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(54) **VERTICAL PIPE LINING METHOD AND SYSTEM**

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See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,861,634 A 8/1989 Renaud
5,010,440 A * 4/1991 Endo 361/215

5,393,481 A * 2/1995 Wood 264/516
5,439,033 A * 8/1995 Kamiyama et al. 138/98
5,566,719 A * 10/1996 Kamiyama et al. 138/98
5,606,997 A * 3/1997 Blackmore et al. 138/98
5,765,597 A * 6/1998 Kiest, Jr. et al. 138/98
6,152,184 A * 11/2000 Kamiyama et al. 138/98
6,708,728 B2 * 3/2004 Driver et al. 138/98
6,942,426 B1 * 9/2005 Kampbell et al. 405/184.2
6,960,313 B2 * 11/2005 Waring et al. 264/36.17

* cited by examiner

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(57) **ABSTRACT**

The invention discloses a vertical pipe lining method comprising placing a repair material having a first end and a second end into a pipe having a bottom opening and a top opening. The repair material is inflated to press the repair material against the inside wall surface of the pipe; and heated air is conveyed through the inflated repair material from the bottom opening to the top opening to cure or mold a thermal responsive component of the repair material to the pipe. The invention also teaches a repair material for vertically oriented pipes comprising a multi-layered lining comprising a first outer layer and a second inner layer wherein the first outer layer comprises a resin impregnated fiber and the second inner layer is air impermeable. The invention also teaches a system for repairing vertical pipe utilizing a repair material inflation device, an air blower and an air heater.

8 Claims, 13 Drawing Sheets

