoned.

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524/430; 524/442; 524/444; 524/492

(58) **Field of Search** 524/442, 492,
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(56) **References Cited**

U.S. PATENT DOCUMENTS

3,250,833 5/1966 Wagner .
3,423,828 1/1969 Halpern .

3,713,860 1/1973 Auskern .
4,772,436 9/1988 Tyszblat .
4,777,153 10/1988 Sonuparlak et al. .
5,164,233 11/1992 Sonuparlak et al. .
5,221,558 6/1993 Sonuparlak et al. .
5,427,722 6/1995 Fouts et al. .
5,676,745 10/1997 Kelly et al. .

FOREIGN PATENT DOCUMENTS

0241120 10/1987 (EP) .
0241384 10/1987 (EP) .
0393525 10/1990 (EP) .
63-041519 2/1988 (JP) .
63-252981 10/1988 (JP) .

OTHER PUBLICATIONS

S. Sonuparlak, Tailoring the Microstructure of Ceramics and
Ceramic Matrix Composites through Processing 37, Com-
posites Science and Technology, (1990): 299-312.

A. S. Fareer, et al., Mechanical Properties of 2-D Nicalon™
Fiber-Reinforced LANXIDE™ Aluminum Oxide and Alu-
minum Nitride Matrix Composites, "Ceram. Eng. Sci. Pro.",
(1990): 782-794.

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(57) **ABSTRACT**

A direct filling material and method of using the same. A
powdered ceramic is mixed with a saline mixture. A curable
resin is also maid with the powdered ceramic to forma
paste. After the paste has been used to fill a cavity, used in
a preform or the like it is cured in site to form an intercon-
nected ceramic and resin network.

10 Claims, 2 Drawing Sheets