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Kamath et al.

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(54) **EXTENDED FILE SYSTEM**

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(Under 37 CFR 1.47)

**Related U.S. Application Data**

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(51) **Int. Cl.$^7$** ............................................. **G06F 15/167**
(52) **U.S. Cl.** ........................ **709/213**; 709/218; 709/219; 709/203; 707/3
(58) **Field of Search** ................................ 709/203, 213, 709/218, 219; 707/3

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(57) **ABSTRACT**

A method and system for transparently combining remote and local storage to provide an extended file system such as a virtual local drive for a computer system client/user, e.g., a user of a pocket sized personal computer or a cable set-top box. A client device may load file system object data, storing the directories and files remotely, and retrieving the files only when required. Via its local storage, the extended file system handles unreliable connections and delays. When a connection to an extended file system server is present, the extended file system provides automatic downloading of information that is not locally cached, and automatically uploading of information that has been modified on the client. Extended file system attributes are employed to determine the actual location of file system data, and a lightweight protocol is defined to download or upload remote data by low-level components that make the remote source transparent from the perspective of the application. The system scales to large networks as it employs the lightweight protocol and establishes a connection only to retrieve and submit data.

**11 Claims, 12 Drawing Sheets**
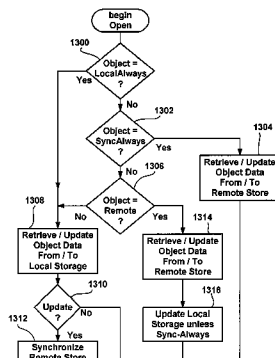
*FIG. 1*

*FIG. 2*

## FIG. 3

*FIG. 4*

**Client**   80

76

**Server**

Application

APIs

OS Kernel

File System Manager   32

XFS-CLIENT   33

XFSDISK   34

XFSFSD   96

XFSCLNT   94

Winsock over TCP/IP

XFS-SERVER

92

102   NAME SERVICES

100   PERMISSIONS MANAGER

98   ACCESS CONTROLLER

74

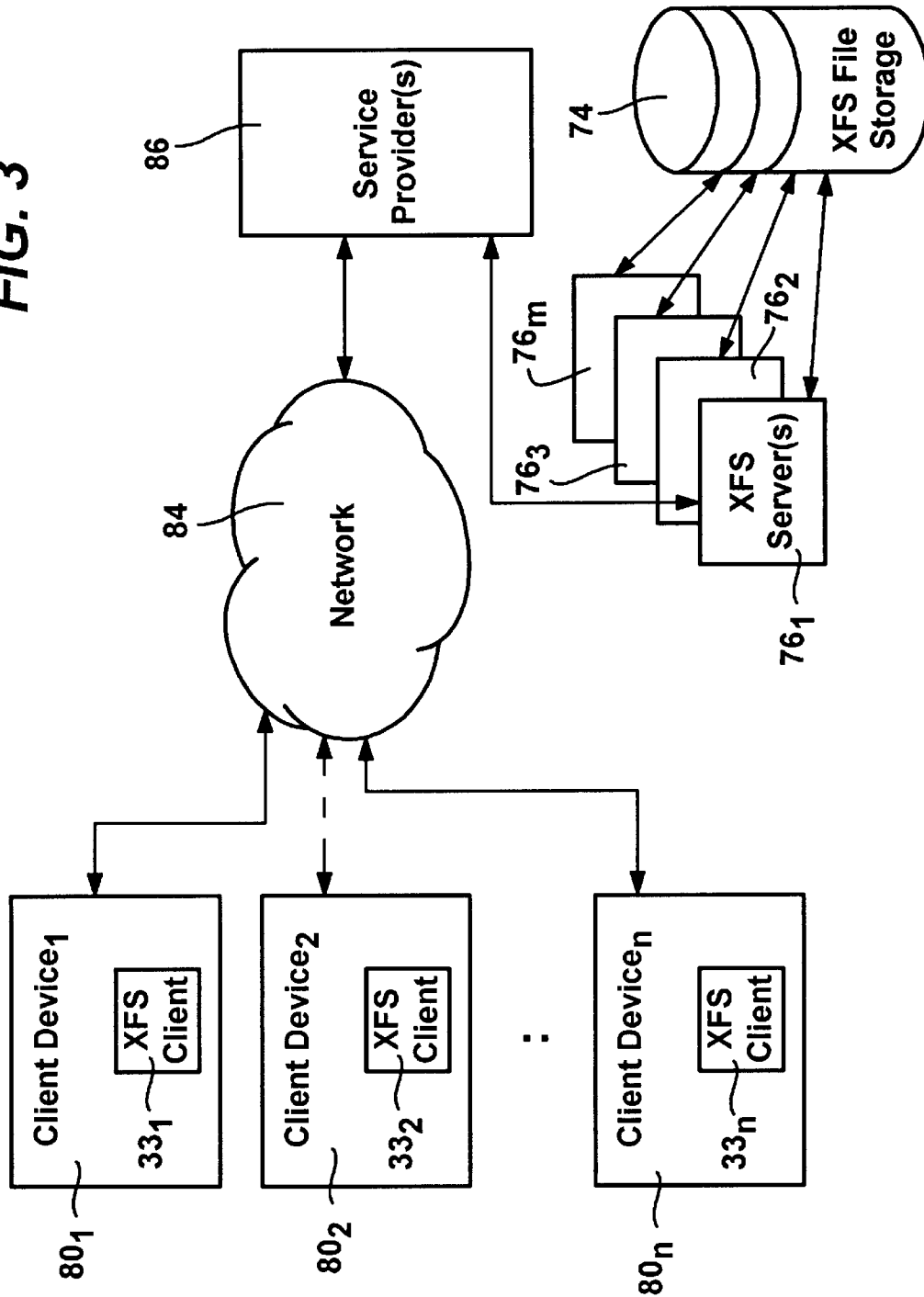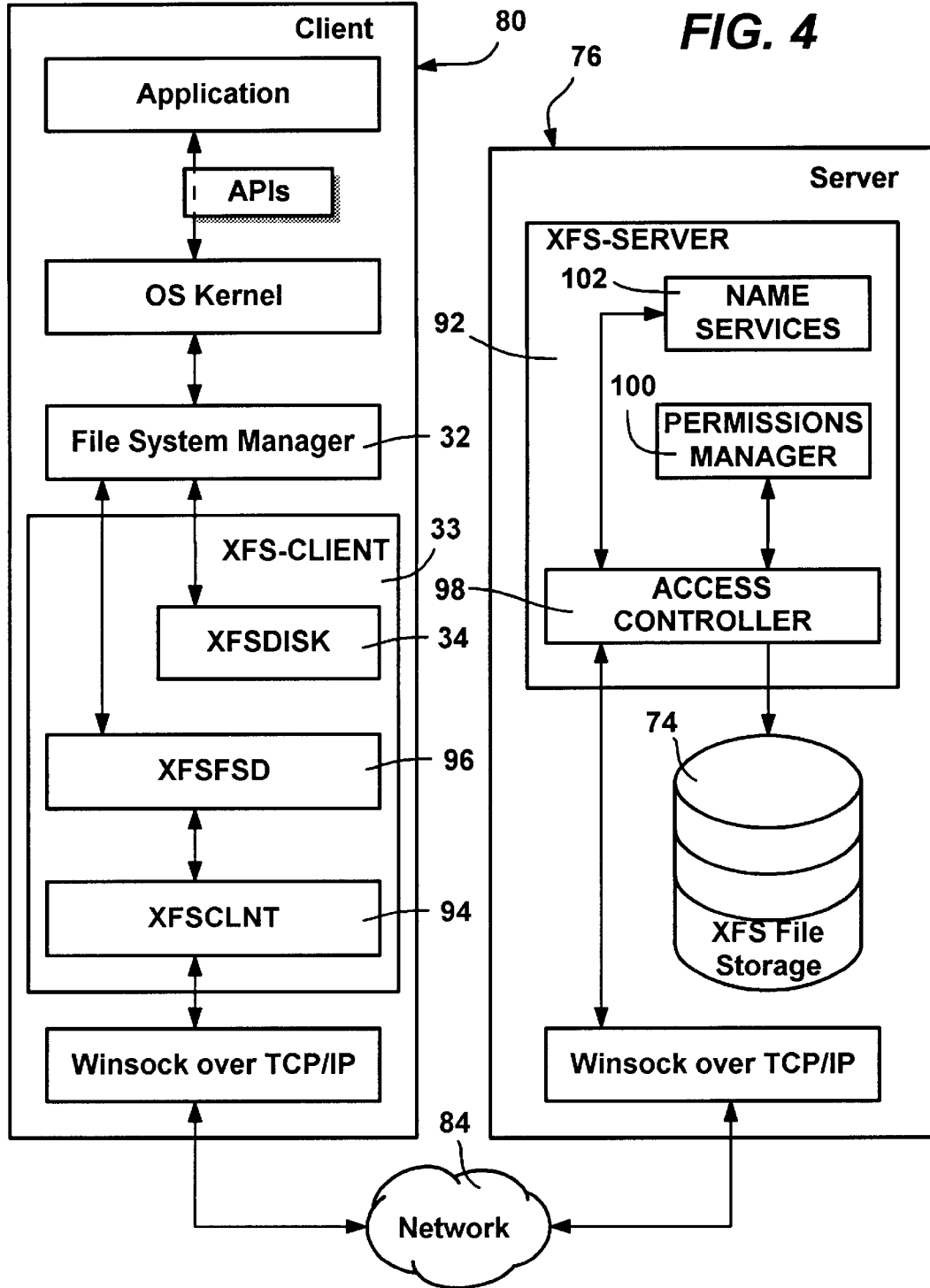XFS File Storage

Winsock over TCP/IP

84

Network
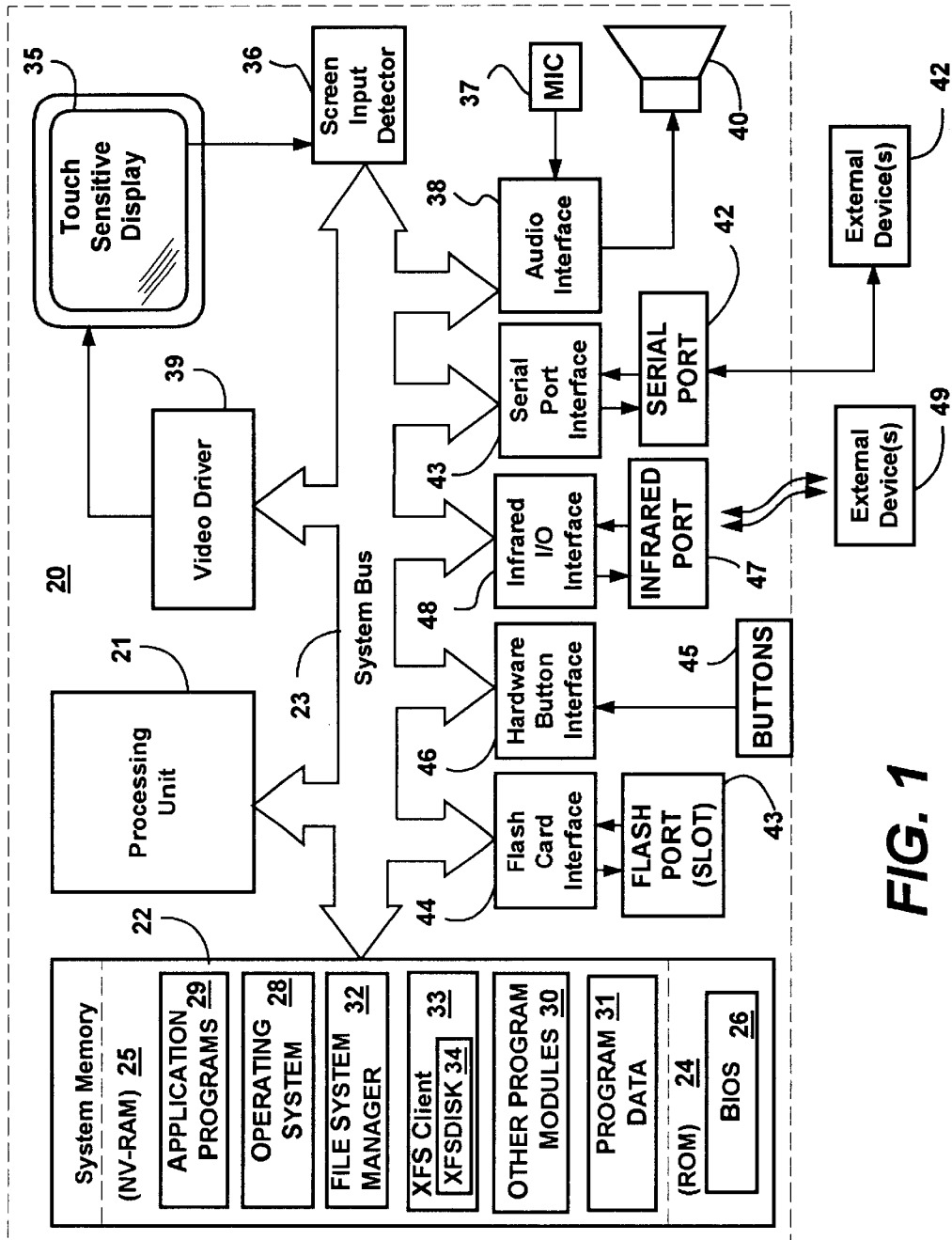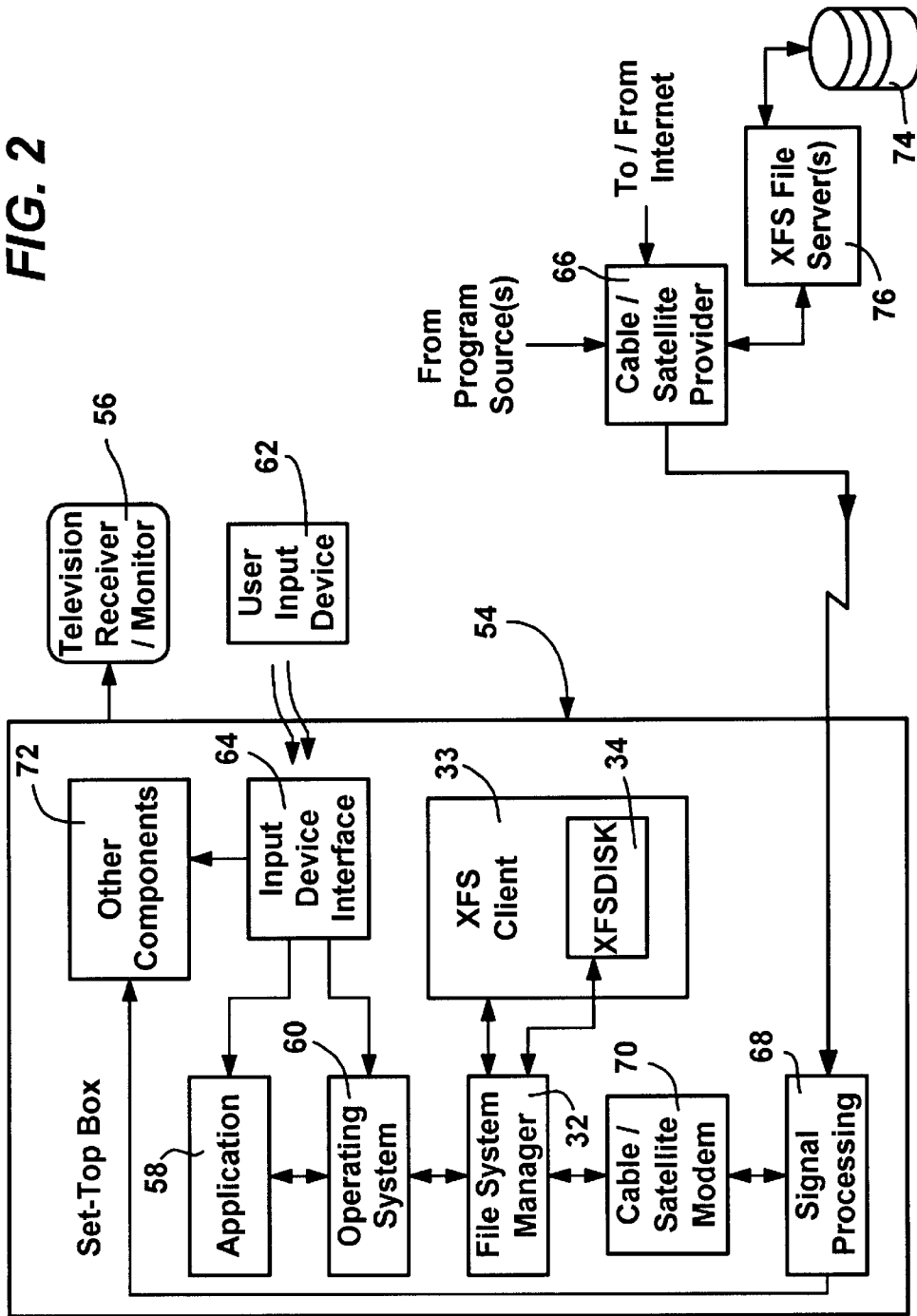
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