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Ross

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[54] **FRAC PACK FLOW SUB**

5,103,902 4/1992 Ross et al. 166/120

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[57] ABSTRACT

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[52] U.S. Cl. **166/51; 166/278**

[58] Field of Search 166/51, 55, 184, 187,
166/278

Gravel slurry is pumped through the longitudinal service bore of a tubular service tool which is extended through a packer mandrel and into the seal bore of a tubular cross-over tool which is disposed in the annulus between the service tool and a well casing. Slurry flow is directed from the service bore through a cross-over flow port of the cross-over tool into the annulus between the cross-over tool and the well casing. The gravel-laden slurry is injected through casing perforations into the surrounding earth formation at a high flow rate. After the fracture operation has been completed, the slurry flow rate is reduced substantially and a gravel pack is accumulated in the annulus between the well screen and the well casing. Slurry liquid is circulated through the well screen into a return flow bore of the service tool. The slurry liquid is then conducted through a longitudinal cross-over flow passage formed through the cross-over tool into a return annulus defined between the service tool and the packer mandrel. The slurry liquid is then conducted through the annulus between the service tool and the well casing to the surface.

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21 Claims, 4 Drawing Sheets

