IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In the *Inter Partes* Review of U.S. Patent No. 8,326,218

Trial No.:	Not Yet Assigned
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Filed:	November 12, 2009
Inventors:	Philip M. Wala
Assignee:	COMMSCOPE TECHNOLOGIES LLC
Title:	POINT-TO-MULTIPOINT DIGITAL RADIO FREQUENCY TRANSPORT

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PETITION FOR *INTER PARTES* REVIEW UNDER 37 C.F.R. § 42.100

On behalf of SOLiD, Inc. ("SOLiD" or "Petitioner") and in accordance with 35 U.S.C. § 311 and 37 C.F.R. § 42.100, *inter partes* review ("IPR") is respectfully requested for claims 1-28 of U.S. Patent No. 8,326,218 ("the '218 patent") (Ex. 1002).

The undersigned representative of Petitioner authorizes the Office to charge the Petition and Post-Institution Fees, and any additional fees, to Deposit Account 503013, ref: 428880-605001.

TABLE OF CONTENTS

Page

TABLE OF CONTENTS
(continued)

Page

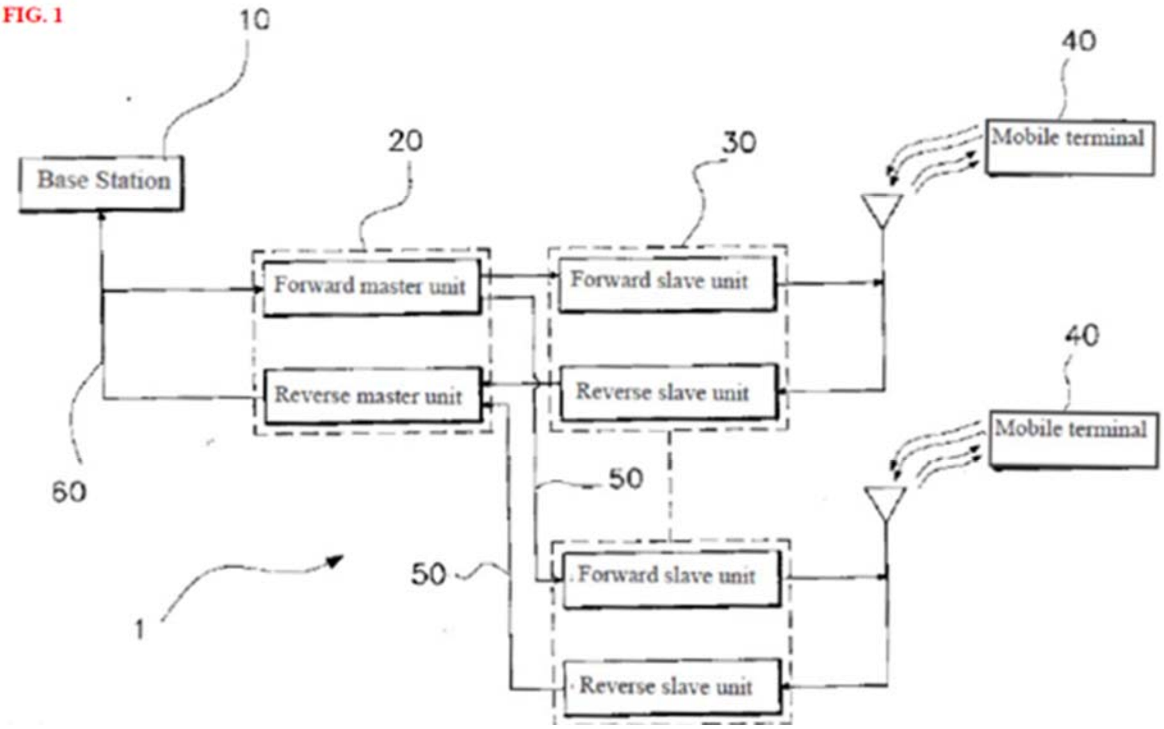
I. Introduction

U.S. Patent No. 8,326,218 (the ’218 patent) describes a digital antenna system that enables extension of radio frequency (RF) analog signals from base stations to areas (*e.g.*, inside of buildings) where access to such signals is inhibited. The ’218 patent systems include a digital host unit that communicates with a base station, and a plurality of remote units distributed within the hard to reach area. On the downstream path, the ’218 patent digitizes analog signals received from the base station and transmits those digital signals to the remote units. The remote units then convert the digital signals back to analog and forward them to nearby wireless devices via their antennas. On the upstream path, the remote units sample and digitize analog RF signals received at the antennas and forward the digital data to the host unit. The host unit sums digital sample data received from multiple remote units and uses the summed data values to generate analog signals that are forwarded to the base station.

The ’218 patent was allowed in part based on claim features describing the digital host unit performing the digital summing operation on digitized radio frequency signals received at the host unit. *See*, Ex. 1002, claim 1. While the Examiner found the claims of the ’218 patent to be patentable, the Examiner did not have the benefit of the Oh reference (Ex. 1007) cited herein. The Examiner’s failure to find the Oh reference is understandable because Oh is a publication of a Korean patent application filed in April 1999 that was published in Korean in August 1999.

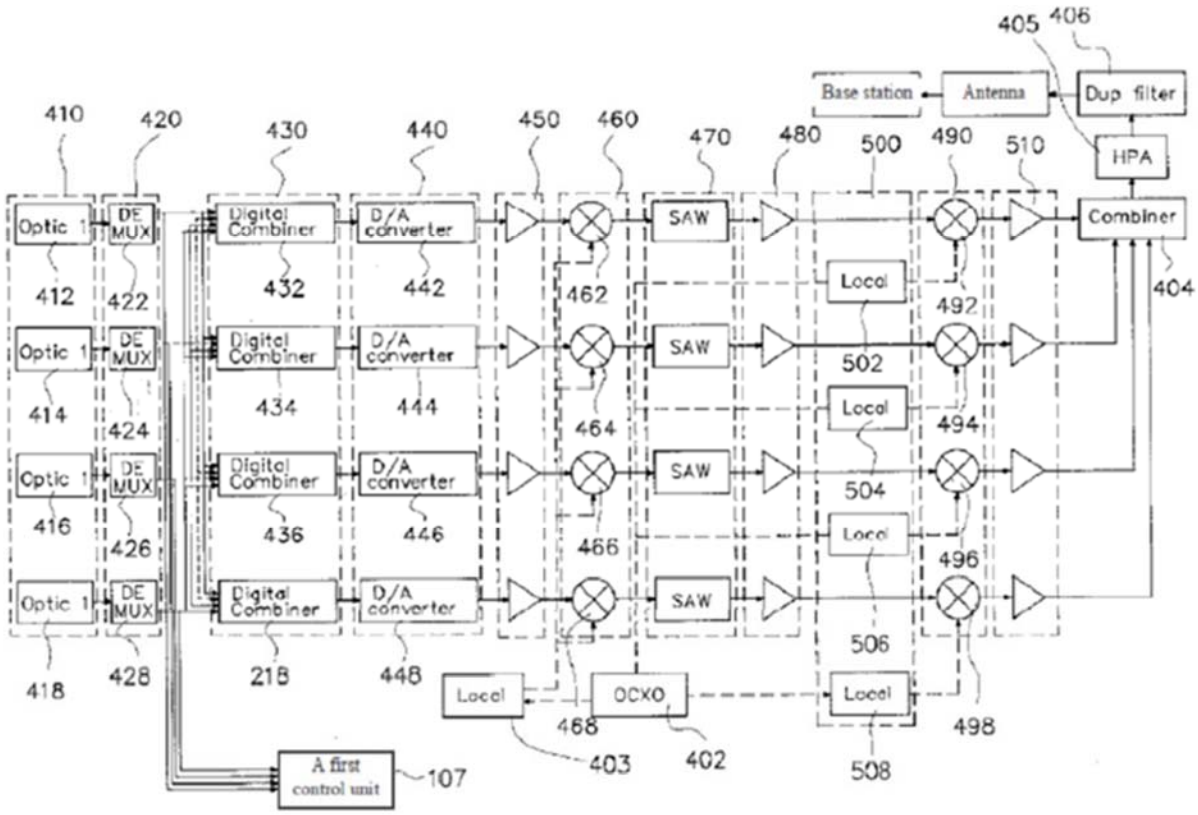
Oh clearly discloses the '218 patent's claimed systems and methods. Oh discloses a Digital Optic Repeater illustrated in Fig. 1 that helps extend RF signals to what it calls hard to reach "radio wave shadow areas." Ex. 1007, Abstract.

FIG. 1



And Oh discloses the host-based digital summing operation, where digital data is received at master unit 20 at 412, 414, 416, and 418 from multiple remote slave units 30 and is routed to digital combiners 432, 434, 436, 438 on which an analog RF signal is created for transmission to the base station. *See*, Ex. 1007, 5:14-17 ("Four intermediate frequency signals in the same frequency band outputted from each demultiplexer are transmitted to one digital combiner. After creating 14-bit intermediate frequency signals by <u>combining four 12-bit intermediate frequency signals</u> in the same band,…")

FIG. 5



Had the Examiner had access to the Oh reference during prosecution, the '218 patent would not have issued. Because claims 1-28 are unpatentable as described herein, institution of trial for *Inter Partes* Review is requested to consider cancellation of the challenged claims. Ex. 1005, ¶¶31-58, 70-75.

II. Grounds For Standing Pursuant To 37 C.F.R. § 42.104(a)

Petitioner certifies the '218 patent is available for IPR and Petitioner is not barred or estopped from requesting IPR challenging the patent claims on the grounds identified herein.

III. Background Information For The ’218 Patent

A. Overview Of The ’218 Patent

The ’218 patent is directed to a digital distributed antenna system illustrated in Fig. 1 having a host unit and multiple distributed remote antenna units.

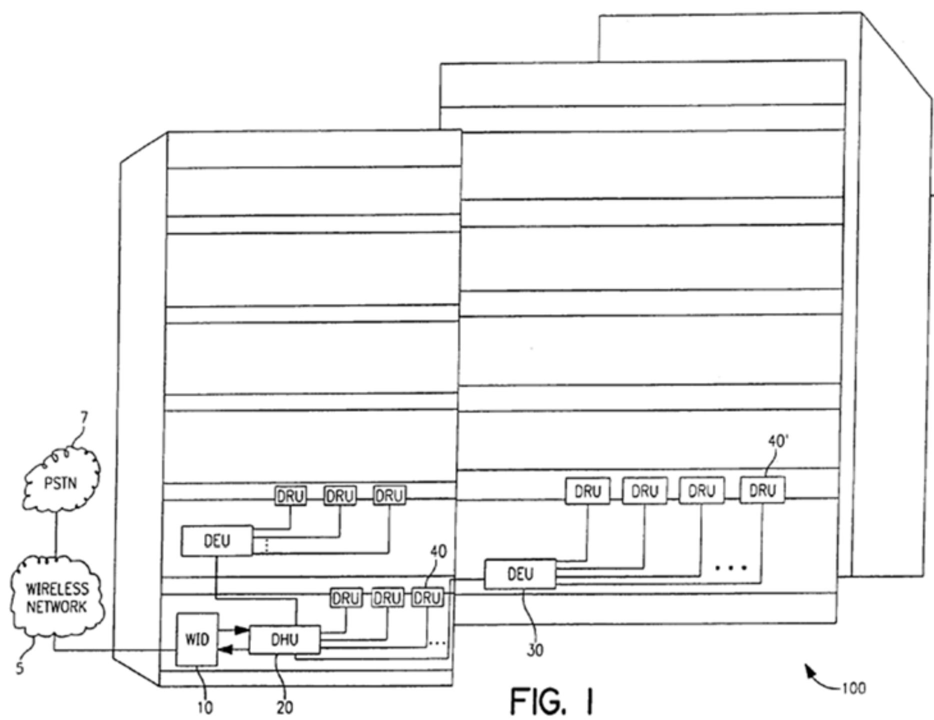
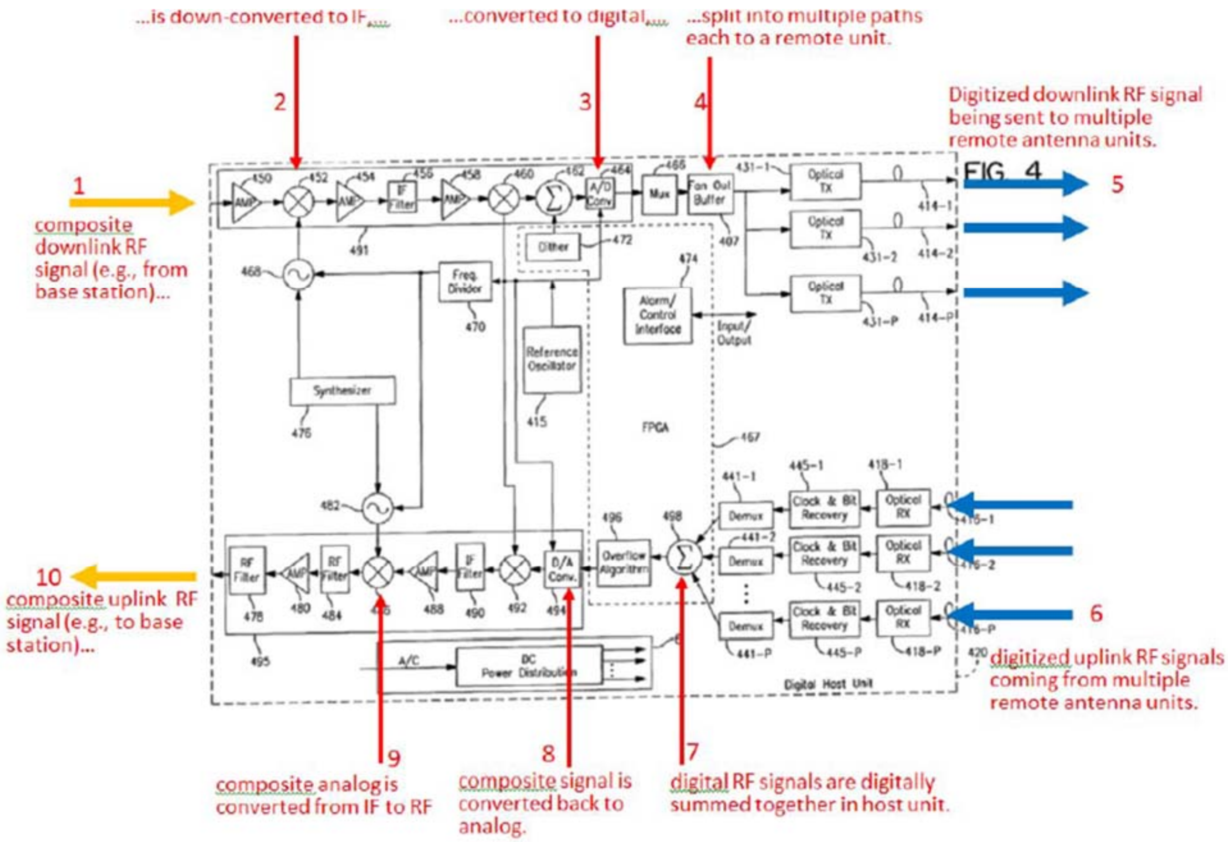


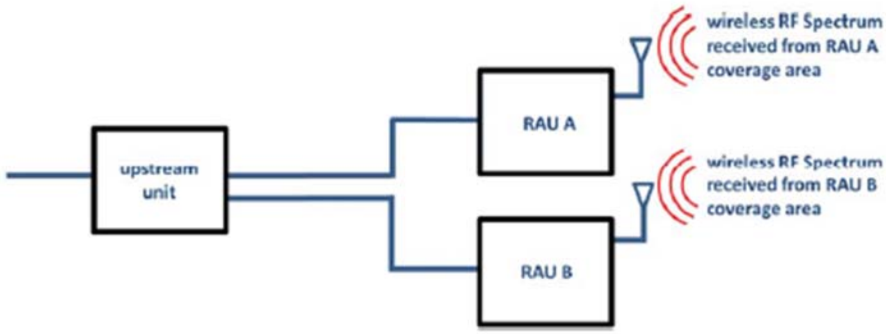
FIG. 1

Annotated Fig. 4 of the ’218 patent below illustrates a host unit that provides digitization of an RF signal received from a base station (top left) for distribution to multiple digital remote units (top right). Annotated Fig. 4 further illustrates creation of an uplink RF signal for transmission to the base station (bottom left) based on digital samples received from multiple digital remote units (bottom right).

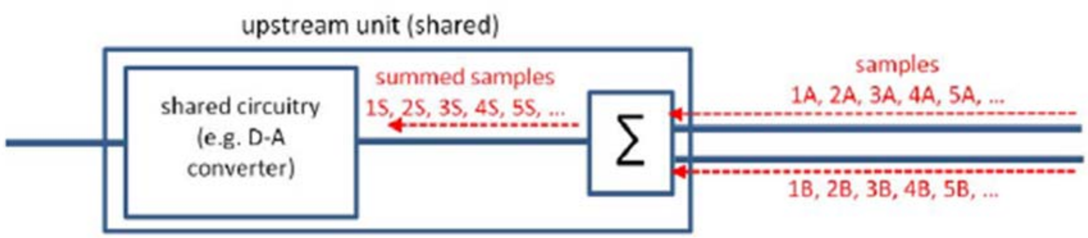


In the downlink direction, the host unit down-converts a composite downlink RF signal, takes a sequence of digitized samples, and delivers a sequence of digitized samples over a fiber optic cable to each of several remote units. Ex. 1002, 7:7-21. At each digital remote unit, the arriving stream of digital samples are converted back into the analog signal from which they are derived and then delivered to an antenna for transmission. *Id*., 9:9-24.

In the uplink direction, each digital remote unit receives the wireless RF spectrum from its coverage area and converts this to a sequence of digital samples that are sent over a fiber optic cable to the host unit.



Ex. 1002, 9:38-42 (drawing from Ex. 1008 ¶173, Patent Owner's background description of this patent family showing remote antenna units (RAU) relaying signals from wireless devices to an upstream unit, *e.g.,* a host unit). The upstream unit receives the sequence of samples from the respective remote units and digitally sums the corresponding digital samples from the respective remote units by summing corresponding digital values of the recorded samples.



Ex. 1002, 7:57-8:11; Ex. 1008, ¶177. The summed digital samples are then converted into an analog signal and converted to an RF signal for delivery to the base station. *Id.*; Ex. 1005, ¶¶59-63.

B. Overview Of The Prosecution History

The '218 patent issued after a single Office Action having only a nonstatutory double patenting rejection against U.S. Patents 6,704,545 and 7,639,982. *See*, Ex.

1016, 26-62. The '218 patent was allowed after a terminal disclaimer was filed. *Id.*, 39-40. Oh was not considered by the Examiner during prosecution of the '218 patent.

C. Level Of Skill In The Art

A person of ordinary skill in the art ("POSITA") as of July 2000 (the earliest patent filing date to which the '218 patent could claim priority) would have possessed at least a bachelor's degree in electrical engineering with at least two years of industry experience with data communications system (or equivalent degree or experience). Ex. 1005, ¶¶3-19, 28-30. A person could also have qualified as a POSITA with some combination of (1) more formal education (such as a master's of science degree) and less technical experience, or (2) less formal education and more technical or professional experience. *Id.*

IV. Identification Of Challenge Pursuant To 37 C.F.R. § 42.104(b)

A. 37 C.F.R. § 42.104(b)(1): Claims For Which IPR Is Requested

IPR is requested for claims 1-28 of the '218 patent.

B. 37 C.F.R. § 42.104(b)(2): The Prior Art And Specific Grounds On Which The Challenge To The Claims Is Based

IPR is requested in view of the following references:

- Korean Laid-Open Disclosure No. KR1999-0064537 to Yong Hoon Oh ("Oh") (Ex. 1007). Oh is prior art to the '218 patent at least under 35 U.S.C. § 102(a).
- U.S. Patent No. 5,883,882 to Adam Schwartz ("Schwartz"). Schwartz is prior art to the '218 patent under at least 35 U.S.C. §§ 102(a), (b), and (e).

- U.S. Patent No. 5,969,837 to Allan Farber ("Farber"). Farber is prior art to the '286 patent under at least §§ 102(a), (b), and (e).

The specific statutory grounds on which the challenge to the claims is based and prior art relied upon for each ground are as follows:

Ground 1a: Claims 1-10, 12-14, 16-20, 23-25, and 27-28 are unpatentable under 35 U.S.C. § 103 over Oh;

Ground 1b: Claims 11, 15, 21-22, and 26 are unpatentable under 35 U.S.C. § 103 over Oh in view Schwartz.

C. 37 C.F.R. § 42.104(b)(3): Claim Construction

The Board gives claims their ordinary and customary meaning, or "the meaning that the term would have to a [POSITA] at the time of the invention." *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312-13 (Fed. Cir. 2005) (en banc). Petitioner does not propose any claims for construction beyond the *Phillips* construction.

D. 37 C.F.R. § 42.104(b)(4): How The Construed Claims Are Unpatentable

An explanation of how claims 1-28 are unpatentable, including where each claim feature is found in the prior art and the motivation to combine the prior art, is set forth below in Section V.

E. 37 C.F.R. § 42.104(b)(5): Supporting Evidence

An Appendix of Exhibits supporting this petition is attached. Exhibit 1005 is a supporting Declaration of Dr. R. Jacob Baker.

V. There Is A Reasonable Likelihood Claims 1-28 Of The '218 Patent Are Unpatentable

A. Brief Overview Of The Prior Art

1. Overview Of Oh

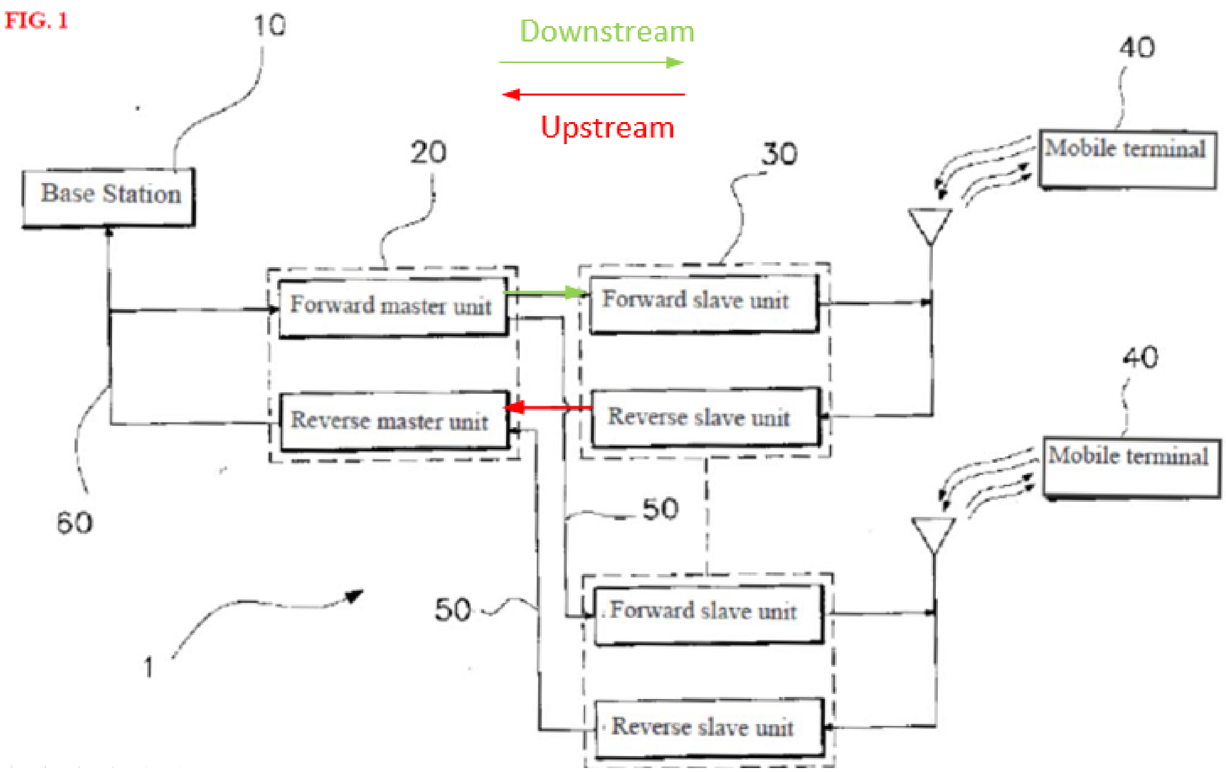
Oh is a publication of a Korean patent application filed by Yong Hoon Oh on April 3, 1999. Oh was published on August 5, 1999.

Oh discloses an optic repeater system that is installed to facilitate communications to and from "radio wave shadow area" where base station signals are unable to reach. Ex. 1007, 2:4-7. When a "base station is far away" or when the mobile terminal is "in the radio wave shadow area, the base station cannot perform streamlined transmission/reception to/from the mobile terminals." *Id.*, 2:11-13.

Optic repeater systems were used prior to Oh in an attempt to provide wireless access to mobile terminals in the radio wave shadow area. *Id.*, 2:16-19. In those historic systems, transmissions between the primary unit and the remote units across an optic line were analog. *Id.*, 2:20-22. But because "the RF signals transmitted/received to/from said first optic repeater and a second optic repeater [were] analog signals, the strength of the signals is greatly decreased during transmission through the optical line." *Id.*, 28-30. This analog signal attenuation required implementation of signal amplifiers in prior systems, which exacerbated signal-to-noise ratio issues. *Id.*, 2:30-33.

To address the analog signal attenuation issue, Oh "provide[s] a digital optical repeater that can maximize the efficiency of signal transmission in a way such that the optic repeater converts the intermediate frequency signals, analog signals, to the digital signals and transmits/receives them through the optical line." *Id.*, 2:36-39. An Oh optic repeater system includes a first optic repeater (master unit 20) that is in communication with the base station 10 and second optic repeater (slave units 30) that are distributed within the radio wave shadow area. *Id.*, Abstract, 2:19-20.

FIG. 1



On the downstream path (left-to-right in Fig. 1), RF signals are received by the forward portion of master unit 20 from the base station 10 and are processed by the forward master unit 100. *Id.*, 2:72-73. The forward master unit 100 "converts RF signals, analog signals, transmitted from the base station 10 to the intermediate frequency signals; converts them to digital signals; and transmits them to the slave unit 30 through the optic line 50." *Id.*, 3:5-6. The forward portion of the slave units 30 (*e.g.*, forward slave unit 200) "converts digital signals to the intermediate frequency signals, analog signals; converts the intermediate frequency signals to RF signals; and transmits them to the mobile terminals 40. *Id.*, 3:1-4.

On the upstream path (right-to-left in Fig. 1), the reverse portion of slave unit 30 (*e.g.*, reverse slave unit 300) converts analog RF signals received from the mobile terminals 40 to digital signals and transmits them to master unit 20 through the optic line 50. *Id.*, 4:23-25. The reverse portion of master unit 20 (*e.g.*, reverse master unit 400) "converts the digital signals transmitted from the slave unit 30 through the optic line 50 to the intermediate frequency signals, analog signals, converts them to the RF signals, and transmits them to the base station 10." *Id.*, 4:62-64.

FIG. 2

Labels for 182, 184, 186, 188 fixed here. See Oh, 3:40 ("four A/D converters 182, 184, 186, and 188")

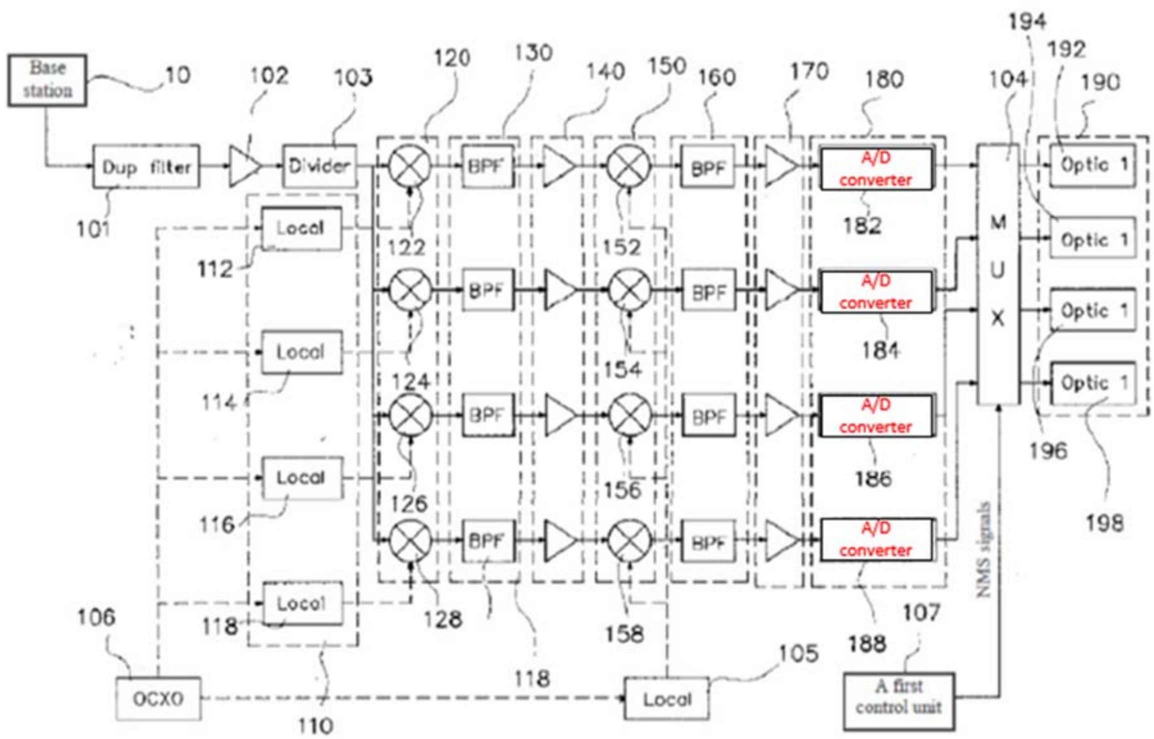


Fig. 2 provides example detail of the forward portion of Oh's master unit 20. The forward master unit receives RF signals from the base station 10 through a bi-directional filter 101. A divider 103 divides the RF signals into its component frequency bands (*i.e.*, the component frequency bands that make up the RF signal received from the base station 10), where each of those component band signals is processed in parallel through first mixer unit 120, band pass filter (BPF) 130, amplifier 140, second mixer unit 150, second BPF 160, and second amplifier 170 collectively to transition the signals from their band frequencies to baseband frequency close to DC. *Id.*, 3:6-14. Analog to Digital (A/D) converters 182, 184, 186, 188 sample the baseband signals to convert them to digital representations of the analog component frequency band signals. *Id.*, 3:14-16. Multiplexer 104 multiplexes the four 12-bit digital sample values with 4-bit network management system (NMS) control data from control unit 107 and applies that 52-bit (*i.e.*, the 4-12-bit words plus the 4-bit NMS control information) serial data stream to each of a plurality of optic converters 192, 194, 196, 198 for transmission across optic lines 50 to destination slave units. *Id.*, 3:38-44.

FIG. 3

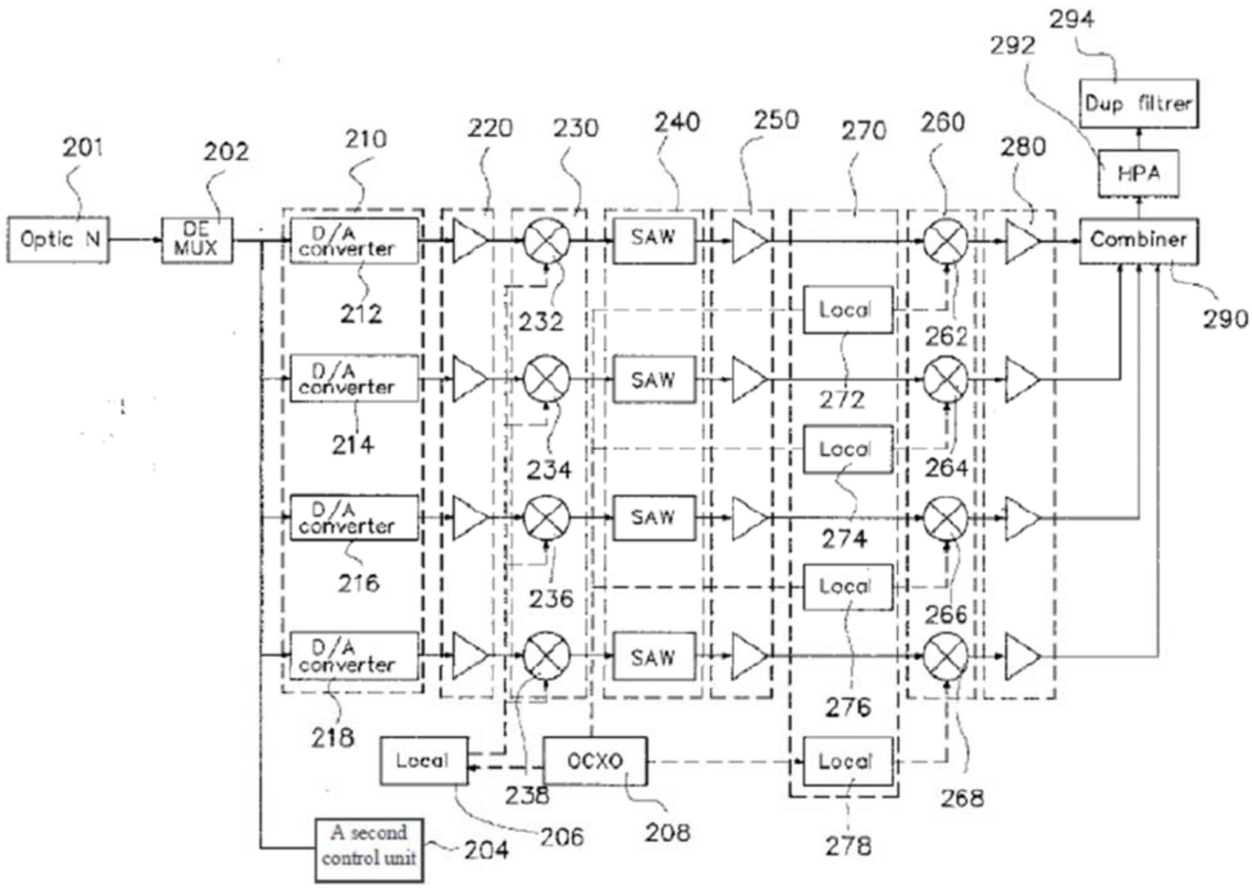


Fig. 3 provides example detail of the forward portion of one of Oh's slave units 30. The 52-bit digital signal transmitted on one of the optic lines 50 is received at a second optic converter unit 201. The 4 bits of control data are provided to control unit 204. Each of the 12-bit sample signals is routed to a respective digital to analog (D/A) converter 212, 214, 216, 218 at the start of respective paths for recreating the RF signal received from the base station *Id.*, 3:62-67. Each D/A converter converts its 12-bit digital signals to intermediate frequency signals, which are amplified at 220, mixed with a step up frequency at 230, amplified again at 250, mixed with a respective frequency at 260 to recreate the analog band frequency signals, and amplified again at 280. *Id.*, 3:50-59. "[C]ombiner 290 [] combines the RF signals of four different frequency bands [*i.e.*, analog combining (Ex. 1005, ¶58)]… and transmits them to the mobile terminals 40 through a second power amplifier 292 and a second bi-directional filter 294." Ex. 1007, 3:59-61.

FIG. 4

Labels for 382, 384, 386, 388 fixed here. See Oh, 4:53-54 ("four A/D converters 382, 384, 386, 388")

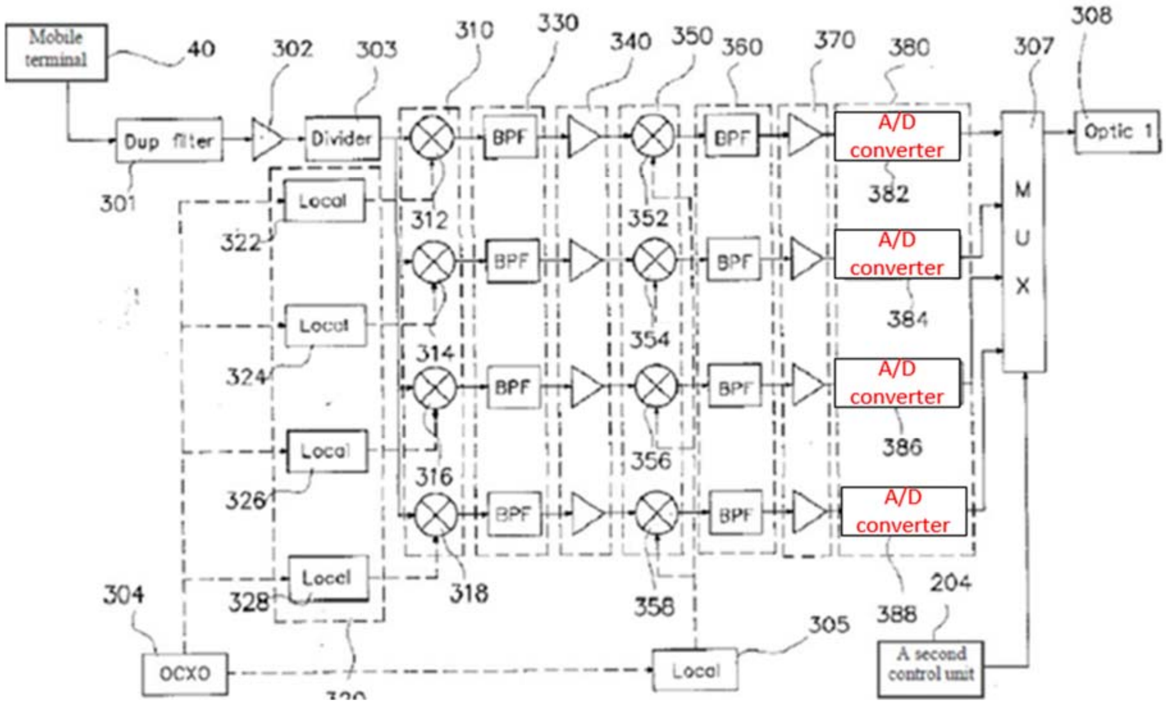


Fig. 4 illustrates example details of the upstream path at a slave unit 30 (*e.g.*, reverse slave unit 300). "RF signals transmitted from the mobile terminals 40 to the reverse slave unit 300 of the slave unit 30 through the antenna are converted to the intermediate frequency signals close to DC…, mixed with the NMS signals transmitted from a second control unit 204, and transmitted to the reverse master unit 400 through the optic line." *Id.*, 4:16-18. RF signals from the mobile terminals 40 are directed through a bi-directional filter 301 to a divider 303. Similar to the master unit divider of Fig. 2, the divider 303 divides the RF signal from the mobile terminals 40 into component frequency bands, where each of those component band signals is processed in parallel through mixer unit 310, BPF 330, amplifier 340, mixer unit 350, BPF 360, and amplifier 370 collectively to transition the signals from their band frequencies to baseband frequency close to DC. *Id.*, 4:26-34. A/D converters 382, 384, 386, 388 sample the baseband signals to convert them to digital representations of the analog component frequency band signals. *Id.*, 3:14-16. Multiplexer 307 multiplexes the four 12-bit digital sample values with 4-bit network management system (NMS) control data from control unit 204 and applies that 52-bit serial data stream to optic converter 308 for transmission across optic line 50 to master unit 20. *Id.*, 3:56-61.

FIG. 5

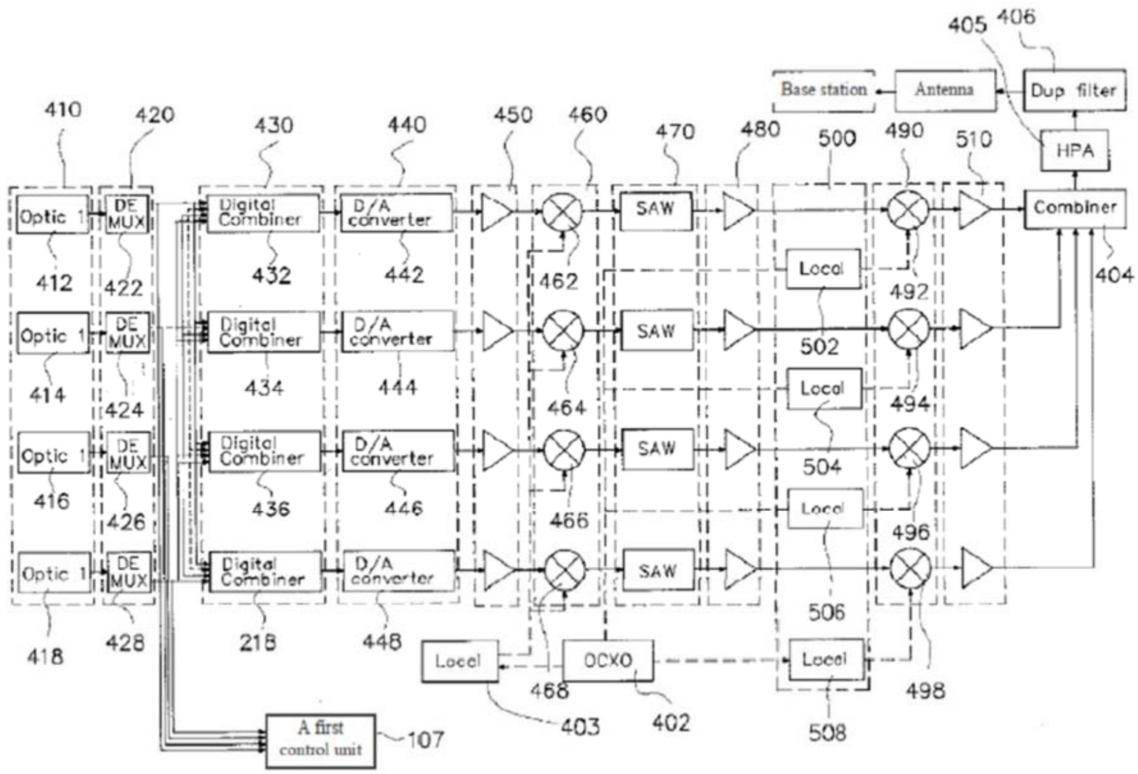


Fig. 5 illustrates example detail of the upstream path at the master unit 20 (*e.g.*, reverse master unit 400), which receives four streams of digital data from four slave units over optic lines (*i.e.*, digital data from a first slave unit at 412, a second slave unit at 414, a third at 416, and a fourth at 418). Each demultiplexer 422-428 is associated with a respective one of the remote slave units to route digital sample data to its respective frequency band path in the reverse unit. Each demultiplexer 422-428 receives digital sample data and control data from one slave unit 30 and separates that digital sample data according to frequency band. *Id.*, 5:4-10. In the example where the reverse master unit of Fig. 5 is connected to four slave units 30, the 52-bit data from the slave unit is demultiplexed at a first demultiplexer, with one 12-bit data sample being sent to each of four digital combiners and 4-bit control data to control unit 107. *Id.*, 5:11-12. Thus, demultiplexer 422 sends a 12-bit sample associated with a first frequency band to first digital combiner 432, a 12-bit sample for second band to combiner 434, a 12-bit sample for third band to combiner 436, and a 12-bit sample for fourth band to combiner 438. Demultiplexers 424, 426, 428 similarly send 12-bit samples to each of the digital combiners 432, 434, 436, 438. *Id.*, 5:11-15.

Each digital combiner 432, 434, 436, 438 receives four digital samples associated with its band and "aggregates the same digital signals transmitted from each demultiplexer." Specifically, each digital combiner performs digital combining "by combining four 12-bit intermediate frequency signals in the same frequency band" to "creat[e] 14-bit intermediate frequency signals." *Id.*, 4:69; 5:16-17; Ex. 1005, ¶58. Those 14-bit digital signals are then applied to respective D/A converters 442, 444, 446, 448 to provide intermediate frequency signals. *Id.*, 5:18. The intermediate frequency signals are shifted to their respective band frequencies by being amplified at 450, mixed with a step up frequency at 460, filtered at 470, amplified again at 480, mixed with a respective frequency at 490 to recreate the radio frequency signals, and amplified again at 510. *Id.*, 4:73-5:2. "[C]ombiner 404 aggregates the RF signals in different frequency bands [*i.e.*, performs analog combining (Ex. 1005, ¶58)]… amplifies the strengths and level in a first power amplification unit 405, and transmits them to the base station 10 through a fourth bi-directional filter 406" such as via an antenna as depicted in Fig. 5

or an RF cable. Ex. 1007, 5:27-29.

Oh shows multiple, different example ways of communicating with a base station. For example, a wired connection (*e.g.*, RF cable 60) is illustrated in FIG. 1 between the base station 10 and master unit 20. Oh also illustrates a wireless connection (*e.g.*, antenna in Fig. 5) between the first bi-directional filter 406 of the master unit 20 and the base station 10. A POSITA would understand that the most straightforward, inexpensive system would perform downstream and upstream communications with the base station using the same medium type (*e.g.*, RF cable or wireless). Oh's explicit disclosure of wired and wireless base station communication options evidences the obviousness of implementing upstream and downstream communications with the base station in a wired implementation or a wireless implementation.

The similarities between Oh's implementation and the specification examples of the '218 patent are striking. The only differences of arguable import are the lack of explicit disclosure of expansion units in Oh (addressed by the Schwartz obviousness combination detailed in the companion IPR petition addressing '218 patent claims), and the fact that Oh divides and then digitizes and reconstructs its analog signals on a per frequency band basis (notice four rows of processing in each of Oh's Figs. 2-5), while the '218 patent performs a single digitization of its entire received analog signals.

This difference is a matter of design choice and is of little technical import, and more importantly is irrelevant to the claims. Whether one samples an entirety of a received analog signal for optical transmission and subsequent analog recreation at once, or one divides the received analog signal into its component bands before sampling, transporting, recreating those bands and combining them (*e.g.*, at combiner 404), the resulting analog signal at the destination carries the same information. And most importantly, when the claims discuss digitizing an analog signal, there are no recited requirements about how that analog signal is represented by the digital data (*i.e.*, there are no requirements regarding whether the digital data represents only a single analog wave form, rather than representing its (4) component bands that when combined form the analog waveform). Thus Oh's difference in implementation choice is irrelevant to the unpatentability analysis for this matter.[1]

Oh is analogous art to the '218 patent because it is in the same field of endeavor (RF data communications) and it is associated with the common problem of extending RF data communications into hard to reach areas. Ex. 1005, ¶¶70-85; Ex. 1007, 2:4-13.

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[1] Further, the number of bands that Oh processes is configurable (*see*, 3:9 ("*e.g.*, 4 ea."). In the nominal case where Oh operates on only a single frequency band channel, Oh's operation (*i.e.*, a single sampling/reconstruction path representing the entire received analog signal) is almost identical to that of the '218 patent.

2. Overview Of Schwartz

Like the ’218 patent and Oh, Schwartz addresses expansion of RF signal coverage into hard to reach areas “especially within structures or around other obstacles, man-made or natural, which otherwise tend to block or disrupt radio waves.” Ex. 1010, 1:26-30. Schwartz proposes a radio frequency transport system similar to the ’218 patent and Oh, differing in that Schwartz propagates signals from its host unit (central station 20) to its remote units (remote stations 22) using analog signals. Oh recognized such analog RF distribution systems as state of the art prior to its invention of its digital relays. *See*, Ex. 1007, 2:28-30 (Conventional Technology – “Since the RF signals transmitted/received to/from said first optic repeater and a second optic repeater are analog signals, the strength of the signals is greatly decreased during transmission through the optical line.”)

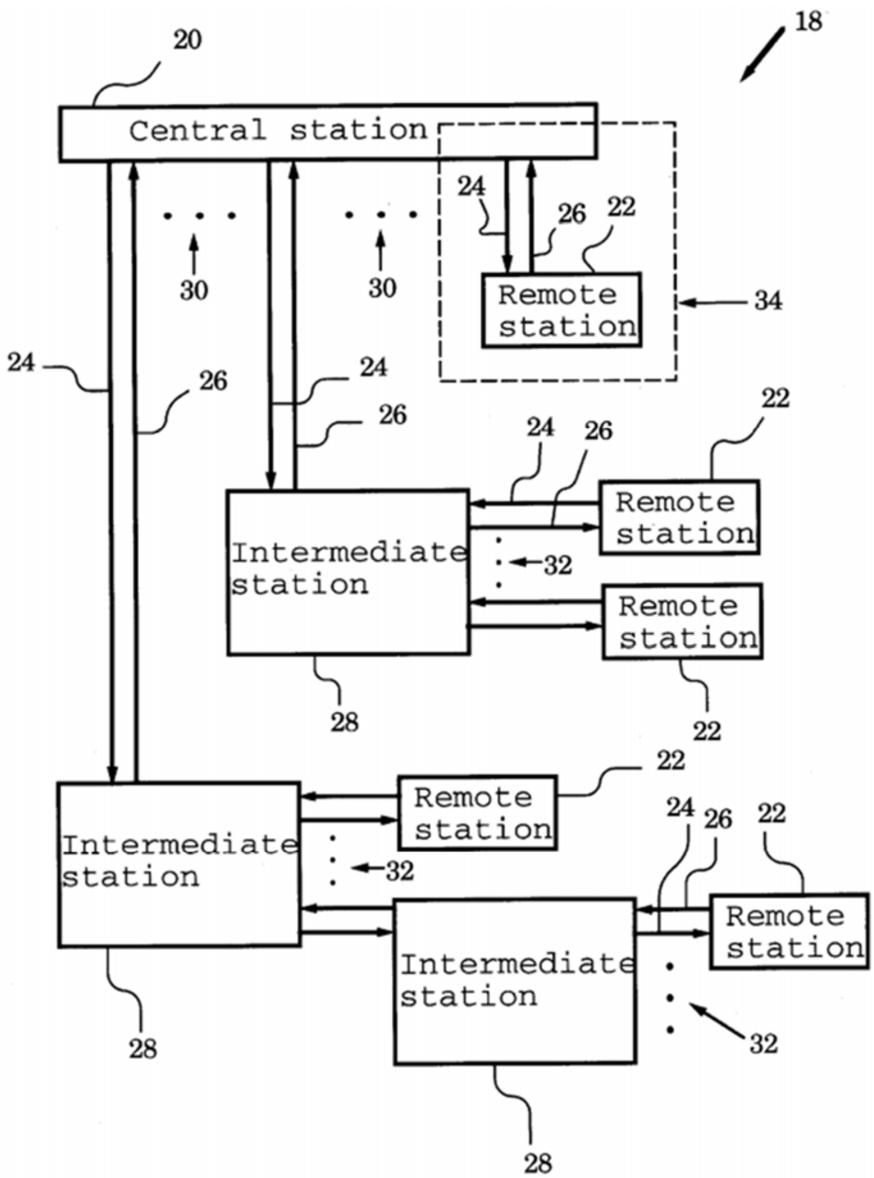


FIG. 1

While Schwartz discloses an analog RF signal distribution platform, the likes of which Oh improved upon via its relay digitization, Schwartz evidences that it was well known to implement RF signal distribution systems using topologies beyond the host↔remote unit arrangement of Oh. Schwartz, like Oh discloses implementations where some branches may contain remote units directly connected to the host unit, as illustrated at 34. Ex. 1010, 42-44.

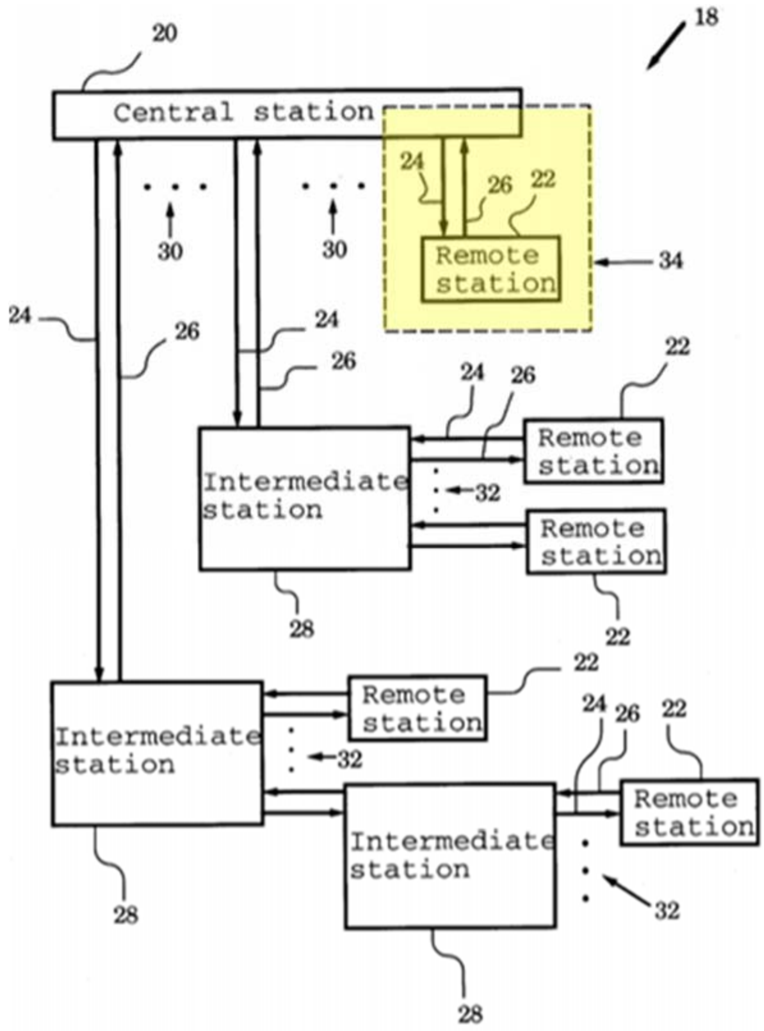


FIG. 1

Schwartz also discloses additional branches whereby intermediate stations 28 may be connected to the host central station 20, and even to other intermediate stations 28, so as to expand the number of remote stations 22 to which the central station is ultimately responsive.

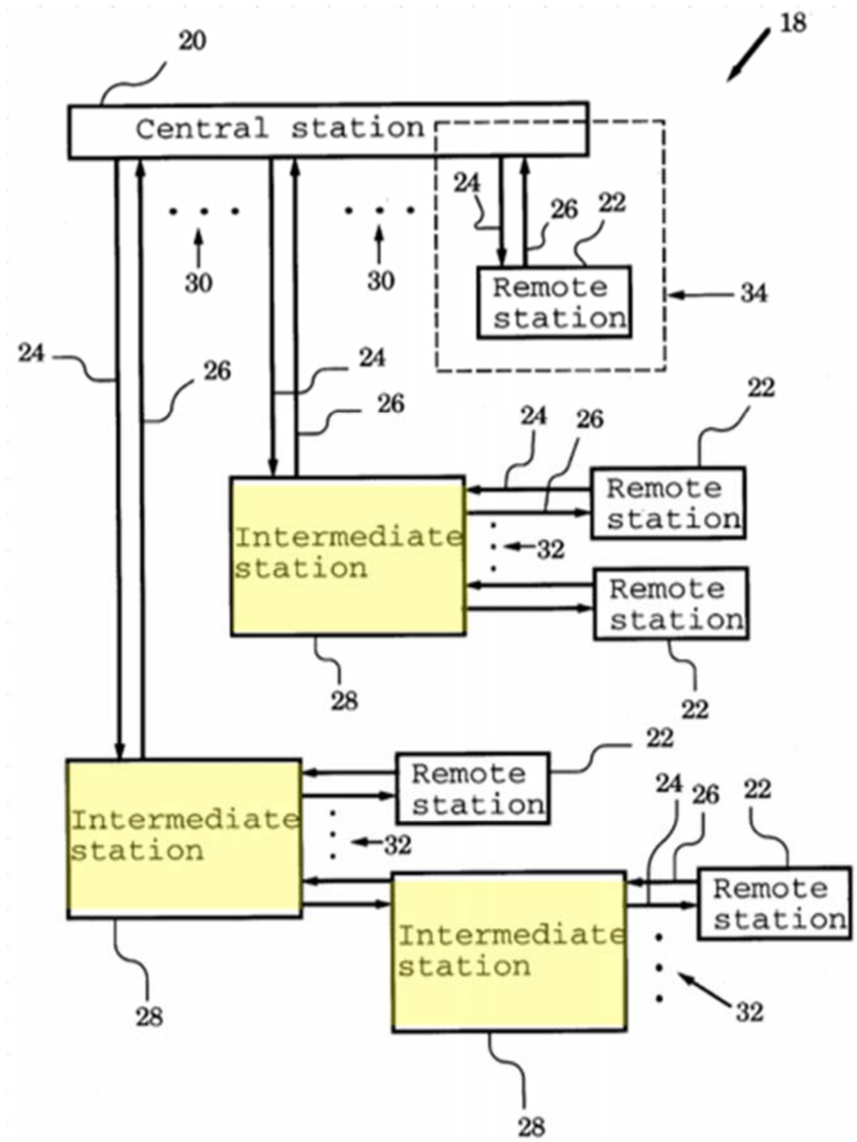


FIG. 1

Ex. 1010, 4:38-42 ("Intermediate stations 28, preferably are repeaters and likewise have pairs of downlink cable 24 and uplink cable 26 which in turn connect to any number of other intermediate stations 28 and/or remote stations 22.")

Schwartz's intermediate stations 28 "preferably are repeaters" (4:38-39), where example intermediate station 28 implementation details are shown in Fig. 7a. Ex. 1010, 10:13-15.

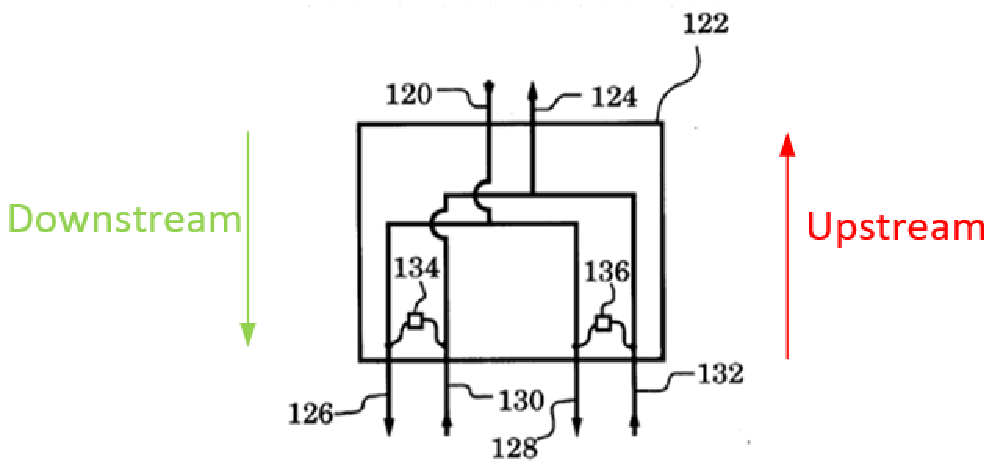


FIG. 7a

In the downstream direction (top to bottom in the figure), "downlink connection 120 splits into two secondary downlink connections 126 and 128 before exiting station 122." Ex. 1010, 10:15-18. In the upstream direction, "uplink connection 124 is fed by two secondary uplink connections 130 and 132." *Id.*, 10:19-20. In that uplink operation, signals from downstream units (*e.g.*, remote units) are received at 130, 132 and applied to a common uplink connection line 124, aggregating the analog signals received on those lines. Ex. 1005, ¶91.

Schwartz's RF signal distribution topology that supports intermediate expansion units enables a network where host central station 20 is connected to "any number of intermediate stations 28 and/or remote stations 22," providing an RF signal distribution platform that is customizable to the difficult RF environment into which the platform is installed. Ex. 1010, 4:34-38; 1:24-30 ("[I]ntermediate stations provide bi-directional branching points within the network. Such a system is highly advantageous for providing wireless two-way communication service especially within structures or around other obstacles, man-made or natural, which otherwise tend to block or disrupt radio waves.”). Ex. 1005, ¶¶89-92.

3. Overview of Farber

Farber is a U.S. Patent filed in July 1997 entitled “Communications System,” that describes a wireless communications station employing optical fibers. Ex. 1022, 1:4-6. Farber discloses the use of fiber in an antenna system for reaching difficult coverage areas such as buildings, as illustrated in Fig. 1, and other shadowed areas that is very similar to the digital system of Oh. *Id*., 4:30-33. Farber states that the optical fibers “may be single or multi mode.” *Id*., 2:59-60. With reference to Fig. 2, Farber describes that “[p]referably the fiberoptic transmitter employs a vertical cavity surface emitting laser or an edge emitting laser coupled to a single or multi-mode fiber.” *Id*. 2:51-53; Ex. 1005, ¶88.

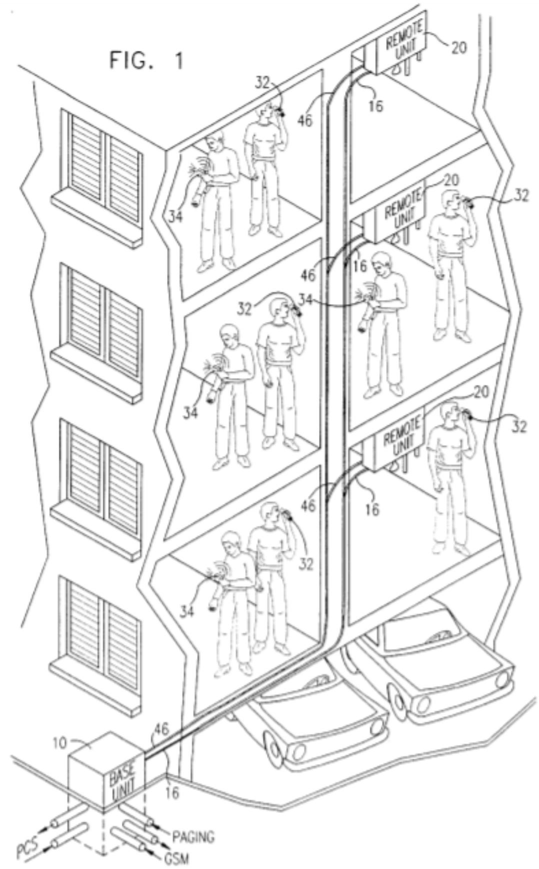


FIG. 1
REMOTE UNIT
20
32
46
16
34
BASE UNIT
10
PCS
PAGING
GSM

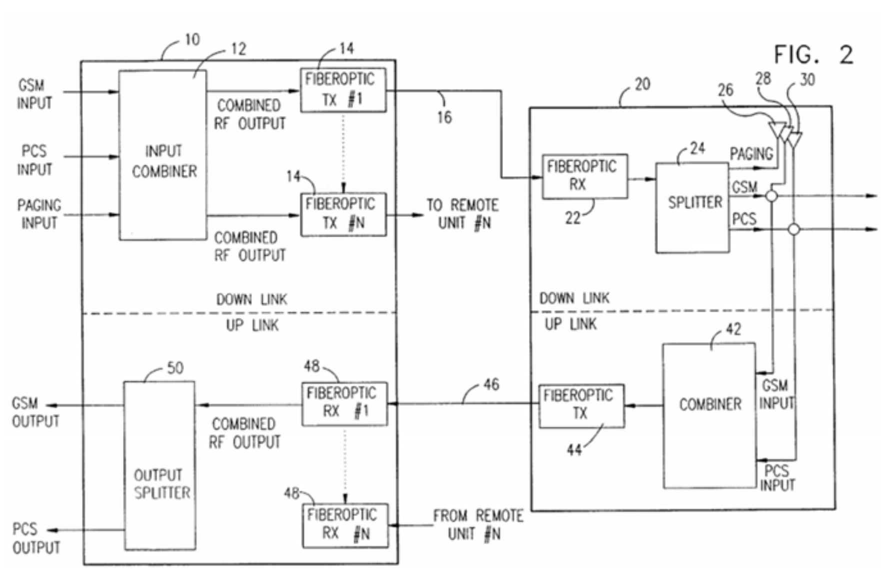


FIG. 2
GSM INPUT
PCS INPUT
PAGING INPUT
INPUT COMBINER
COMBINED RF OUTPUT
FIBEROPTIC TX #1
FIBEROPTIC TX #N
TO REMOTE UNIT #N
DOWN LINK
UP LINK
GSM OUTPUT
PCS OUTPUT
OUTPUT SPLITTER
FIBEROPTIC RX #1
FIBEROPTIC RX #N
FROM REMOTE UNIT #N
FIBEROPTIC RX
SPLITTER
PAGING
GSM
PCS
FIBEROPTIC TX
COMBINER
GSM INPUT
PCS INPUT

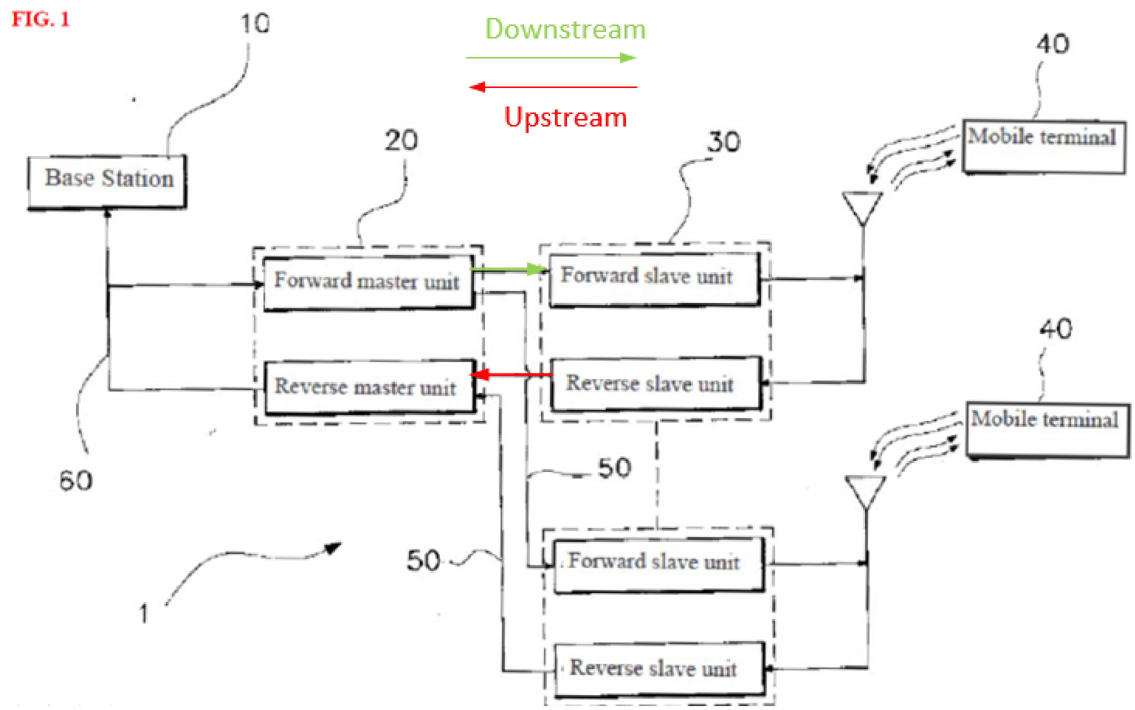
B. Ground 1a: Claims 1-10, 12-14, 16-20, 23-25, and 27-28 Are Obvious Over Oh

1. Independent Claim 1

(a) Preamble: "A system for wireless radio frequency signal distribution within a coverage area in which one or more wireless units wirelessly transmit in an upstream wireless radio frequency spectrum, the system comprising:"

To the extent the preamble of claim 1 is limiting, it is rendered obvious by Oh.

As discussed above, Oh discloses a Digital Optic Repeater system that receives RF signals from a base station 10 at a master unit 20 and from mobile terminals 40 at remote slave units 30. The optic repeater 1 is installed in a radio wave shadow area having multiple mobile terminals 40 and converts received analog signals to intermediate frequency signals (*e.g.*, close to DC in the example at 3:11-14) and then to digital signals for mutual transmission and reception to one another across optic lines 50. Ex. 1007, Abstract, Fig. 1. At a destination unit, the digital signals transmitted across the optic lines 50 are converted to analog signals, and upconverted to RF signals for transmission to their destination (*e.g.*, base station 10 or mobile terminals 40). *Id.*



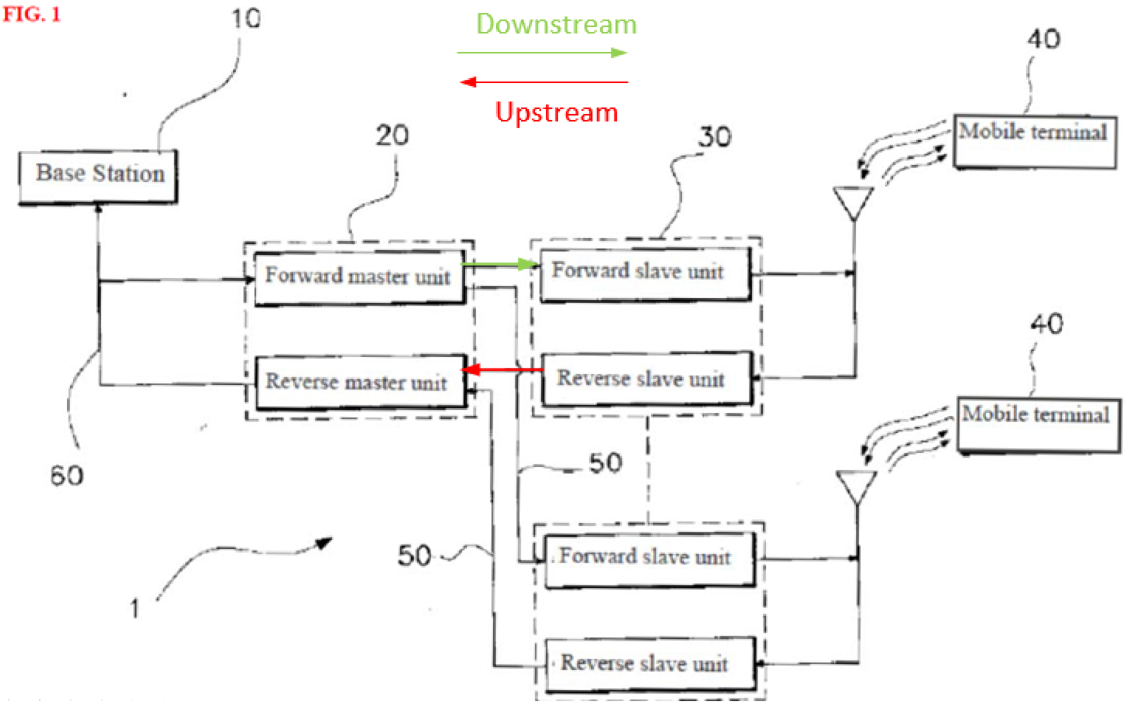
Oh therefore renders obvious each limitation recited in the preamble of claim 1 by disclosing a system for wireless radio frequency signal (RF data from base station 10) distribution (transmission of those RF signals to mobile terminals 40 using antennas via the master 20 and slave units 30 across optic lines 50) within a coverage area (radio wave shadow area) in which one or more wireless units (mobile terminals 40) wirelessly transmit in an upstream wireless radio frequency spectrum (analog signals transmitted from mobile terminals 40 to antennas of slave units 30 in the upstream direction). Ex. 1005, ¶¶382-383.

(b) Element 1: "a host unit;"

As discussed above and as shown in Fig. 1, Oh's master unit 20 transmits/receives analog signals to/from the base station and relays digital samples of those analog signals to/from remote slave units 30 across optic lines 50. Ex. 1007, 3:1-

6; 4:66-5:1.

FIG. 1



Oh's master unit 20 is analogous to the '218 patent's digital host unit (DHU) 20 which interfaces with a wireless interface device (WID) 10 that in embodiments comprises a base station (Ex. 1002, 4:40-43). And like Oh's master unit 20, on the downstream path the '218 patent's DHU "receives RF signals from WID 10 [*i.e.*, base station] and converts the RF signals to digital RF signals. DHU 20 further optically transmits the digital RF signals to multiple DRUs 40."

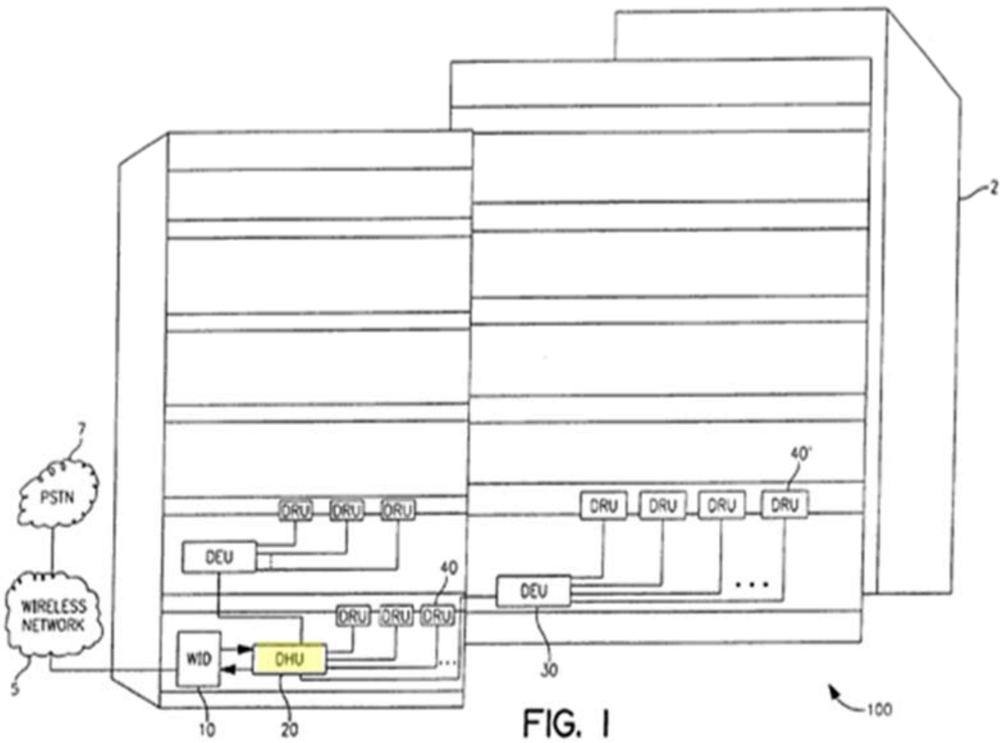
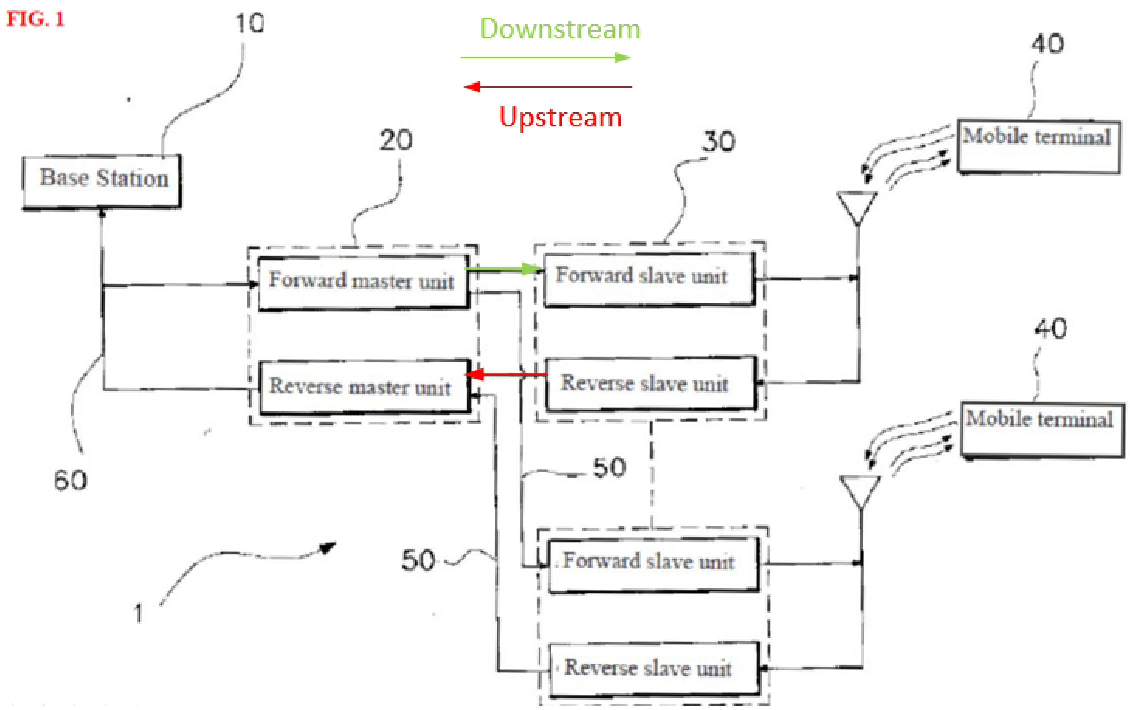


FIG. 1

Because Oh's master unit 20 communicates analog signals bi-directionally with a base station, and communicates digital signals bi-directionally with multiple remote units (slave units 30), it is analogous to the host unit described in the '218 patent. Thus Oh renders obvious a host unit (master unit 20). Ex. 1005, ¶¶384-386.

(c) Element 2a: "a plurality of remote units communicatively coupled to the host unit using at least one communication medium,"

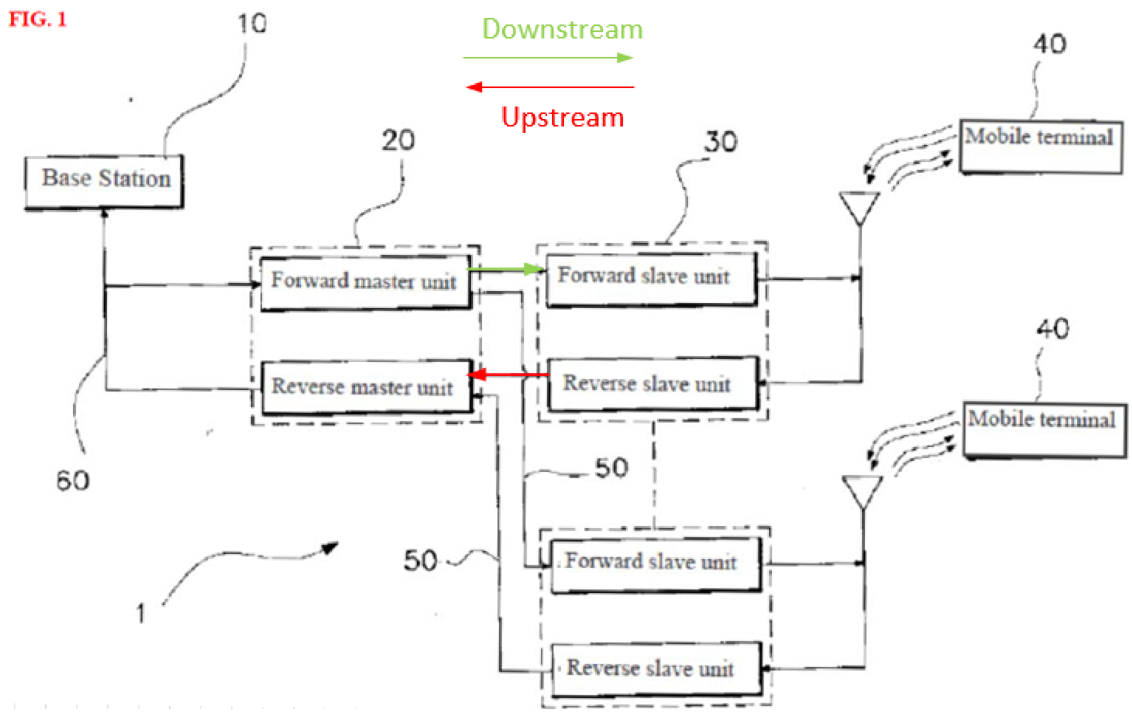
Oh discloses master unit 20 is coupled to multiple remote slave units 30 via optic lines 50.



Thus Oh renders obvious a plurality of remote units (30) communicatively coupled to the host unit (20) using at least one communication medium (50). Ex. 1005, ¶387.

(d) Element 2b: "wherein each of the plurality of remote units is associated with a portion of the coverage area;"

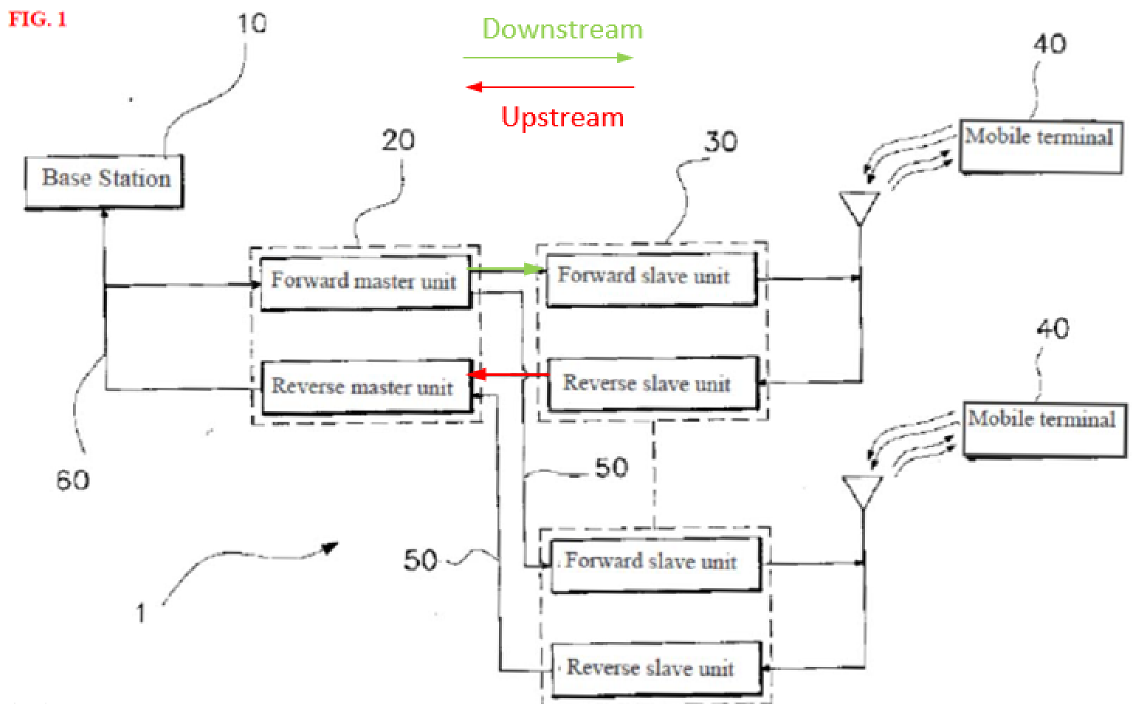
Oh discloses optic repeater 1 having multiple slave units 30 is installed in a radio wave shadow area having multiple mobile terminals 40. Each mobile terminal 40 is associated with a slave unit 30 of the radio wave shadow area.



Thus Oh renders obvious each of the plurality of remote units (30) is associated with a portion of the coverage area (radio shadow wave area). Ex. 1005, ¶¶388.

(e) Element 3: "wherein each of the plurality of remote units receives a respective original upstream analog wireless signal comprising the upstream radio frequency spectrum and any upstream transmissions from any of the wireless units that are within the portion of the coverage area associated with that remote unit;"

As depicted in Fig. 1 of Oh, each slave unit 30 receives an analog signal from a mobile terminal 40. Each mobile terminal 40 is associated with a slave unit 30 of the radio wave shadow area.

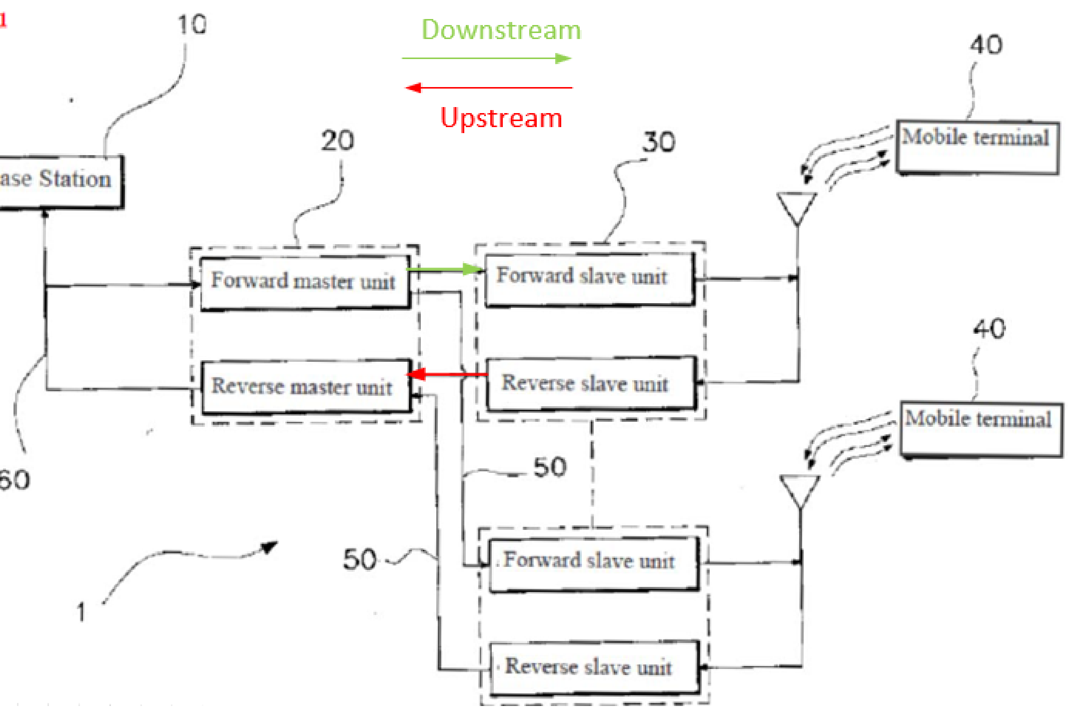


Thus Oh renders obvious each of the plurality of remote units (slave units 30) receives a respective original upstream analog wireless signal comprising the upstream radio frequency spectrum and any upstream transmissions from any of the wireless units (from mobile terminals 40) that are within the portion of the coverage area (radio wave shadow area) associated with that remote unit (slave units 30). Ex. 1005, ¶389.

(f) Element 4: "wherein each of the plurality of remote units generates respective upstream digital RF samples indicative of the respective original upstream analog wireless signal received at that remote unit;"

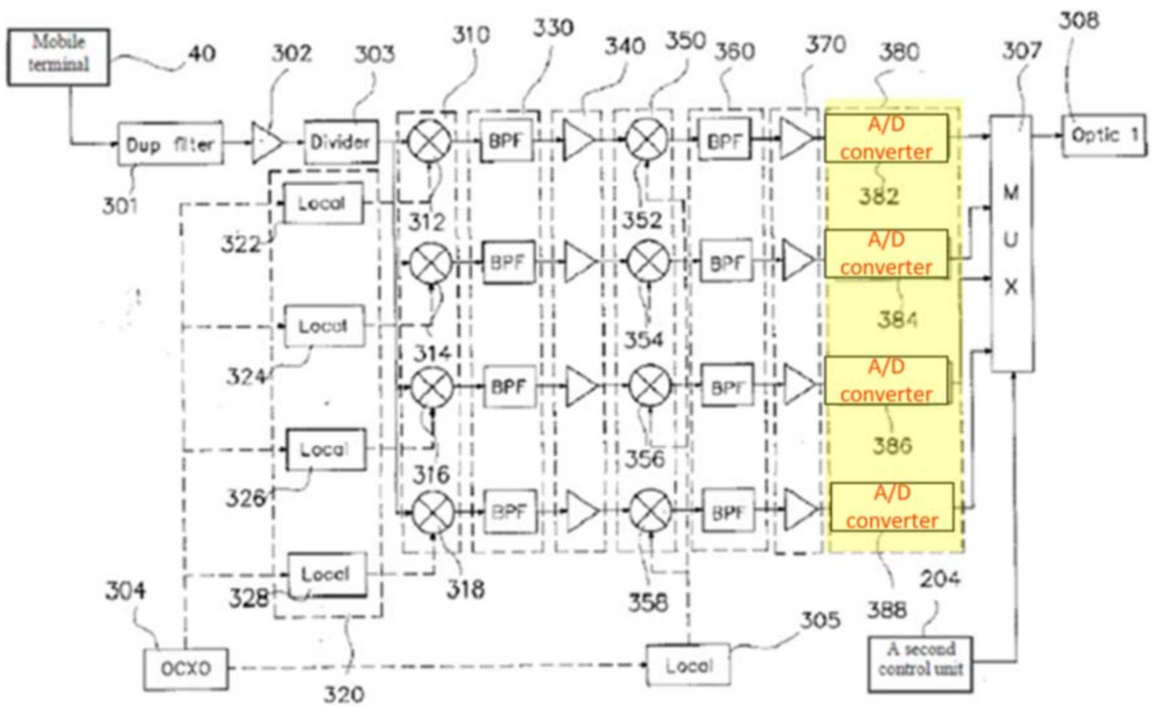
Patent Owner has made clear in a prior litigation that "digital radio frequency (RF)" as that term is used in the '218 patent refers to sampling of any of baseband signals, intermediate frequency signals, or radio frequency signals. *See*, Ex. 1008, Acampora Report, ¶136 ("Accordingly, <u>the baseband digital samples</u>, any intermediate frequency digital samples, and any radio frequency digital samples are all referred to a[s] being digital RF.") Additionally, Patent Owner also has made clear that use of the term "wireless" to modify "radio frequency spectrum" is "to emphasize that the 'radio frequency spectrum' being received and digitized by the remote antenna units is spectrum that is associated with wireless communications." Ex. 1008, Acampora report, ¶408. Oh's disclosure of A/D conversion (*i.e.*, sampling) of intermediate frequency signals, including signals down converted to close to DC (*i.e.*, baseband signals) is disclosure of wireless radio frequency distribution as that term is used in the '218 patent.

FIG. 1



As depicted in Fig. 4 of Oh, each slave unit 30 receives an analog signal from a mobile terminal 40, divides the received analog signal into its component frequency bands at 303, and downconverts the frequency band signals to near DC at 310-370. Ex. 1007, 4:26-34. The downconverted band signals are then sampled at 380 to create 12-bit digitized radio frequency signals. *Id.*, 4:56-61. The multiplexer 307 multiplexes the four 12-bit samples with 4 bits of control data from 204 to form 52-bit serial data signals that are forwarded to master unit 20. *Id.*

FIG. 4

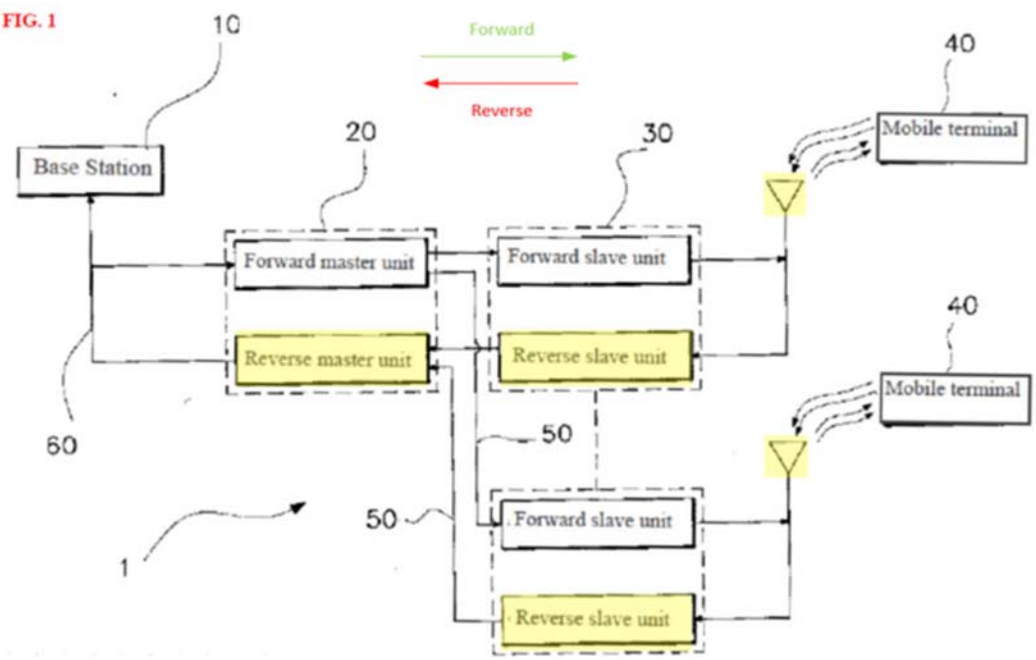


Thus Oh renders obvious each of the plurality of remote units (slave units 30) generates respective upstream digital RF samples (output from A/D converter unit 380) indicative of the respective original upstream analog wireless signal (from mobile terminals 40) received at that remote unit (slave units 30). Ex. 1005, ¶¶390-392.

(g) Element 5: "wherein each of the plurality of remote units communicates the respective upstream digital RF samples generated by that remote unit to the host unit using the at least one communication medium;"

Oh discloses that its reverse slave units 300 multiplex "all the digital signals transmitted from said second A/D converter unit 380 … to serial data signals and outputs them to the reverse master unit 400 through a third optic converter unit 308 and the optic line 50." Ex. 1007, 4:36-39.

FIG. 1

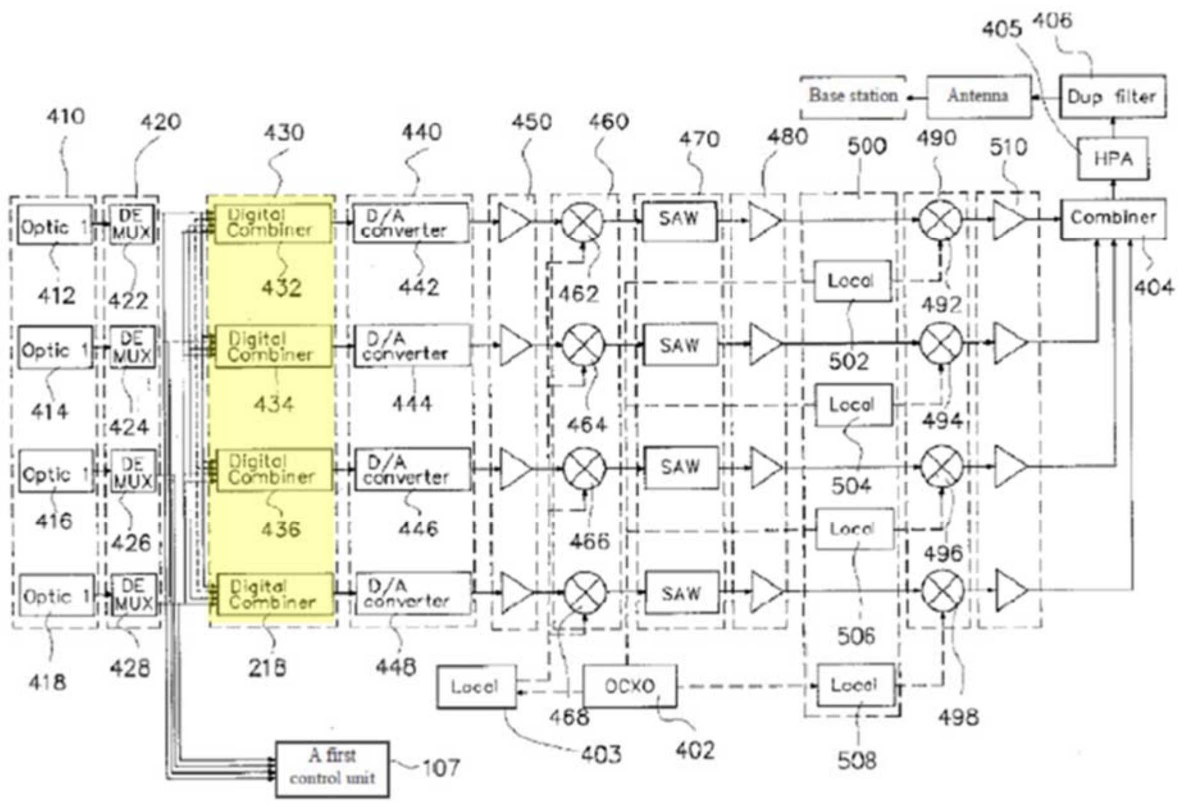


Thus Oh renders obvious that each of the plurality of remote units (slave units 30) communicates the respective upstream digital RF samples generated by that remote unit to the host unit (master unit 20) using the at least one communication medium (optic lines 50). Ex. 1005, ¶393.

(h) Element 6: "wherein the host unit digitally sums corresponding upstream digital RF samples received from the plurality of remote units to produce summed upstream digital RF samples;"

Oh's master unit 20 includes a digital combiner unit 430 that performs digital combining by aggregating digital signals transmitted from each demultiplexer 422, 424, 426, 428 of demultiplexer unit 420. Ex. 1007, 4:68-70.

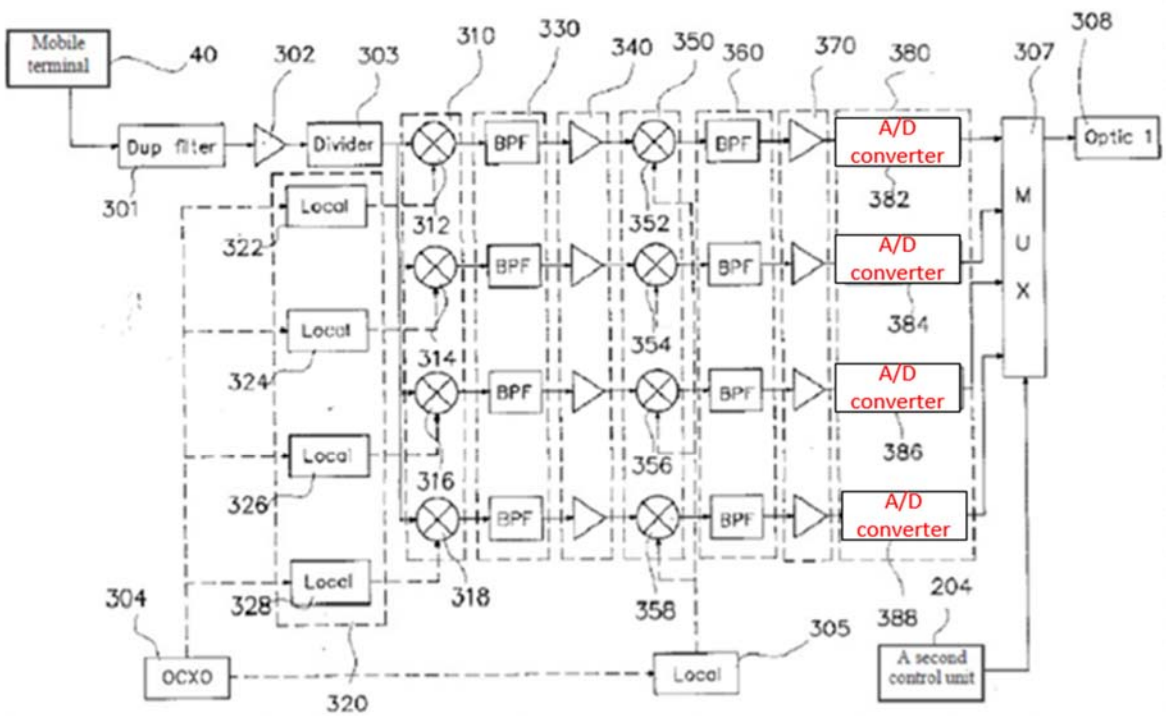
FIG. 5



Those demultiplexers at 420 receive data from individual remote slave units 30 at 410.

As depicted in Fig. 4, each slave unit 30 receives an analog signal from mobile terminals 40, divides the received analog signal into its component frequency bands at 303 and downconverts the frequency band signals to near DC at 310-370. Ex. 1007, 4:26-34. The downconverted band signals are then sampled at 380 to create 12-bit digitized radio frequency signals. *Id.*, 4:56-61. The multiplexer 307 multiplexes the four 12-bit samples with 4 bits of control data from 204 to form 52-bit serial data signals that are forwarded to master unit 20. *Id.*

FIG. 4



Referring back to Fig. 5, each demultiplexer 422, 424, 426, 428 receives a 52-bit signal from its respective slave unit 30. Each demultiplexer forwards 12-bits of sample data to the appropriate digital combiner associated with the proper frequency band for that 12-bit sample and forwards its 4 bits of control data to control unit 107. Upon receiving four 12-bit signals (one from each of demultiplexer 422, 424, 426, 428), each digital combiner 432, 434, 436, 438 performs digital combining on those 12-bit signals to "creat[e a] 14-bit intermediate frequency signal[] by combining[2] four 12-bit intermediate frequency signals in the same frequency band." Ex. 1005, ¶80 (Dr. Baker testifying that whether referred to as "adding," "aggregating," or "combining," the result of digital combiners 432, 434, 436, 438 processing of the four 12-bit signals to create a 14-bit signal is a "digital sum:" *e.g.*, 1010 1010 1010 (2,730) + 1100 1100 1100 (3,276) + 1111 1111 1111 (4,095) + 0000 1100 1100 (204) = 10 1000 0100 0001 (10,305)); Ex. 1007, 5:16-17.[3] Those 14-bit signals are then converted to analog signals at 440, upconverted, combined (*i.e.*, analog combining), and transmitted to the base station 10. *Id.*, 5:17-29; Ex. 1005, ¶58.

Thus Oh renders obvious the host unit (master unit 20) digitally sums the

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[2] The translation originally commissioned by SOLiD translated this word as "added." In parallel litigation in the UK, CommScope requested that it be translated as "combined." The translator is agreeable to using "combined," and that is reflected in Ex. 1007 submitted herewith.

[3] This is evidenced by the CommScope patents themselves referring to their "sum" operation as "combining." *See*, Ex. 1002, 4:66-67, 5:1-13 ("Both DHU and DEU split signals in the forward path and **sum signals in the reverse path**…Splitting and **combining** the signals in a digital state avoids the combining and splitting losses experienced with an analog system.")

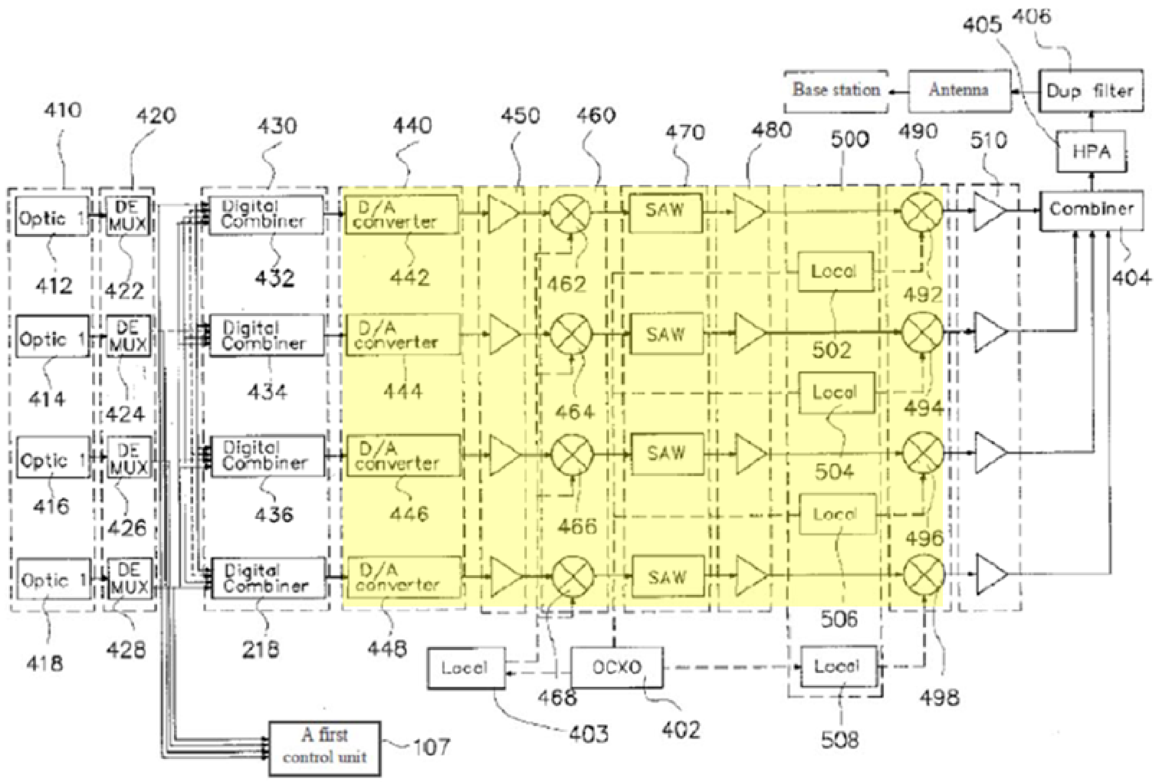
corresponding upstream digital RF samples (digital samples from slave units 30) received from the plurality of remote units (slave units 30) to produce summed upstream digital RF samples (creates 14-bit signals by combining four 12-bit signals). Ex. 1005, ¶¶394-397, 58.

(i) Element 7: "wherein the host unit converts the summed upstream digital RF samples to a replicated upstream analog wireless radio frequency signal."

The upstream portion of master unit 20 (*e.g.*, reverse master unit 400) "converts the digital signals transmitted from the slave unit 30 through the optic line 50 to the intermediate frequency signals, analog signals, converts them to the RF signals, and transmits them to the base station 10." Ex. 1007, 4:62-64.

As depicted in Fig. 5, the 14-bit digital signals output from digital combiners 432, 434, 436, 438 are then applied to respective D/A converter units 440 to provide intermediate frequency analog signals. *Id.*, 5:18. The intermediate frequency analog signals are shifted to their respective band frequencies by being amplified at 450, mixed with a step up frequency at 460, filtered at 470, amplified again at 480, mixed with a respective frequency at 490 to recreate the analog band frequency signals, and amplified again at 510. *Id.*, 4:73-5:2.

FIG. 5

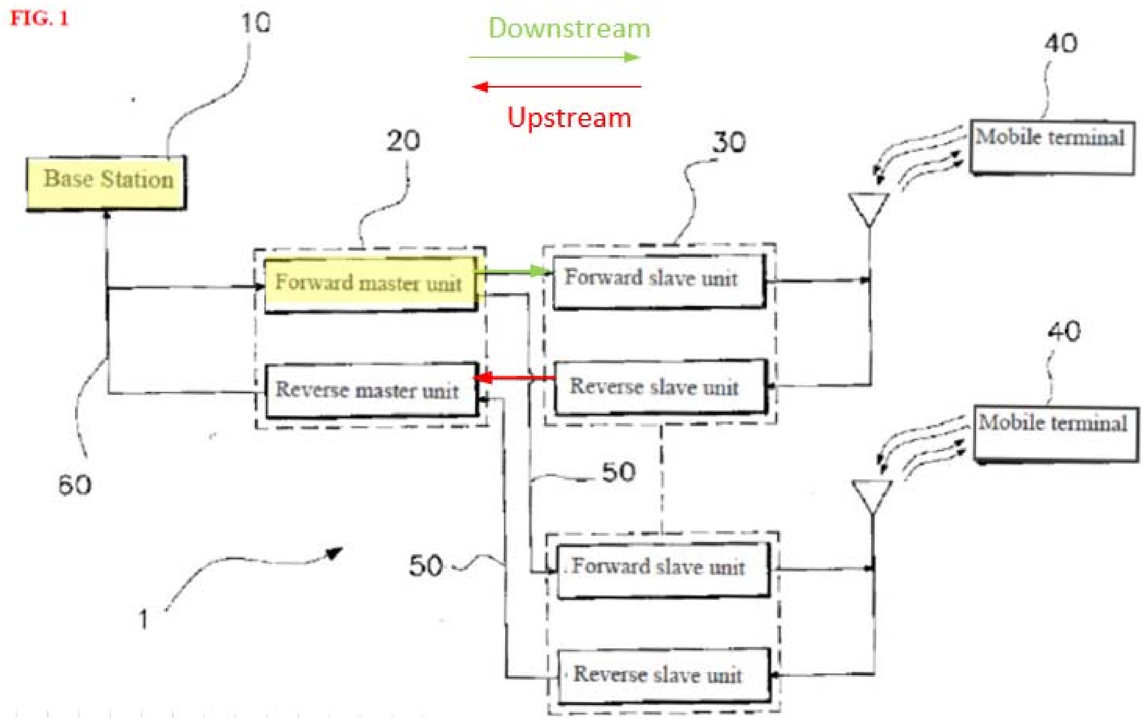


Thus Oh renders obvious the host unit (master unit 20) converts the summed upstream digital RF samples (output from digital combiner unit 430) to a replicated upstream analog wireless radio frequency signal (through 450, 460, 470, 480, 490). Ex. 1005, ¶¶398-399.

2. Dependent Claim 2

(a) Element 1: "wherein the host unit receives an original downstream analog wireless signal comprising a downstream radio frequency spectrum and any downstream transmissions for the wireless units;"

As depicted in Fig. 1, RF signals are received by the forward portion of master unit 20 from the base station 10. Ex. 1005, ¶400; Ex. 1007, 2:72-73.



(b) Element 2: "wherein the host unit generates downstream digital RF samples indicative of the original downstream analog wireless signal;"

Oh discloses master unit 20 is coupled to multiple remote slave units 30 via optic lines 50. That master unit 20 receives analog RF signals from base station 10 and digitizes that analog signal on a per frequency band basis at 180 for communications to slave units 30.

FIG. 1

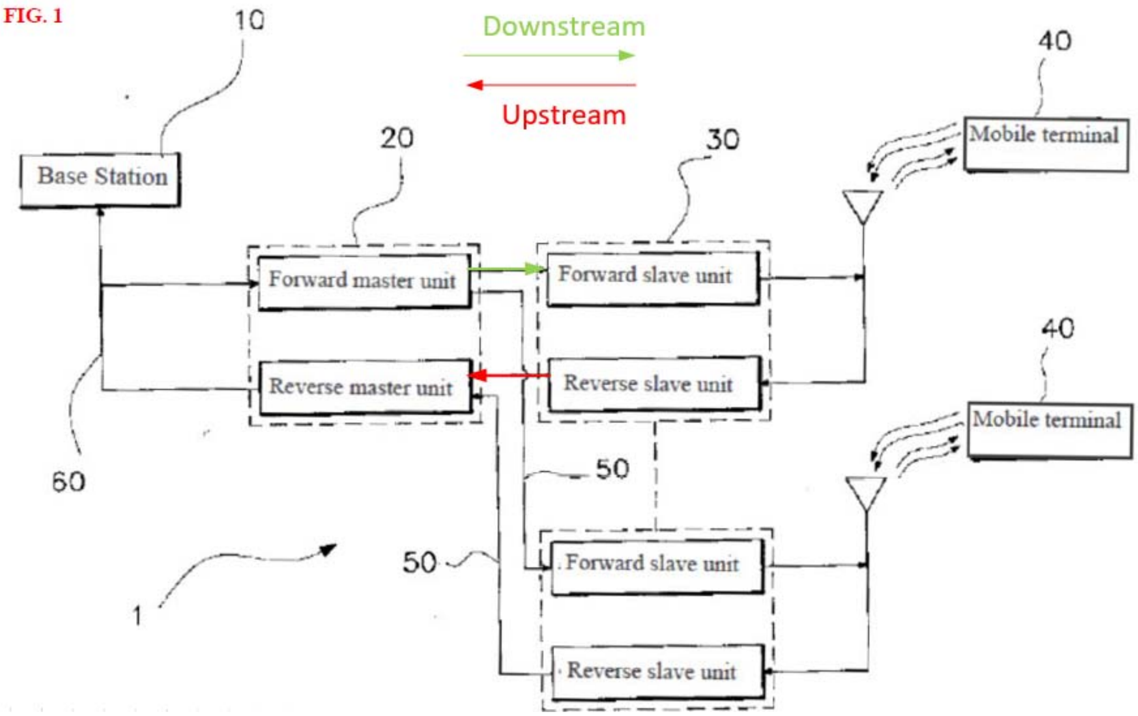
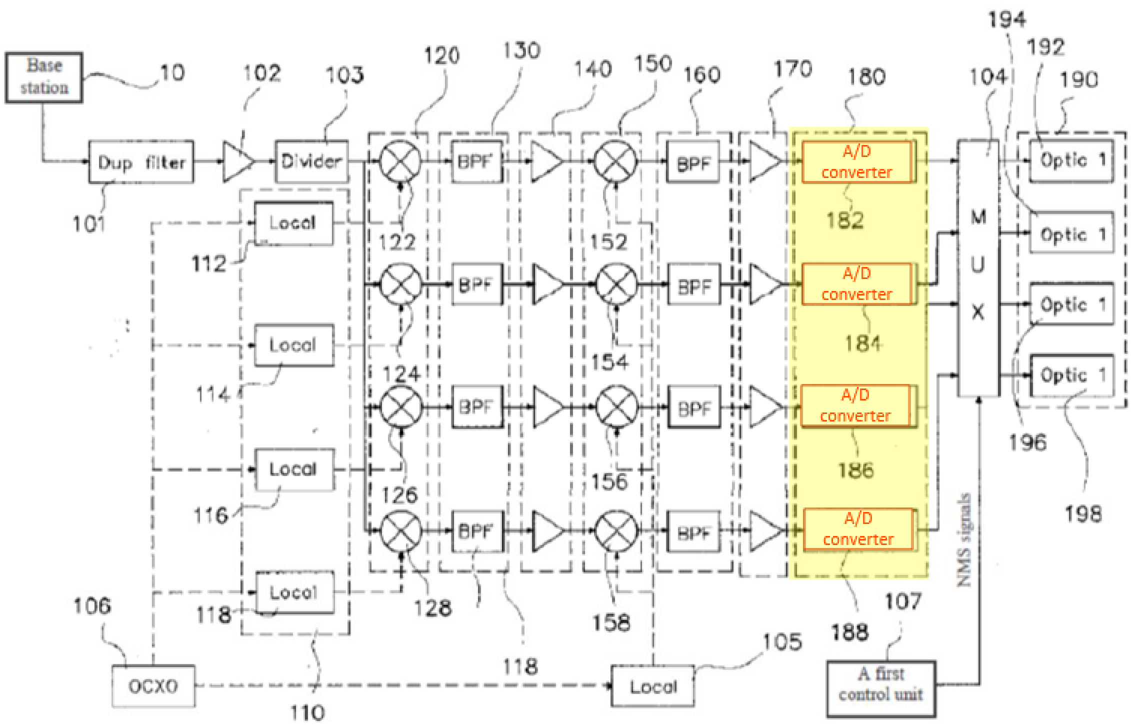


FIG. 2



Thus Oh renders obvious the host unit (master unit 20) generates downstream digital RF samples (generated at 180) indicative of the original downstream analog wireless signal (from base station 10). Ex. 1005, ¶401.

(c) Element 3: "wherein the host unit communicates the downstream digital RF samples to at least some of the plurality of remote units using the at least one communication medium;"

Oh discloses master unit 20 is coupled to multiple remote slave units 30 via optic lines 50. That master unit 20 receives analog RF signals from base station 10 and digitizes that analog signal on a per frequency band basis at 180 for communications to slave units 30.

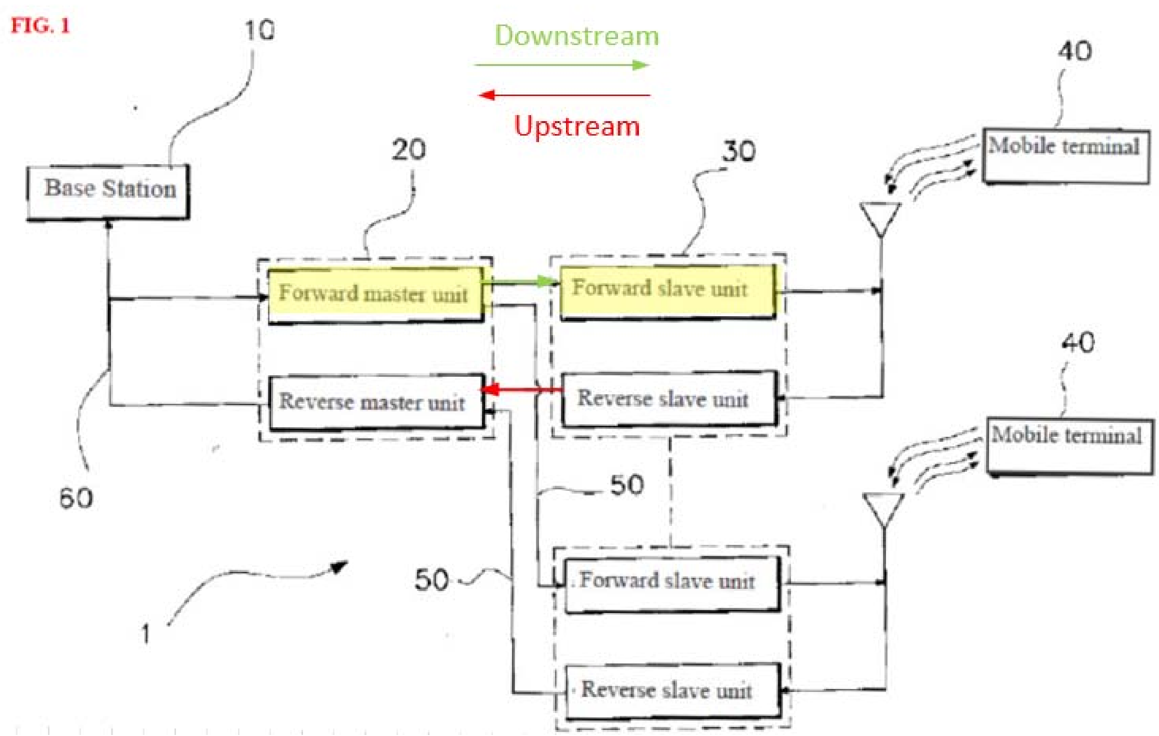
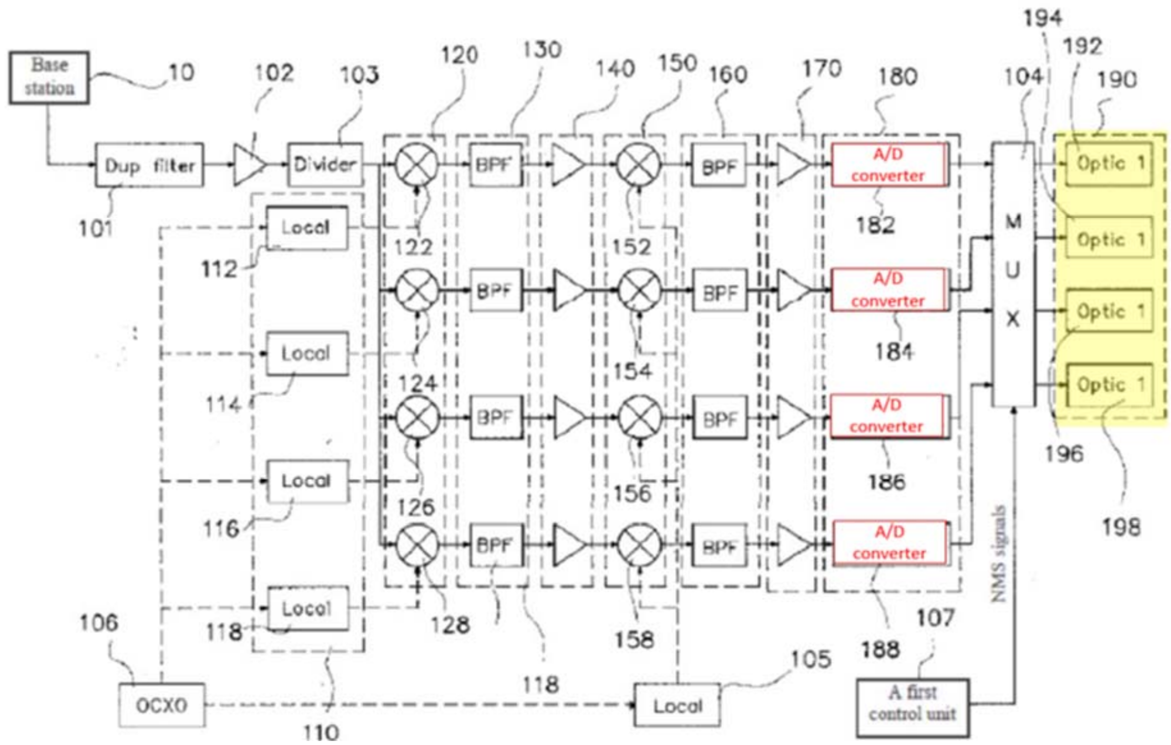


Fig. 2 of Oh depicts optic converter unit 190 that provides an interface between forward master unit 100 of master unit 20 and forward slave unit 200 of remote slave units 30.

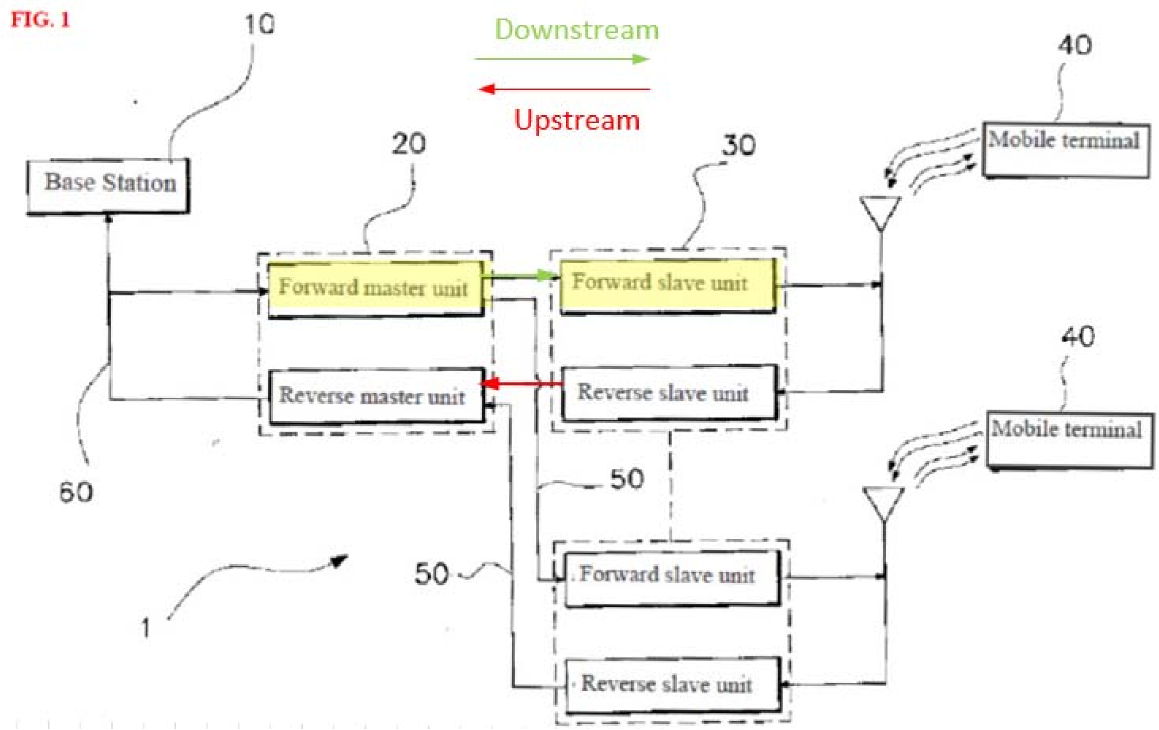
FIG. 2



Thus Oh renders obvious a host unit (master unit 20) that communicates (optic converter 190) the downstream digital RF samples (generated at 180) to at least some of the plurality of remote units (slave units 30) using the at least one communication medium (optic lines 50). Ex. 1005, ¶¶402-404.

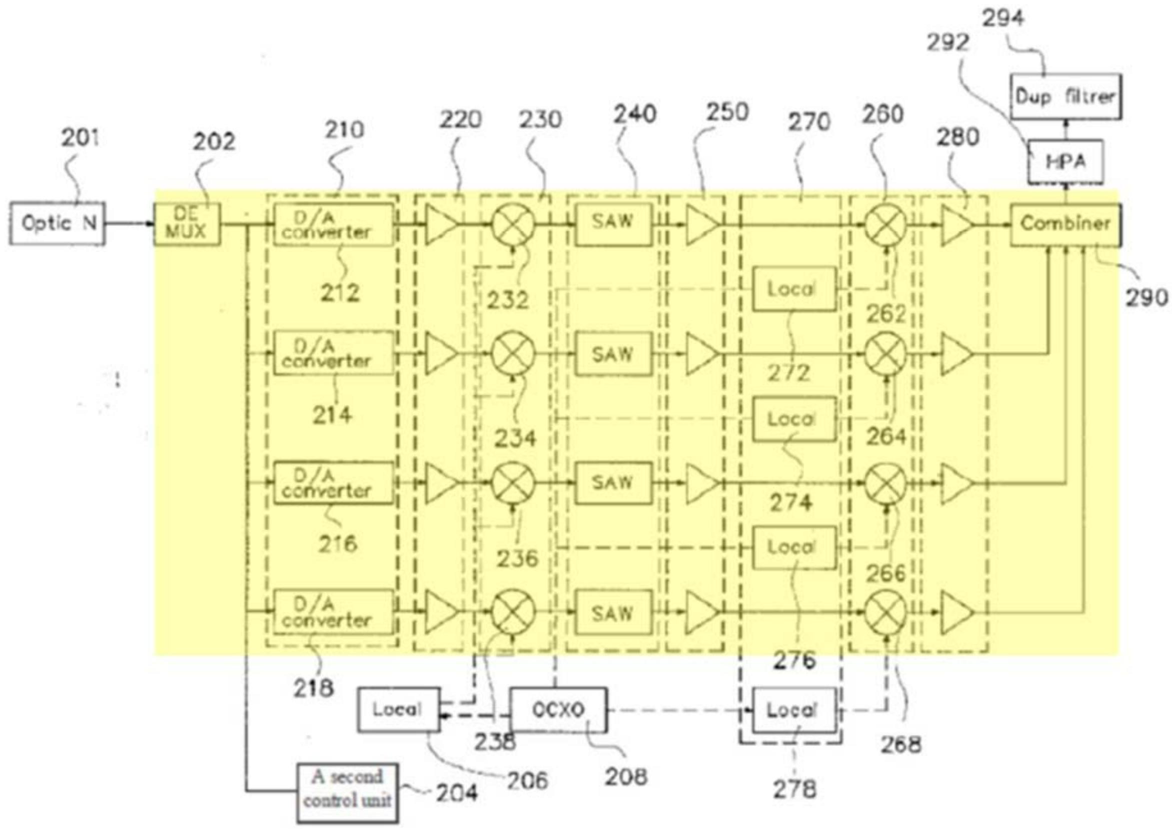
(d) Element 4: "wherein each of the at least some of the plurality of remote units to which the host unit communicates the downstream digital RF samples converts the downstream digital RF samples to a replicated downstream analog wireless radio frequency signal."

Oh discloses that the optic converter unit 190 transmits digitized radio frequency spectrum data to multiple slave units over optic line 50 as depicted in FIG. 1. Ex. 1007, 3:16-18; 38-44.



The forward slave unit 200 of the slave unit 30 "converts the digital signals transmitted from the master unit 20 through the optic line 50 to the intermediate frequency signals, analog signals; converts them to the RF signals and transmits them to the mobile terminals 40." Ex. 1007, 3:47-49.

FIG. 3



Oh discloses that the forward slave unit 200 of the slave unit 30 "converts the digital signals transmitted from the master unit 20 through the optic line 50 to the intermediate frequency signals, analog signals; converts them to the RF signals and transmits them to the mobile terminals 40." Ex. 1007, 3:47-49. That process is described in further detail at 3:50-61, where the digital samples from the master unit 20 are routed for re-creation of the component analog band signals and upconverted to component analog radio frequency signals which are combined at 290 (*i.e.*, analog combining) prior to transmission to mobile terminals 40. Ex. 1005, ¶58.

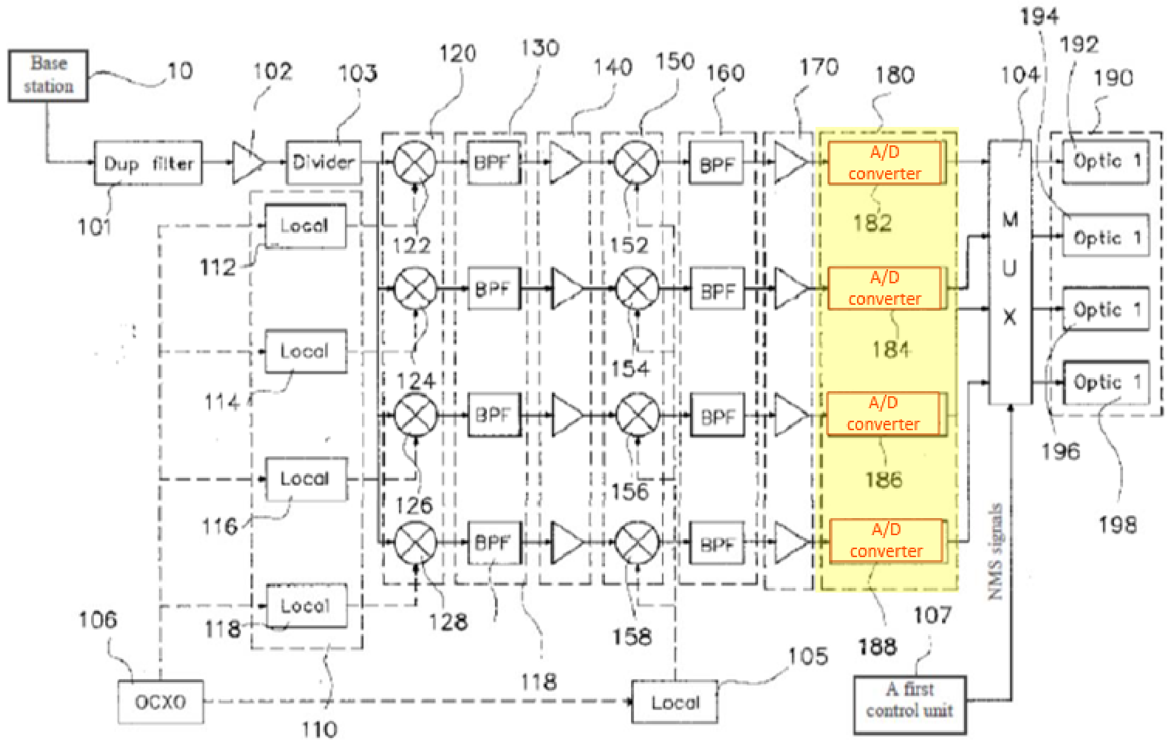
Thus Oh renders obvious each of the at least some of the plurality of remote units (slave units 30) to which the host unit (master unit 20) communicates the downstream digital RF samples (digital sample data received from master unit 20 at 201) converts the downstream digital RF samples to a replicated downstream analog wireless radio frequency signal (converting from digital to analog signals, upconverting the analog signals to their respective band frequencies, and analog combining to form analog radio frequency signals for transmission to mobile terminals 40). Ex. 1005, ¶¶405-408, 58.

3. Dependent Claim 3

(a) Element 1: "wherein the host unit comprises: an analog-to-digital converter to digitize the original downstream analog wireless radio frequency signal in order to produce the downstream digital RF samples;"

Oh's master unit 20 receives RF signals from a base station 10 and divides it into its component frequency bands at 103. Those frequency bands are downconverted to from around 800Mhz to about 70MHz by mixers at 120 that are controlled by local oscillators 110 deriving frequencies from oven controlled oscillator (OCXO) 106. Following filtering 130 and amplification, those intermediate frequency signals are further downconverted to near DC at 150 based on a signal from local oscillator 105, responsive to OCXO 106 before A/D conversion at 180. Ex. 1007, 3:19-39.

FIG. 2

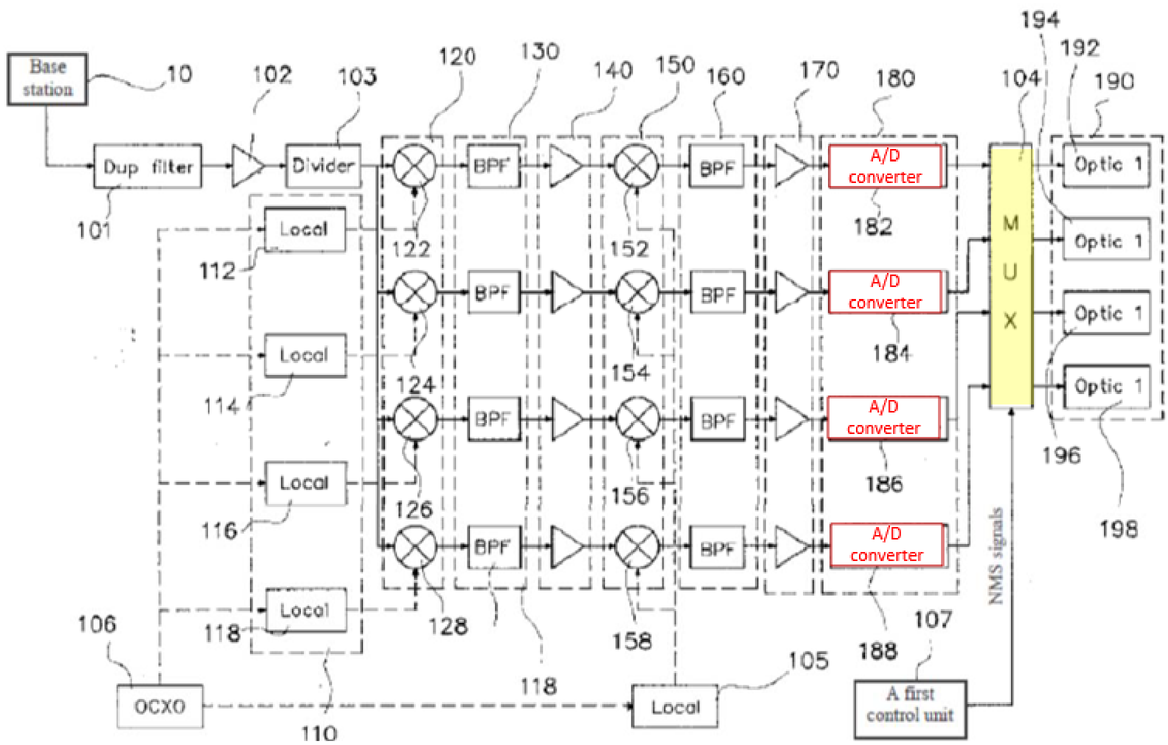


Thus, Oh describes a host unit (20) comprises: an analog-to-digital converter (180) to digitize the original downstream analog wireless radio frequency signal (from base station 10) in order to produce the downstream digital RF samples. Ex. 1005, ¶¶409-410.

(b) Element 2: "a multiplexer to frame the downstream digital RF samples for communication to at least some of the plurality of remote units as a downstream framed signal;"

Multiplexer 104 multiplexes the four 12-bit digital sample values with 4-bit network management system (NMS) control data from control unit 107 and applies that 52-bit (*i.e.*, the 4-12-bit words plus the 4-bit NMS control information) serial data stream to each of a plurality of optic converters 192, 194, 196, 198 for transmission across optic lines 50 to destination slave units.

FIG. 2

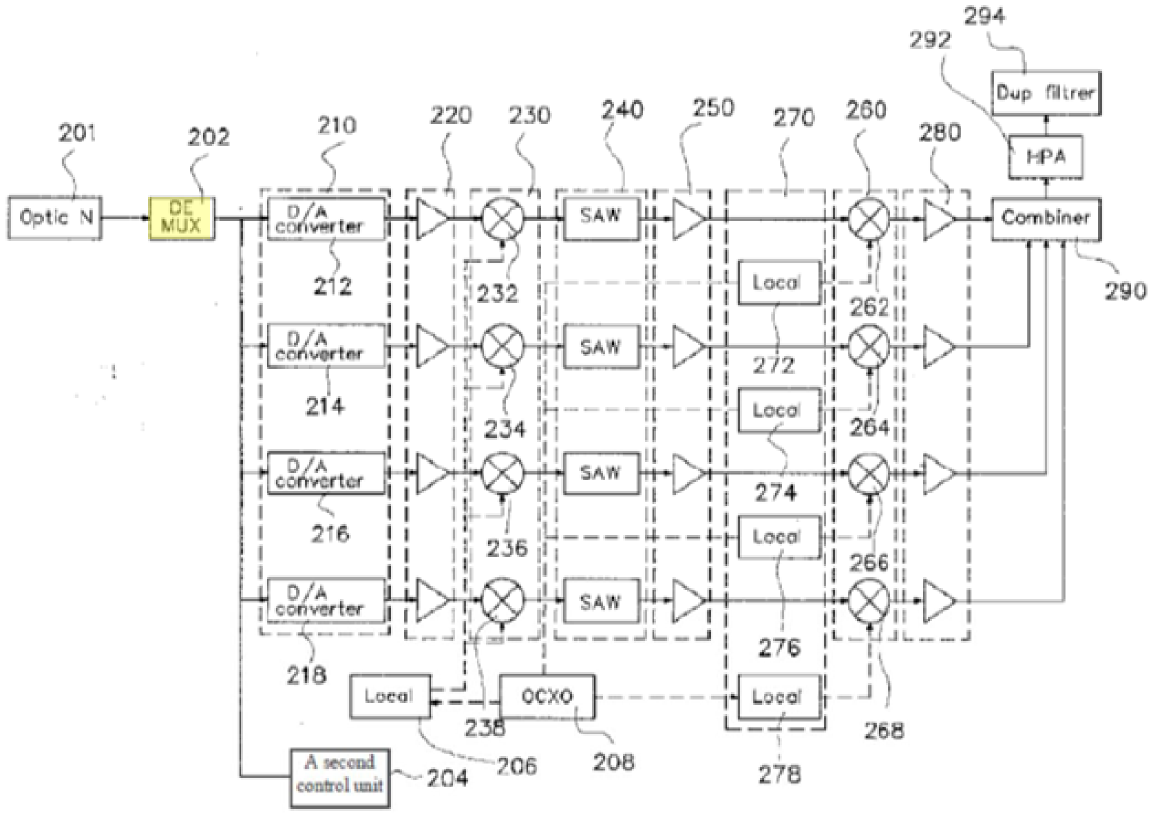


Thus Oh renders obvious a multiplexer (104) to frame the downstream digital RF samples for communication to at least some of the plurality of remote units (30) as a downstream framed signal (output from multiplexer 104). Ex. 1005, ¶¶411-412.

(c) Element 3 and element 3(a): "wherein each of the plurality of remote units comprises: a respective demultiplexer to extract the downstream digital RF samples from the downstream framed signal received from the host unit;"

Oh describes a demultiplexer 202 that routes digital sample data from the master unit 20 to the D/A converter unit 210 of the corresponding row of components for processing that frequency band of the analog signal to be transmitted to the mobile terminals 40. Ex. 1007, 3:50-53.

FIG. 3

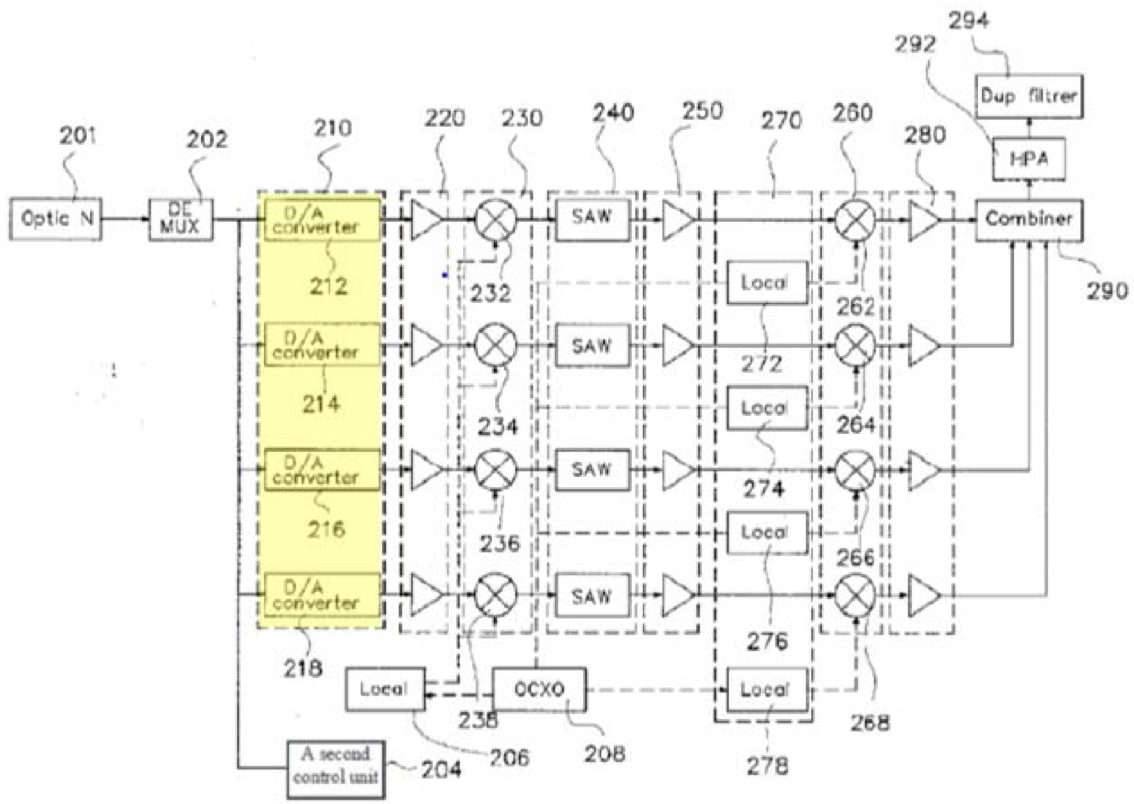


Thus Oh renders obvious wherein each of the plurality of remote units (30) comprises: a respective demultiplexer (202) to extract the downstream digital RF samples from the downstream framed signal received from the host unit (20). Ex. 1005, ¶¶413-414.

(d) Element 3(b): "a respective digital-to-analog converter to convert the downstream digital RF samples to the respective replicated downstream analog wireless radio frequency signal."

Oh describes a demultiplexer 202 that routes digital sample data from the master unit 20 to the D/A converter unit 210 of the corresponding row of components for processing that frequency band of the analog signal to be transmitted to the mobile terminals 40. Ex. 1007, 3:50-53. Following conversion to analog, the signals are processed for upconversion at 220, 230, 240, 250, 270, 260, 280 and are combined at 290 (*i.e.*, analog combining) to form the replicated downstream analog wireless radio frequency signal for transmission to the mobile terminals 40. *Id*., 3:50-61; Ex. 1005, ¶58.

FIG. 3

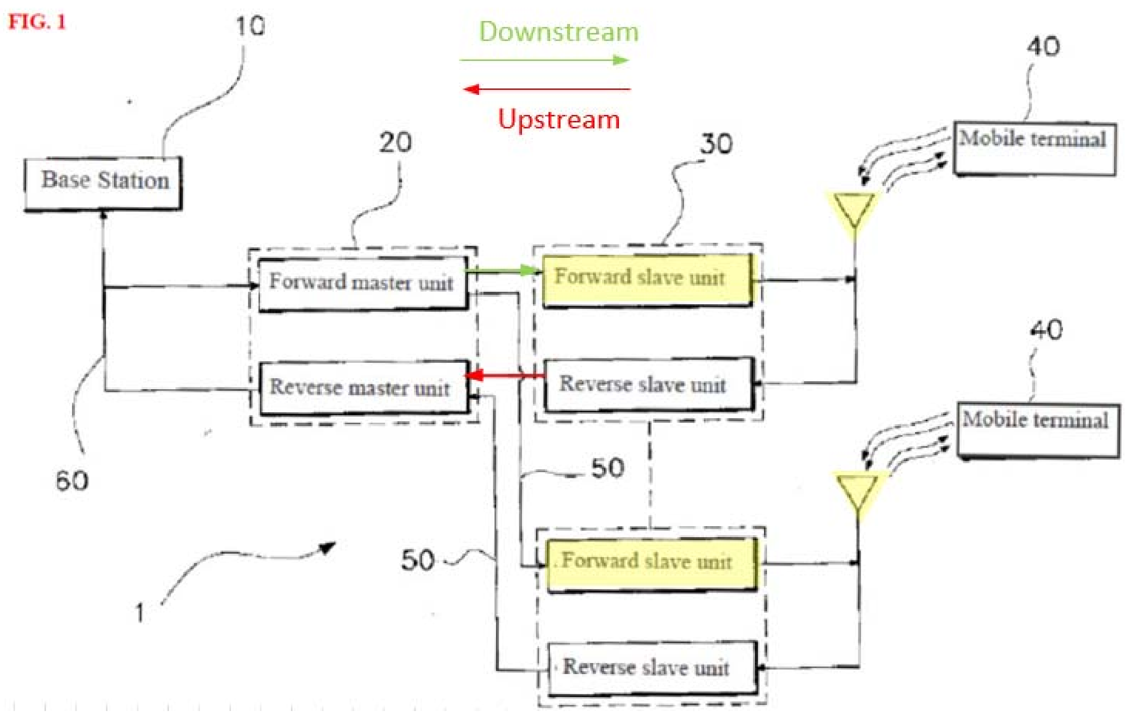


Thus Oh renders obvious a respective digital-to-analog converter (210) to convert the downstream digital RF samples to the respective replicated downstream analog wireless radio frequency signal (via processing at 220, 230, 240, 250, 270, 260, 280 and combination at 290). Ex. 1005, ¶¶415-416.

4. Dependent Claim 4

Claim 4 recites that "wherein the respective replicated downstream analog wireless radio frequency signal generated at each of the at least some of the plurality of remote units is radiated from at least one antenna associated with that remote unit."

Oh describes that RF signals from slave units 30 are transmitted to mobile terminals 40 using antennas. Patent Owner acknowledges that an "antenna simply radiates the composite electrical RF signal with which it has been presented." Ex. 1008, ¶144, 56-57.



Thus Oh renders obvious the respective replicated downstream analog wireless radio frequency signal generated at each of the at least some of the plurality of remote units (30) is radiated from at least one antenna associated with that remote unit (30).

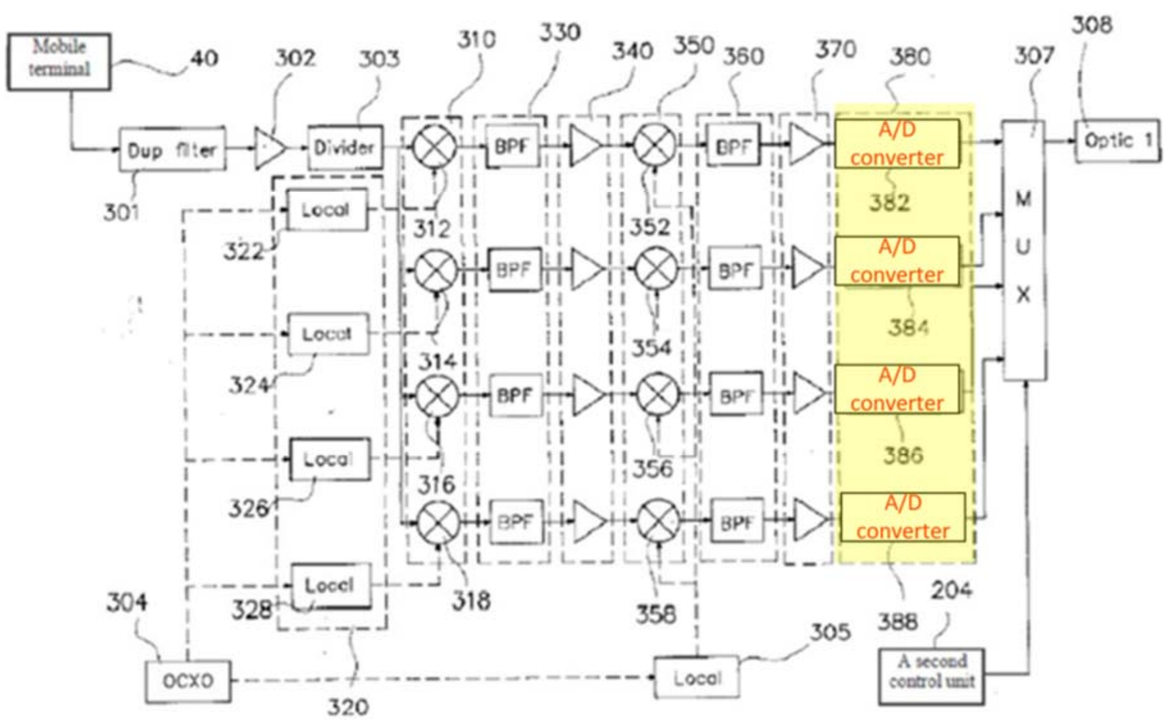
Ex. 1005, ¶¶417-418.

5. Dependent Claim 5

(a) Element 1 and 1(a): "wherein each of the plurality of remote units comprises: a respective analog-to-digital converter to digitize the original upstream analog wireless radio frequency signal received at that remote unit in order to produce the respective upstream digital RF samples;"

Oh discloses that each reverse slave unit 300 "converts the RF signals, analog signals, transmitted from the mobile terminals 40 through a third bi-directional filter 301, to the digital signals." Ex. 1007, 4:23-25. That digitization is illustrated at Fig. 4 where "A/D converter unit 380 converts the intermediate frequency signals, analog signals, to the digital signals." *Id.*, 4:56-67.

FIG. 4

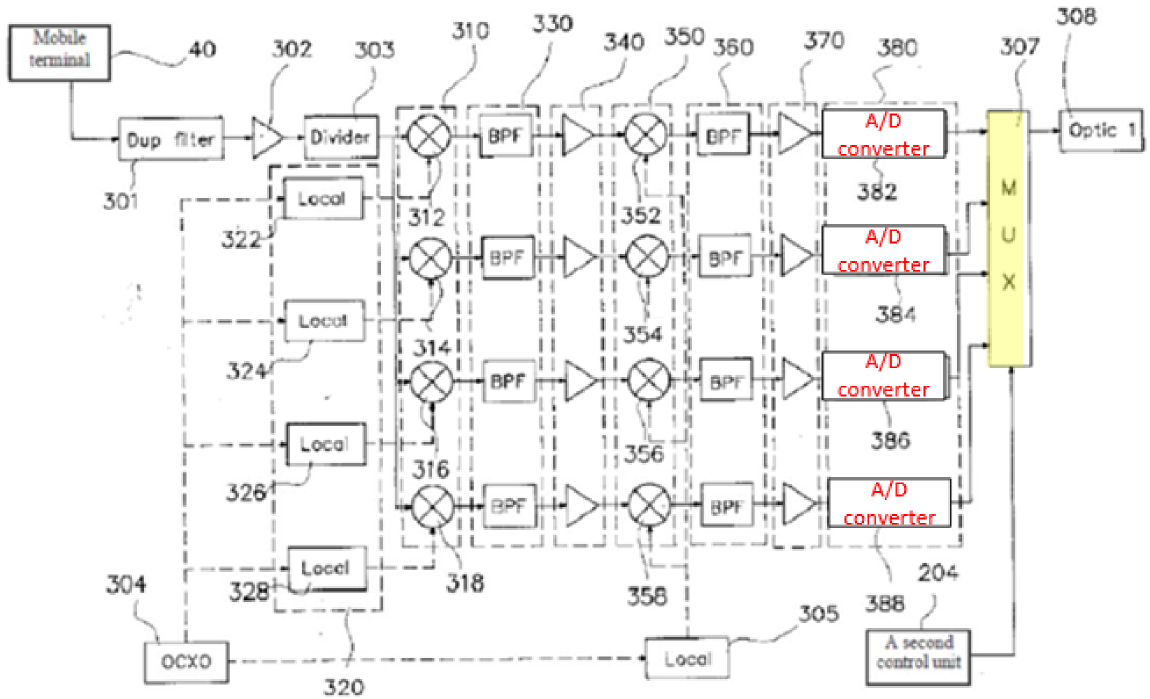


Thus Oh renders obvious each of the plurality of remote units (30) comprises: a respective analog-to-digital converter (380) to digitize the original upstream analog wireless radio frequency signal (from mobile terminals 40) received at that remote unit (30) in order to produce the respective upstream digital RF samples (output from A/D converter unit 380). Ex. 1005, ¶¶419-420.

(b) Element 1(b): "a respective multiplexer to frame the respective upstream digital RF samples for communication to the host unit as a respective upstream framed signal;"

Oh describes the serial data signals from slave units 30 are multiplexed by multiplexer 307. Multiplexer 307 multiplexes four 12-bit digital samples, one for each frequency band, and 4-bit control data from 204 into 52-bit word frames. *Id.*, 4:56-59. And applies that 52-bit serial data stream to optic converter 308 for transmission across optic line 50 to master unit 20. *Id.*, 3:56-61.

FIG. 4

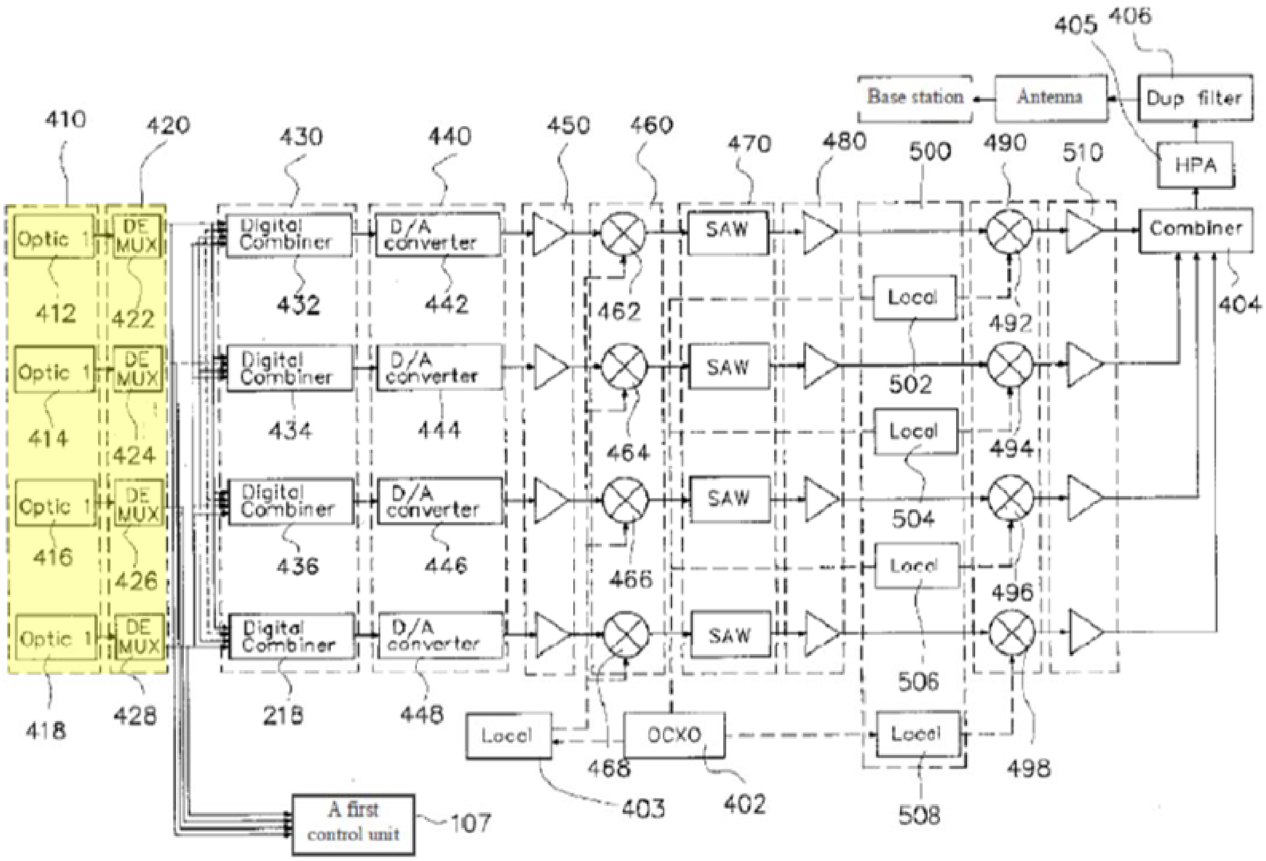


Thus Oh renders obvious a respective multiplexer (307) to frame the respective upstream digital RF samples (output from A/D converter unit 380) for communication to the host unit (20) as a respective upstream framed signal. Ex. 1005, ¶¶421-422.

(c) Element 2 and 2(a): "wherein the host unit comprises: at least one demultiplexer to extract the respective upstream digital RF samples from the respective upstream framed signals received from the plurality of remote units;"

Oh describes demultiplexers 422-428 associated with each of the remote slave units to route digital sample data to its respective frequency band path in the reverse slave unit. Each demultiplexer 422-428 receives digital sample data and control data from one slave unit 30 and separates that digital sample data according to frequency band. *Id.*, 5:4-10. Those demultiplexers at 420 receive data from individual remote slave units 30 at 410.

FIG. 5

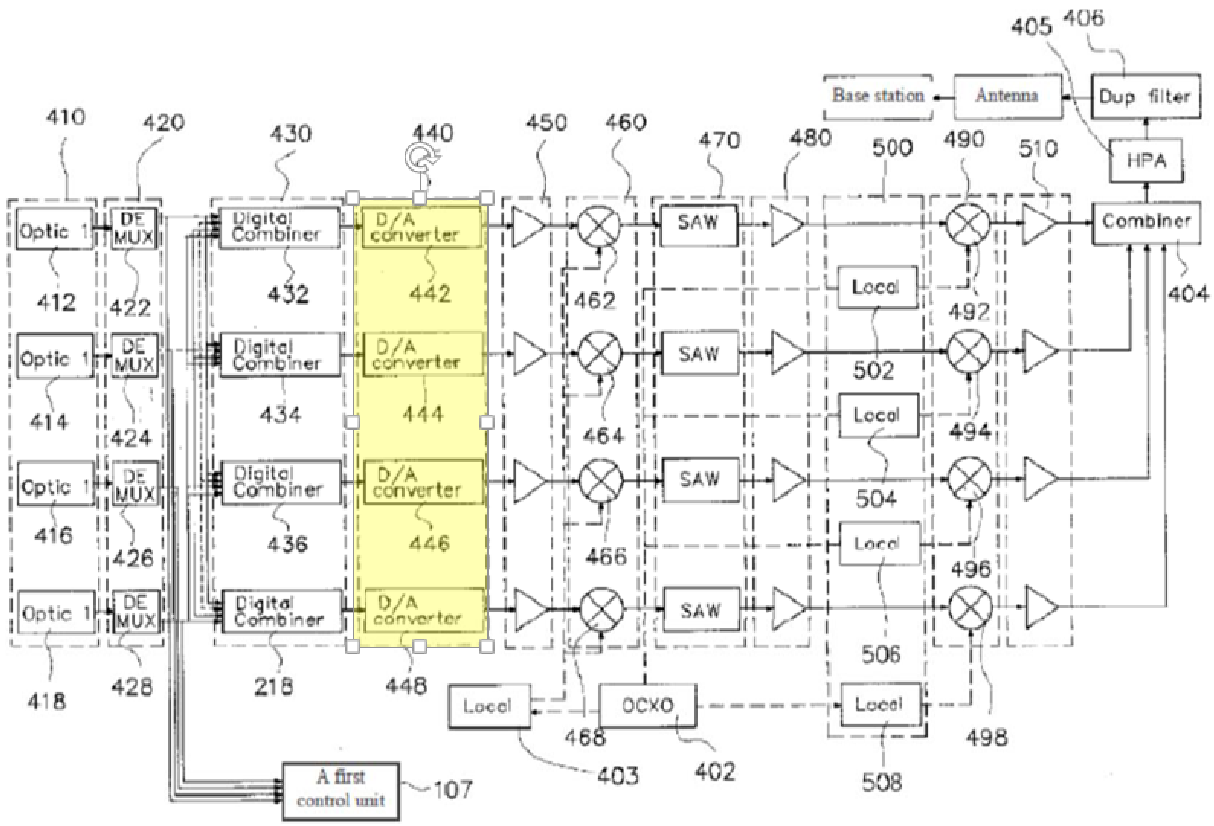


Thus Oh renders obvious a host unit (20) comprises: at least one demultiplexer (420) to extract the respective upstream digital RF samples (output from A/D converter unit 380 of slave unit 30) from the respective upstream framed signals received (at 410) from the plurality of remote units (30). Ex. 1005, ¶¶423-424.

(d) Element 2(b): "a digital-to-analog converter to convert the summed upstream digital RF samples to the replicated upstream analog wireless radio frequency signal."

Oh discloses D/A converter unit 440 receiving the summed upstream digital RF samples from digital combiner unit 430. "D/A converter unit 440 that converts the digital signals transmitted from said digital combiner unit 430 to analog signals, respectively." Ex. 1007, 4:70-71.

FIG. 5



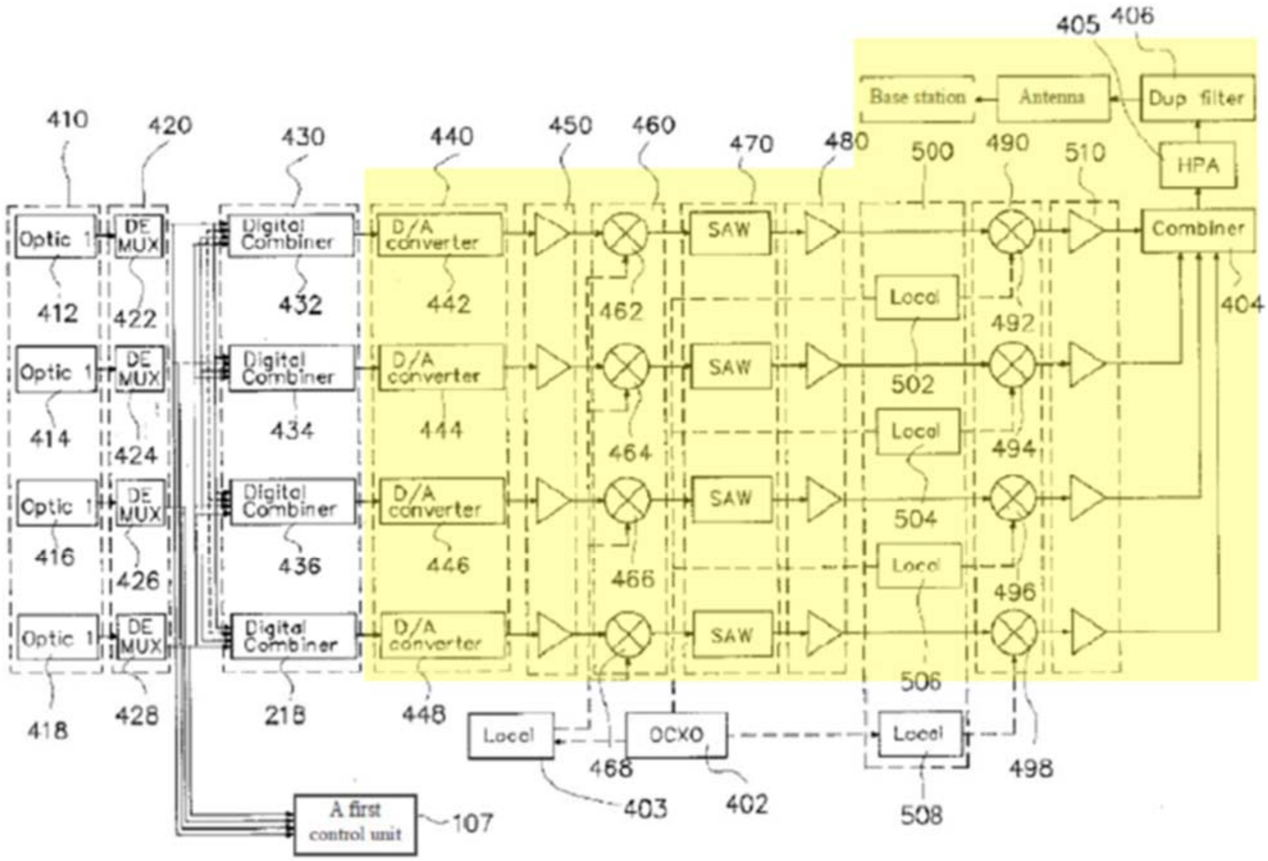
Thus Oh renders obvious a digital-to-analog converter (440) to convert the summed upstream digital RF samples to the replicated upstream analog wireless radio frequency signal. Ex. 1005, ¶¶425-426.

6. Dependent Claim 6

Claim 6 recites that "the replicated upstream analog wireless radio frequency signal is communicated from the host unit to at least one base station."

Following the digital summing operation of Element 2b of claim 5, the summed digital data values are converted to analog signals, up converted to the appropriate frequency signals associated with their particular bands to create component analog signals, that are then combined and transmitted to a base station via an antenna.

FIG. 5



Thus Oh renders obvious the replicated upstream analog wireless radio frequency signal (output from mixers 490) is communicated (using 405, 406, antenna) from the host unit (20) to at least one base station. Ex. 1005, ¶427.

7. Dependent Claim 7

Claim 7 recites that "the replicated upstream analog wireless radio frequency signal is communicated from the host unit to the at least one base station using at least one bi-directional amplifier."

Oh discloses that its master unit 20 bi-directionally communicates with base station 10.

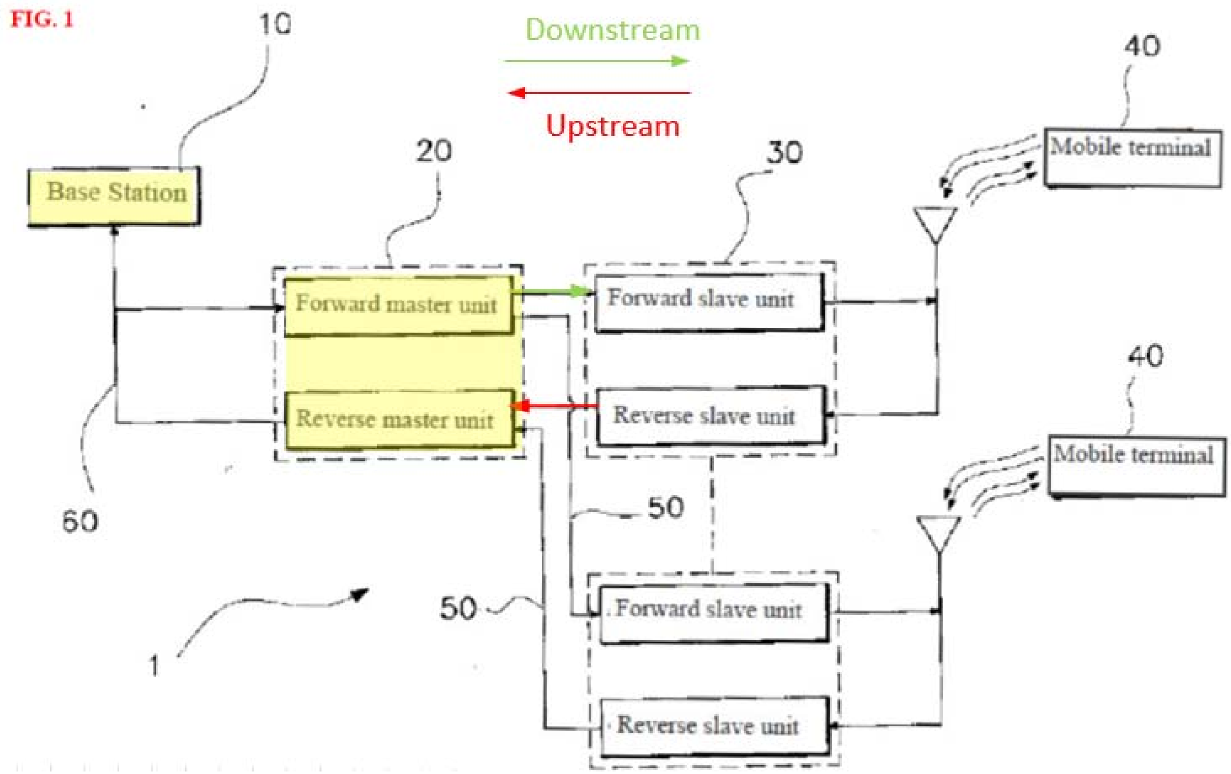
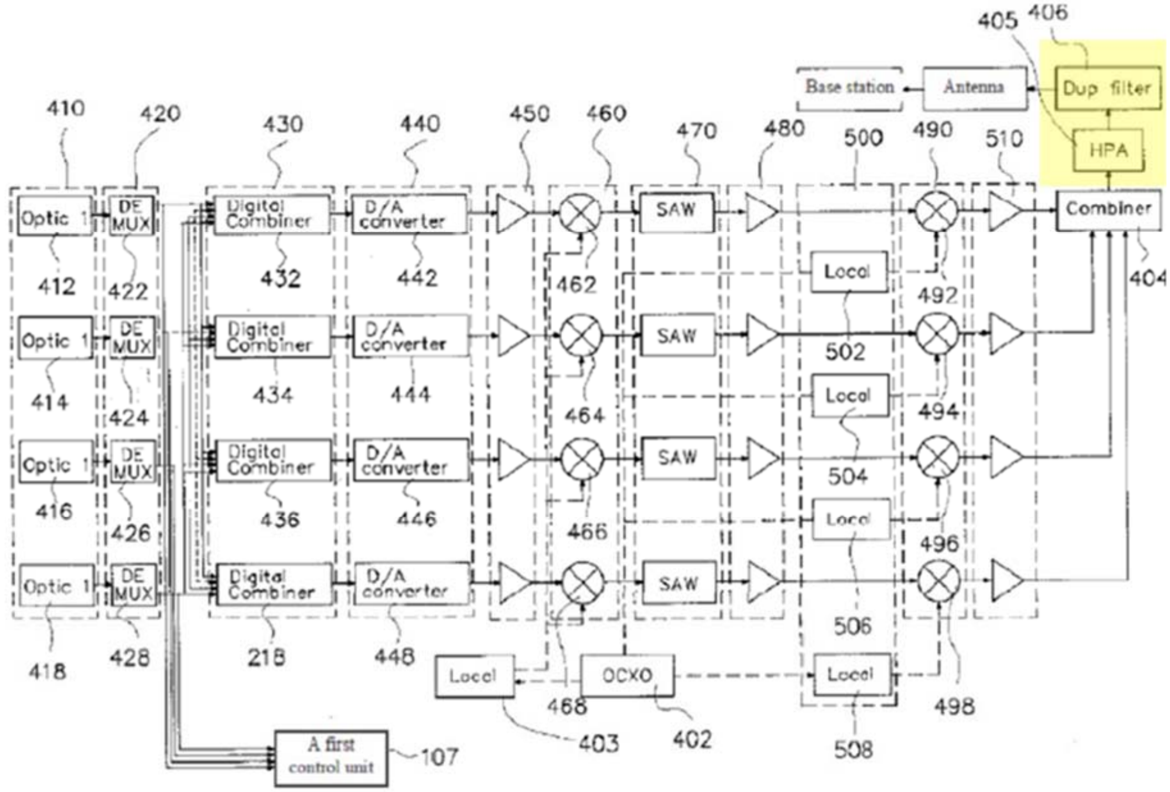


Fig. 5 illustrates that those bi-directional communications are via a bi-directional amplifier, where Oh's master unit 20 communicates with the base station 10 via a bi-directional filter 406 connected to amplifiers 405.

FIG. 5



A POSITA understands that a bi-directional amplifier comprises a bi-directional duplex filter component to prevent the transmit signal from interfering with the receive channel and an amplifier component. Fig. 5 of Oh illustrates its bi-directional filter 406, which is labeled as a duplex filter, being connected to an antenna for wireless communication with the base station 10.

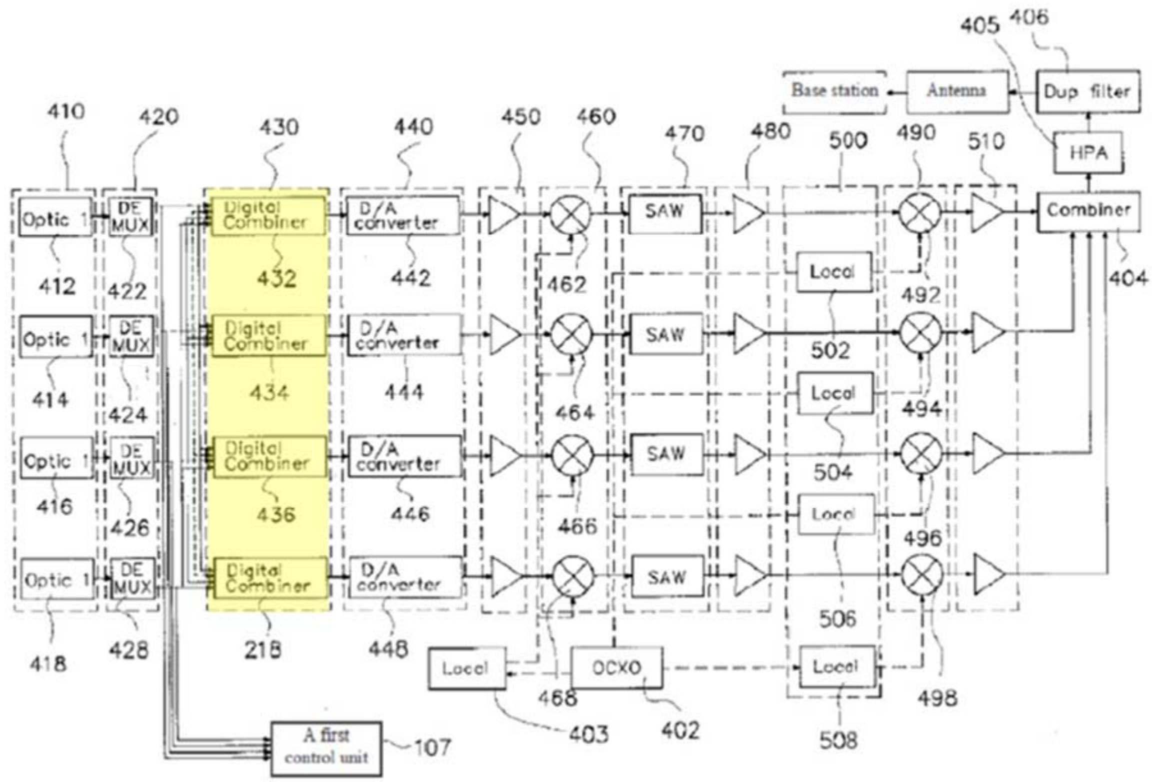
Thus Oh renders obvious the replicated upstream analog wireless radio frequency signal (output from mixers 490) is communicated from the host unit (20) to the at least one base station using at least one bi-directional amplifier (405, 406). Ex. 1005, ¶¶428-431.

8. Dependent Claim 8

Claim 8 recites that "the host unit digitally sums the corresponding upstream digital RF samples received from the plurality of remote units in order to produce the summed upstream digital RF samples at a resolution greater than a resolution of the upstream digital RF samples being summed."

Oh discloses that its A/D converter unit 380 of slave unit 30 samples the downconverted analog signals at each frequency band at 12-bits of resolution. Ex. 1007, 3:38-39; 3:61-64; 4:16. On the reverse path at the master unit 20, digital combiners 432, 434, 436, 438 "creat[e] 14-bit intermediate frequency signals by combining four 12-bit intermediate frequency signals in the same frequency band." *Id*., 5:16-17; Ex. 1005, ¶58.

FIG. 5



Thus Oh renders obvious the host unit (20) digitally sums (at 430) the corresponding upstream digital RF samples received from the plurality of remote units (30) in order to produce the summed upstream digital RF samples at a resolution (14 bits) greater than a resolution (12 bits) of the upstream digital RF samples being summed. Ex. 1005, ¶432.

9. Dependent Claim 9

Claim 9 recites that "the upstream radio frequency spectrum comprises a cellular radio frequency spectrum."

Oh discloses receiving and operations on base station/mobile terminal signals at 800MHz and 1800MHz Ex. 1007, 3:19, 4:40. Those 800MHz and 1800MHz examples are both within the cellular radio frequency spectrum. Ex. 1005, ¶433.

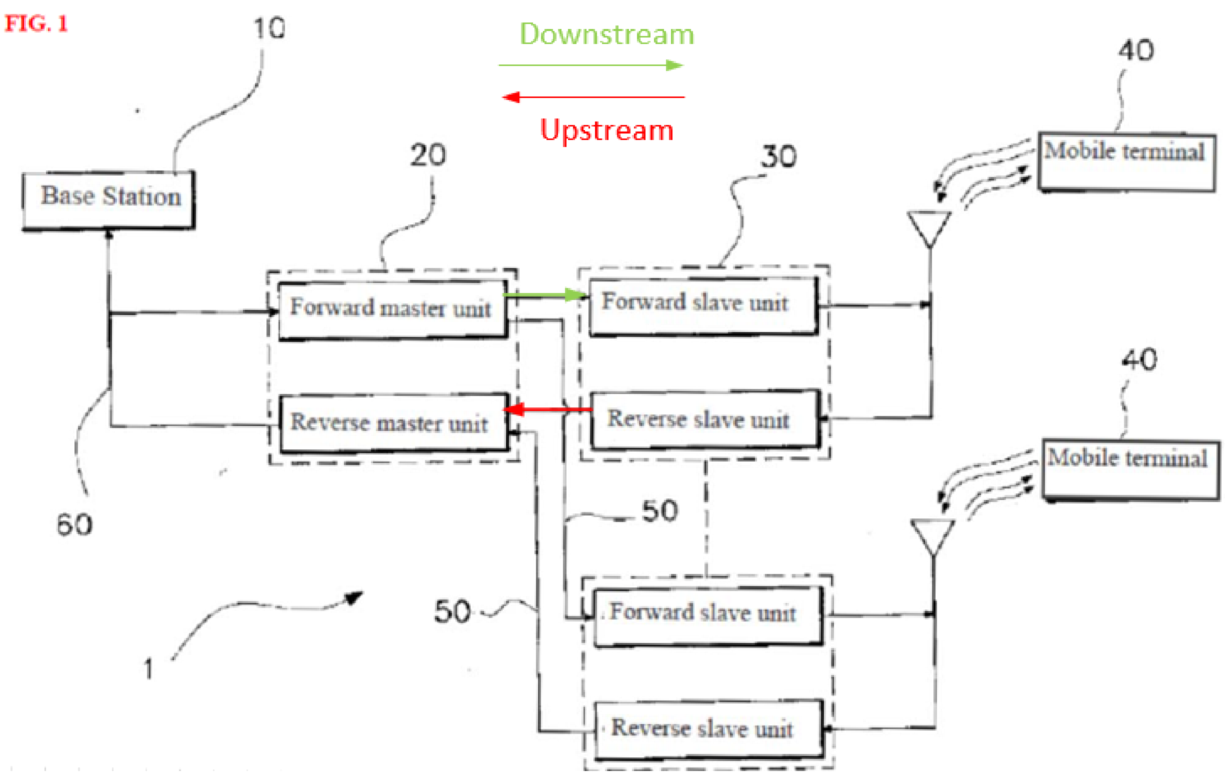
Thus Oh renders obvious the wireless radio frequency spectrum comprises a cellular radio frequency spectrum (800MHz, 1800MHz). *Id.*

10. Dependent Claim 10

Claim 10 recites that "the at least one communication medium comprises at least one of: a single mode optical fiber, a multi-mode optical fiber, and a coaxial cable."

Oh Fig. 1 illustrates master unit 20 communicating in the downstream direction to a slave unit 30 using a first optic line 50, highlighted in green, and in the upstream direction from a slave unit using a second optic line 50 highlighted in red. Thus Oh discloses master unit 20 communicating with each slave unit 30 via fiber pairs.

FIG. 1



Oh is agnostic as to whether multimode or single mode fiber is used. A POSITA would consider selection of multimode or single mode to be a matter of design choice. This is evidenced by Farber which describes the use of single or multimode fiber in an antenna system for reaching difficult coverage areas (*see*, Fig. 1) that is very similar to the digital system of Oh. Ex. 1022 ("Farber"), 4:30-33 ("Preferably the transmitter 14 employs a vertical cavity surface emitting laser or an edge emitting laser coupled to a single or multi-mode fiber 16."); Fig. 2. As further evidence of obviousness of using single mode or multimode fiber, Haas illustrates the cost-benefit analysis of selection of multimode or single mode fiber for an application. Ex. 1012, 1125. A POSITA would have been motivated to select multimode fiber as disclosed by Haas for communicating among a host and remote units when cost is a significant factor for the project. Additionally as disclosed by Haas, in some instances multimode fiber may already be installed in an area into which an RF distribution network is being implemented, making reuse of that multimode fiber an attractive option.

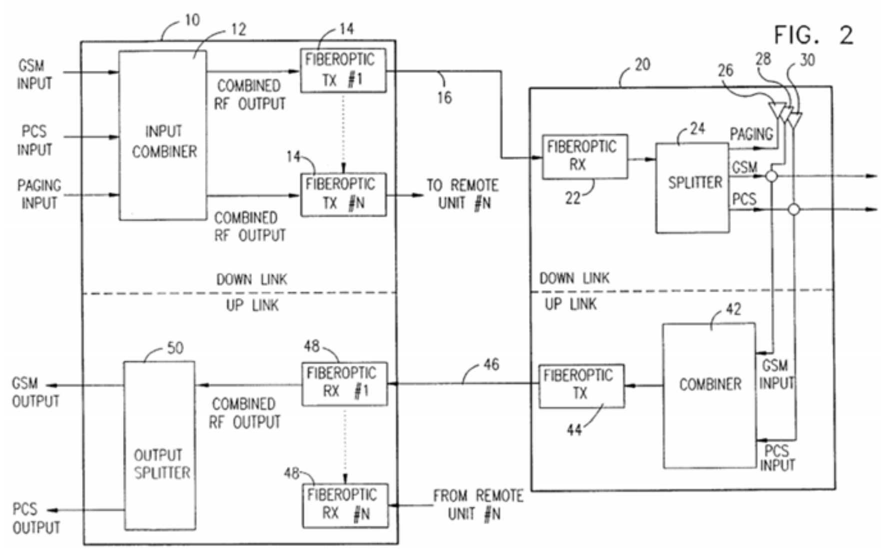


FIG. 2

Thus Oh alone, or in view of Farber renders obvious the digital host unit 20 is coupled to each of the at least two digital remote units 30 by a multimode (*e.g.*, as disclosed by Farber) fiber pair (*see*, red and green annotations between 20, 30 in Oh Fig. 1). Ex. 1005, ¶¶434-436.

11. Independent Claim 12

(a) Preamble: "A host unit for wireless radio frequency signal distribution within a coverage area in which one or more wireless units transmit in an upstream wireless radio frequency spectrum, the host unit comprising:"

Oh discloses the preamble for the reasons discussed above for claim 1, preamble. Ex. 1005, ¶437.

(b) Element 1a: "an interface to communicatively couple the host unit to a plurality of remote units using at least one communication medium,"

Oh discloses master unit 20 is coupled to multiple remote slave units 30 via optic lines 50. That master unit 20 receives analog RF signals from base station 10 and digitizes that analog signal on a per frequency band basis at 180 for communications to slave units 30.

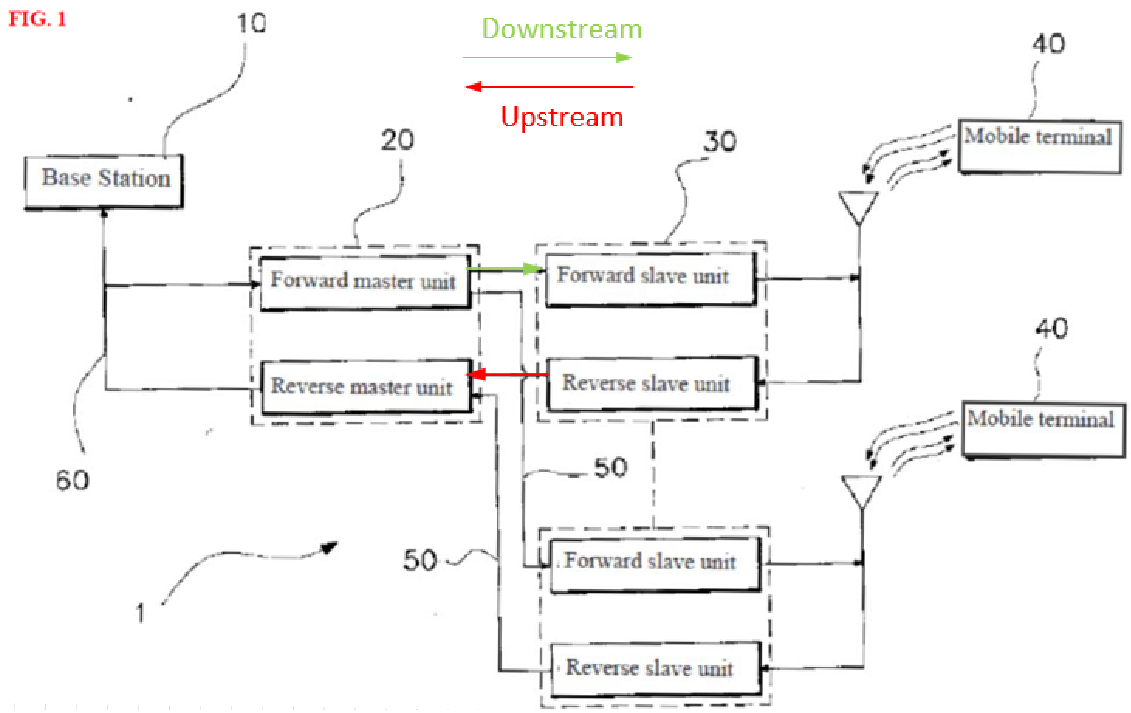
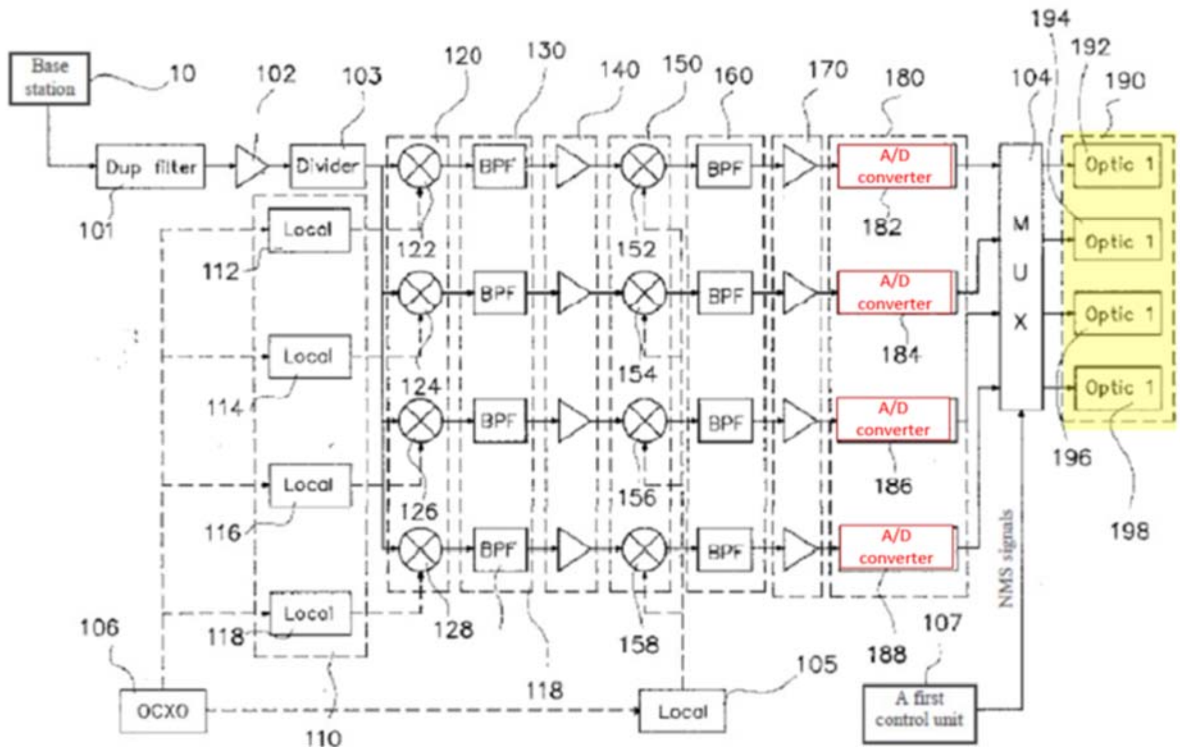


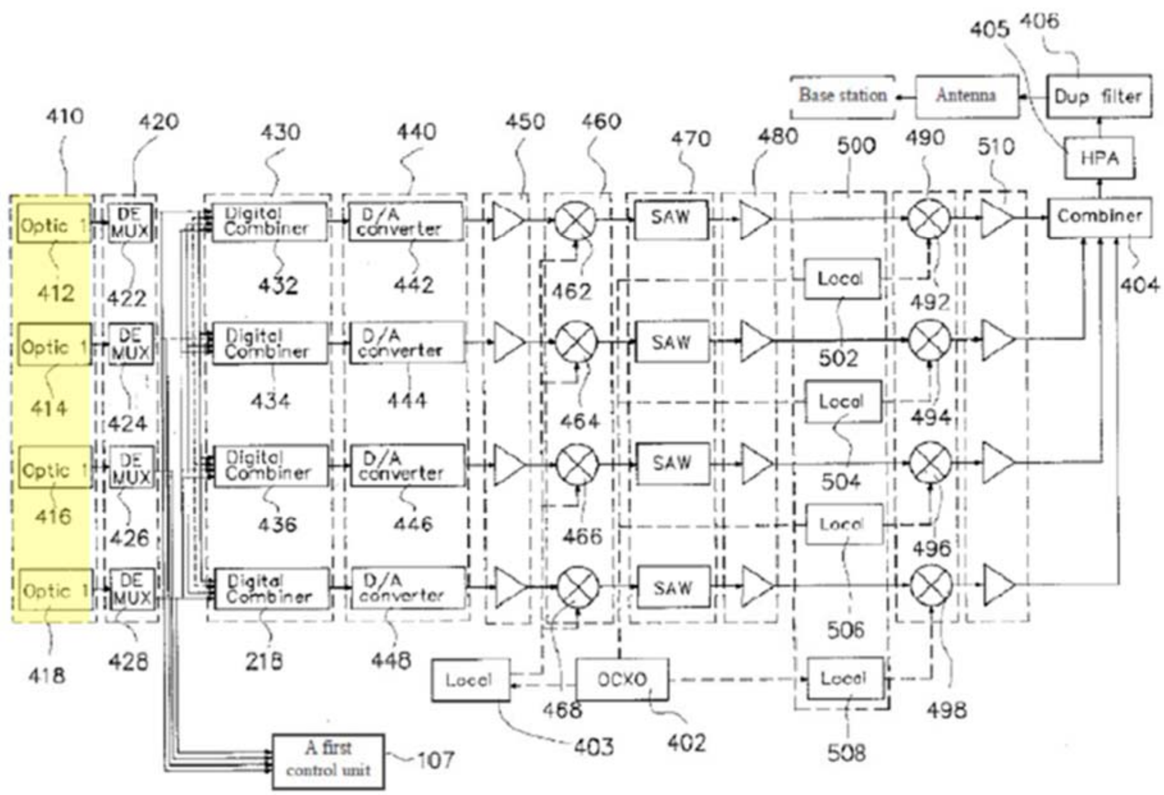
Fig. 2 of Oh depicts optic converter unit 190 that provides a downstream interface between forward master unit 100 of master unit 20 and forward slave unit 200 of remote slave units 30.

FIG. 2



And Fig. 5 illustrates optic converter unit 410 that provides an upstream interface from slave units 30 to master unit 20.

FIG. 5



Thus Oh renders obvious an interface (190, 410) to communicatively couple the host unit (20) to the plurality of remote units (30) using at least one communication medium (50). Ex. 1005, ¶¶438-440.

(c) Elements 1b-1d

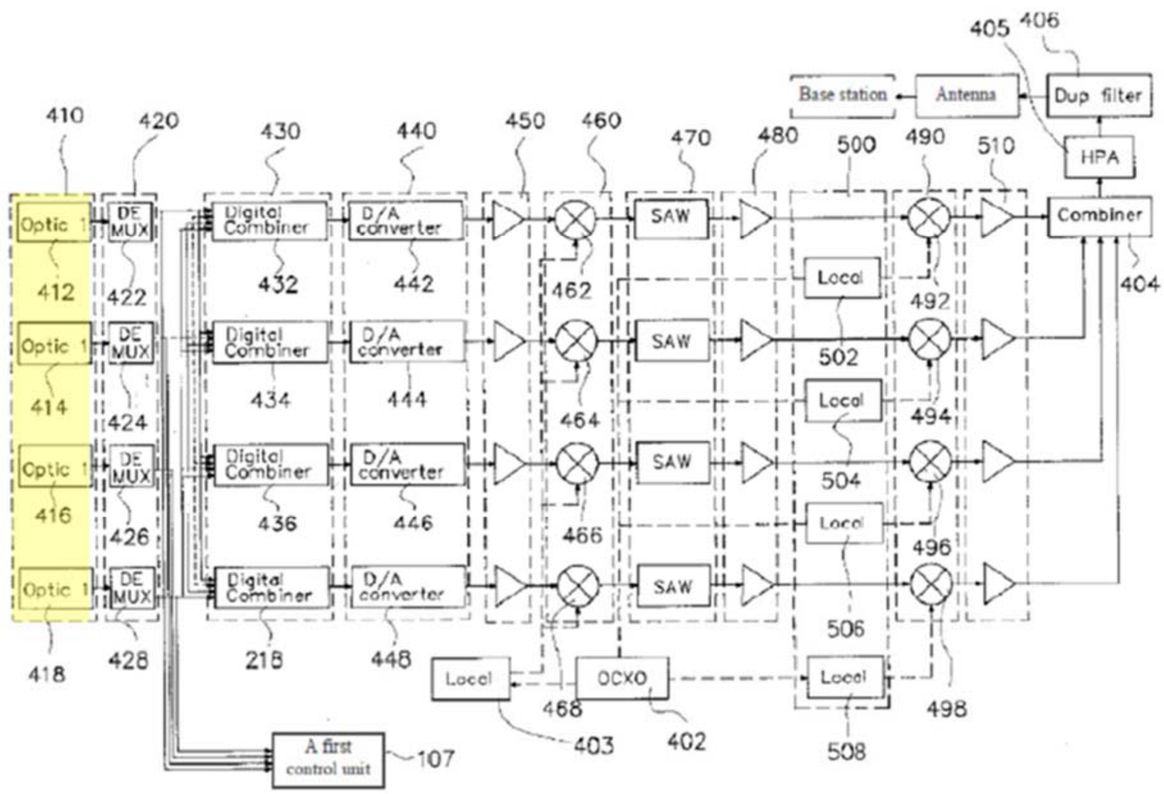
Oh discloses element 1b, 1c, and 1d for the reasons discussed above for claim 1, elements 2b, 3, and 4, respectively. Ex. 1005, ¶441.

(d) Element 1e: "wherein the interface is used to receive the upstream digital RF samples from the plurality of remote units:"

Oh discloses master unit 20 is coupled to multiple remote slave units 30 via optic lines 50. That master unit 20 receives digital samples from slave units 30.

Fig. 5 illustrates optic converter unit 410 that provides an upstream interface from slave units 30 to master unit 20.

FIG. 5



Thus Oh renders obvious the interface (410) is used to receive the upstream digital RF samples from the plurality of remote units (30). Ex. 1005, ¶442.

(e) Element 2: "a digital summer to digitally sum corresponding upstream digital RF samples received from the plurality of remote units to produce summed upstream digital RF samples;"

Oh discloses element 2 for the reasons discussed above for claim 1, element 6. Ex. 1005, ¶443.

(f) Element 3: "a digital-to-analog converter to convert the summed upstream digital RF samples to a replicated upstream analog wireless radio frequency signal."

Oh discloses element 3 for the reasons discussed above for claim 5, element 2b. Ex. 1005, ¶444.

12. Dependent Claim 13

(a) Element 1: "wherein the interface is used to receive, at the host unit, an original downstream analog wireless signal comprising a downstream radio frequency spectrum and any downstream transmissions for the wireless units;"

Oh discloses element 1 for the reasons discussed above for claim 2. Ex. 1005, ¶445.

(b) Element 2: "wherein the host unit further comprises an analog-to-digital converter to digitize the original downstream analog wireless radio frequency signal in order to generate downstream digital RF samples indicative of the original downstream analog wireless signal;"

Oh discloses element 2 for the reasons discussed above for claim 3, element 1. Ex. 1005, ¶446.

(c) Element 3: "wherein the interface is used to communicate the downstream digital RF samples to at least some of the plurality of remote units using the at least one communication medium;"

Oh discloses master unit 20 is coupled to multiple remote slave units 30 via optic lines 50. That master unit 20 receives analog RF signals from base station 10 and digitizes that analog signal on a per frequency band basis at 180 for communications to slave units 30.

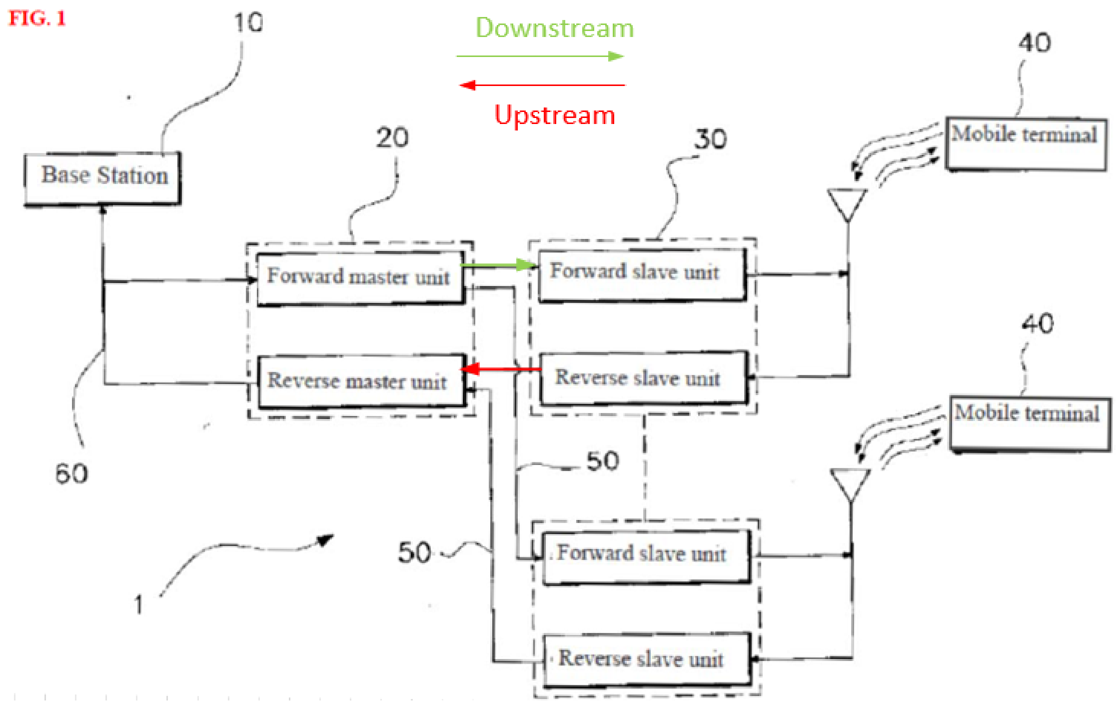
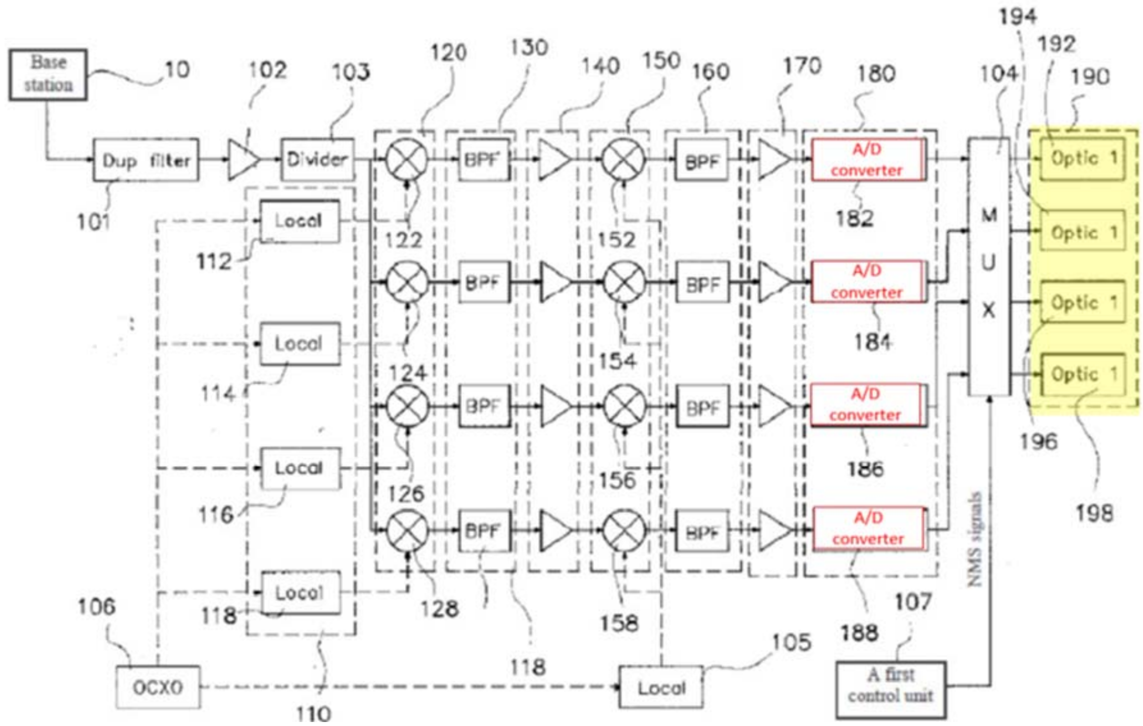


Fig. 2 of Oh depicts optic converter unit 190 that provides a downstream interface between forward master unit 100 of master unit 20 and forward slave unit 200 of remote slave units 30.

FIG. 2



Thus Oh renders obvious the interface (190) is used to communicate the downstream digital RF samples (generated at 180) to at least some of the plurality of remote units (30) using the at least one communication medium (optic line 50). Ex. 1005, ¶¶447-448.

(d) Element 4: "wherein each of the at least some of the plurality of remote units to which the host unit communicates the digital RF samples converts the downstream digital RF samples to a replicated downstream analog wireless radio frequency signal."

Oh discloses element 4 for the reasons discussed above for claim 2, element 4. Ex. 1005, ¶449.

13. Dependent Claim 14

Oh renders dependent claim 14 obvious for the reasons provided above with respect to element 2 of claim 3. Ex. 1005, ¶450.

14. Dependent Claims 16-20

Dependent claims 16-20 are rendered obvious by Oh for the reasons provided above for claims 6-10, respectively. Ex. 1005, ¶451.

15. Dependent Claims 23-24

Dependent claims 23-24 are rendered obvious by Oh for the reasons provided above for claims 8-9, respectively. Ex. 1005, ¶452.

16. Independent Claim 25

(a) Preamble and Element 1: "A method of distributing wireless radio frequency signals within a coverage area in which one or more wireless units transmit in an upstream wireless radio frequency spectrum, the method using a host unit and a plurality of remote units, each of the plurality of remote units being associated with a portion of the coverage area, the method comprising: at each of the plurality of remote units:

Oh discloses the preamble and element 1 for the reasons discussed above for claim 1, preamble-2b. Ex. 1005, ¶453.

(b) Element 2: "receiving a respective original upstream analog wireless signal comprising the upstream radio frequency spectrum and any upstream transmissions from any of the wireless units that are within the portion of the coverage area associated with that remote unit;"

Oh discloses element 2 for the reasons discussed above for claim 1, element 3. Ex. 1005, ¶454.

(c) Element 3: "generating respective upstream digital RF samples indicative of the respective original upstream analog wireless signal received at that remote unit;"

Oh discloses element 3 for the reasons discussed above for claim 1, element 4. Ex. 1005, ¶455.

(d) Element 4: "communicating the respective upstream digital RF samples generated by that remote unit to the host unit using at least one communication medium;"

Oh discloses element 4 for the reasons discussed above for claim 1, element 2a. Ex. 1005, ¶456.

(e) Element 5: "at the host unit: digitally summing corresponding upstream digital RF samples received from the plurality of remote units to produce summed upstream digital RF samples;"

Oh discloses element 5 for the reasons discussed above for claim 1, element 6. Ex. 1005, ¶457.

(f) Element 7: "converting the summed upstream digital RF samples to a replicated upstream analog wireless radio frequency signal."

Oh renders element 7 obvious for the reasons provided above with respect to claim 1, element 7. Ex. 1005, ¶458.

17. Dependent Claims 27-28

Oh renders dependent claims 27-28 obvious for the reasons provided above with respect to claims 8-9, respectively. Ex. 1005, ¶459.

C. Ground 1b: Claims 11, 15, 21-22, and 26 Are Obvious Over Oh in view of Schwartz

1. Motivation to Combine

A person of ordinary skill in the art would be motivated to combine the disclosures of Oh and Schwartz for a variety of reasons. As an initial matter, Oh expressly mentions the types of all-analog RF distribution system described by Schwartz in its "Conventional Technology" section, where Oh notes that in those systems where "the RF signals transmitted/received to/from said first optic repeater and a second optic repeater are analog signals, the strength of the signals is greatly decreased during transmission through the optical line." Ex. 1007, 2:29-30. The resulting needed amplification can cause signal-to-noise ratio issues in the analog signals that ultimately reach destinations at the host or remote units. *Id.*, 2:30-33. Because Oh expressly discusses the types of conventional, all-analog systems described in Schwartz, a POSITA would have recognized compatibilities in those systems and that Oh's digital relay improvements would have been applicable to Schwartz-type topologies (*i.e.*, topologies that incorporate intermediate stations 28 for distribution network expansion).

Additionally, a POSITA starting with Oh would have readily recognized a limitation in Oh's disclosure, where an RF distribution topology would have been limited to the number of remote slave units 30 corresponding to the number of master unit 20 optical ports (*i.e.*, four optic converters 192, 194, 196, 198 on the downstream path and four optic converters 412, 414, 416, 418 on the upstream path limit master unit

20 to connection to four slave units 30). Schwartz's topology that supports intermediate stations 28 for RF distribution network expansion beyond the number of physical ports available at the host (*i.e.*, central station 20). Fig. 1 of Schwartz depicts the ability to daisy-chain intermediate stations 28 together such that a Schwartz network can be expanded to "any number of intermediate stations 28 and/or remote stations 22." Ex. 1010, 4:33-38. Thus a POSITA starting with Oh but looking to provide a large RF distribution network (*e.g.*, in a large building, a sports arena) would be motivated to utilize Schwartz intermediate stations 28 to facilitate that expansion. Ex. 1005, ¶¶460-461.

2. Dependent Claim 11

(a) Element 1: "a digital expansion unit that is communicatively coupled to the host unit;"

Element 1 is rendered obvious by Oh in view of Schwartz.

Schwartz discloses an RF distribution network whereby external RF signals are transmitted to remote stations for wireless transmission via a central station 20. Schwartz discloses that remote stations may be directly connected to the central station 20 or through intermediate stations 28, where each intermediate station 28 may be connected to multiple remote stations 22. And further intermediate stations 28 may be connected to additional intermediate stations 28 to act as signal relays between central station 20 and remote stations 22. Such intermediate stations 28 enable topologies that "connect central station 20 directly to any number of intermediate stations 28 and/or remote stations 22." Ex. 1010, 4:33-38.

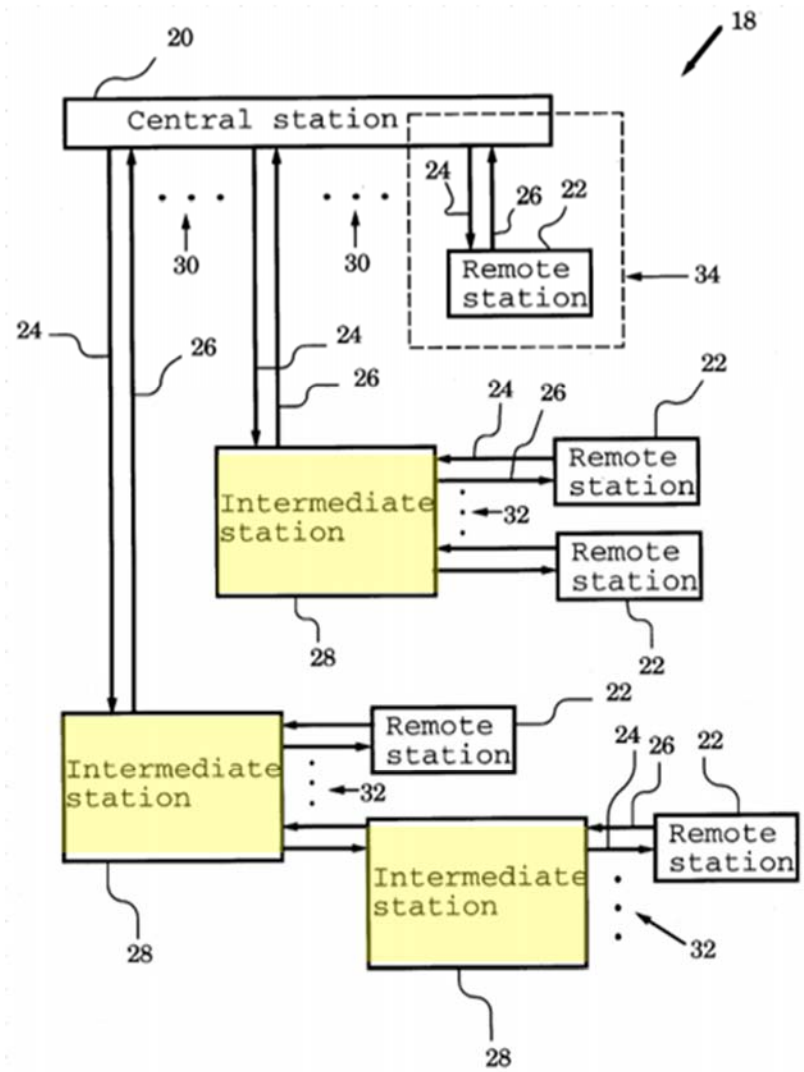


FIG. 1

As described above, a POSITA would have been motivated to incorporate Schwartz intermediate stations 28 into Oh's system to enable connection to more remote units (*e.g.*, slave units 30), where Oh's system was limited in the number of slave units 30 to which master unit 20 could be connected by master unit 20's optical ports (*e.g.*, four ports in Figs. 2 & 5). Thus Oh in view of Schwartz renders obvious a digital expansion unit (Schwartz intermediate station 28) coupled to the host unit (Oh master unit 20). Ex. 1005, ¶¶462-463.

(b) Element 2: "a second plurality of remote units that are communicatively coupled to the digital expansion unit;"

As noted above, a POSITA would have been motivated to incorporate Schwartz-type intermediate stations 28 to enable RF distribution network expansion. Schwartz discloses remote stations 22 that are connected directly to the central station 20 at 34, as well as several remote stations 22 connected to expansion intermediate stations 28.

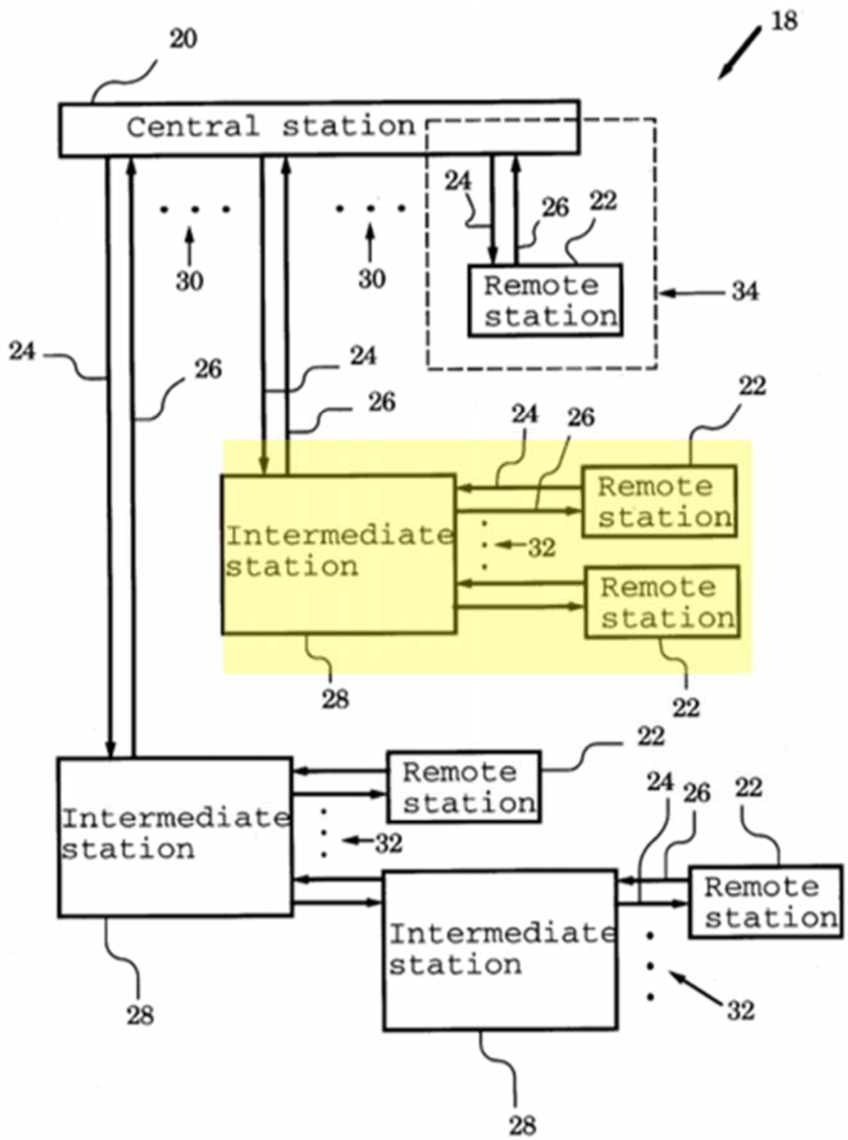


FIG. 1

Thus Oh in view of Schwartz renders obvious a second plurality of remote units (remote station 22) that are communicatively coupled to the digital expansion unit (intermediate station 28). Ex. 1005, ¶464.

(c) Elements 3-5

Oh discloses elements 3-5 for the reasons discussed above for claim 1, elements 3-5, respectively. Ex. 1005, ¶465.

(d) Elements 6-7: "wherein the digital expansion unit digitally sums corresponding upstream digital RF samples received from the second plurality of remote units to produce summed upstream digital RF samples; wherein the digital expansion unit communicates the summed upstream digital RF samples to the host unit;

As detailed above with reference to claim 1, element 6, a POSITA would have considered it obvious to use intermediate units, such as intermediate station 28 of Schwartz to provide expanded coverage of an RF distribution network like the one disclosed in Oh. As depicted in Fig. 7a of Schwartz, those intermediate stations 28 forward RF signals received from upstream (*e.g.*, at 120) to multiple downstream units (*e.g.*, remote stations 22 and/or other intermediate stations 28 via 126, 128). And those intermediate stations 28 further receive RF signals from multiple downstream units (*e.g.*, at 130, 132), combine those received RF signals, and forward the combined signal to an upstream unit (*e.g.*, at 124).

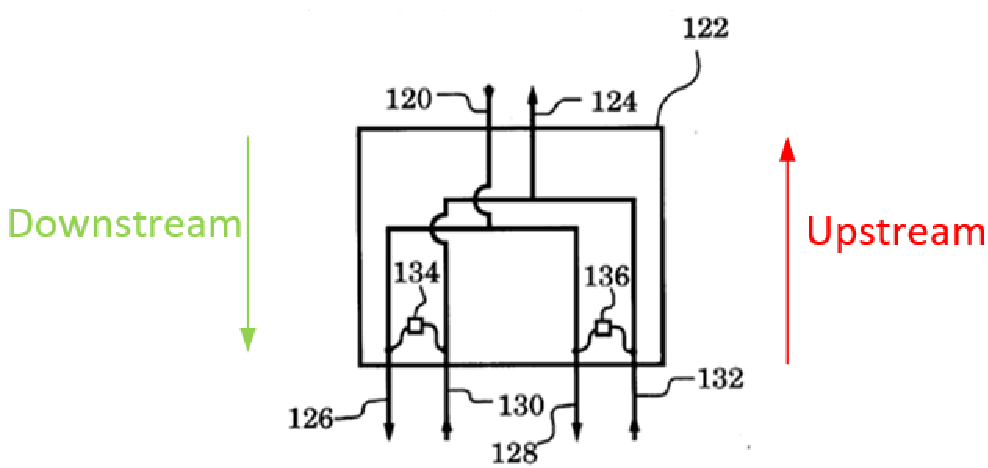


FIG. 7a

Thus when connected between central station 20 two remote stations 22, as the highlighted intermediate station 28 is in Fig. 1 below, Oh in view of Schwartz renders obvious an expansion unit (28) that combines signals received from the second plurality of remote units to provide combined RF signals. As noted above, Schwartz's combining is combining analog signals, accomplished by applying signals from remote stations to a common line that is forwarded to the central station. The obviousness combination of Oh and Schwartz would be operating in a digital domain. The digital version of Schwartz's analog combining is digitally summing the signals received at the intermediate station from the multiple remote station before forwarding those sums to the central station. Ex. 1005, ¶466. Thus Oh in view of Schwartz renders obvious the digital expansion unit digitally summing corresponding upstream digital RF samples received from the second plurality of remote units (22) to produce summed upstream digital RF samples (124); wherein the digital expansion unit (28) communicates the summed upstream digital RF samples to the host unit (20). *Id.*, ¶¶466-467.

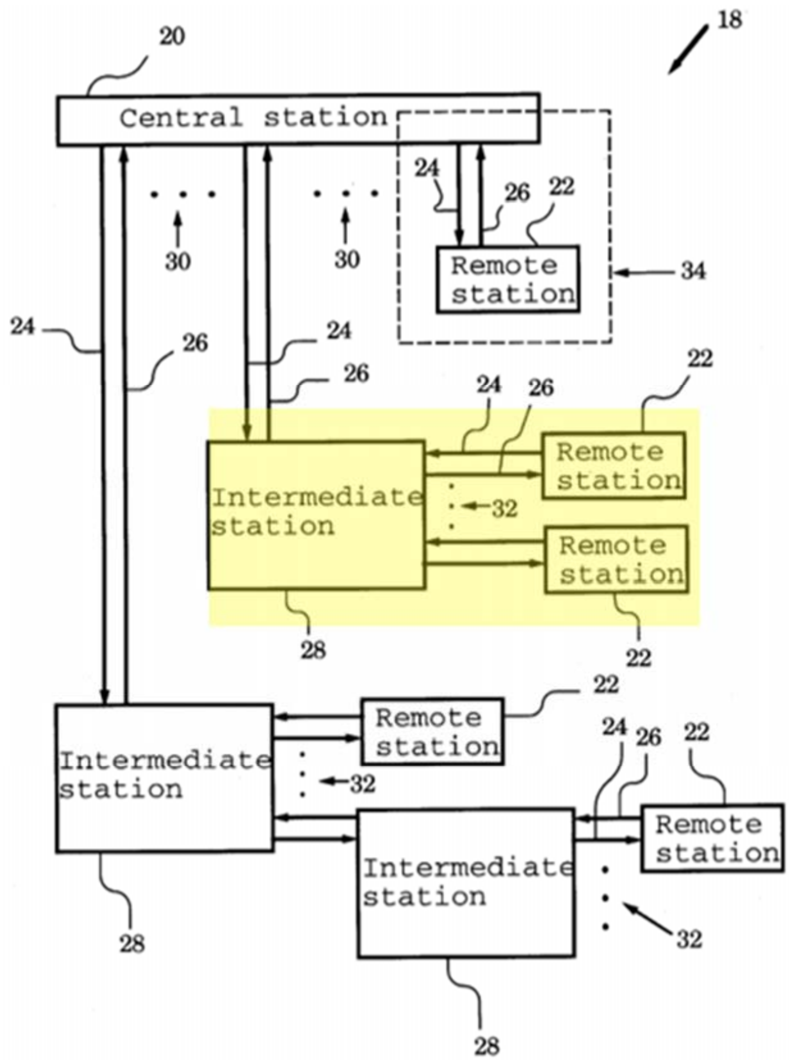


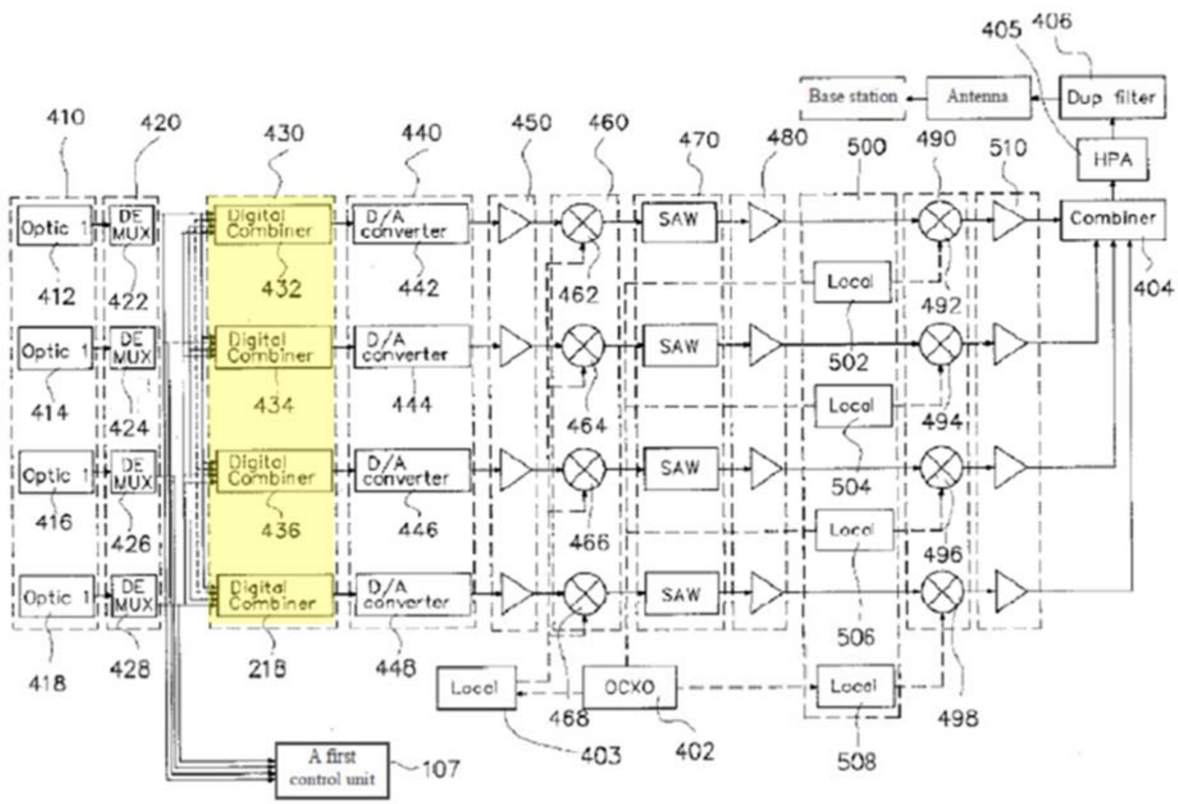
FIG. 1

(e) **Element 8: "wherein the host unit digitally sums the upstream digital RF samples received from the digital expansion unit with corresponding digital RF samples received from the plurality of remote units."**

As detailed above with reference to elements 6-7, a POSITA would have considered it obvious to use intermediate units, such as intermediate station 28 of Schwartz to provide expanded coverage of an RF distribution network like the one disclosed in Oh. The central station of Schwartz receives signals from both remote stations and intermediate stations. It would be obvious to utilize functionality of Oh's master unit to provide digital operations.

As described in claim 1, element 6, Oh's master unit 20 includes a digital combiner unit 430 that aggregates digital signals transmitted from each demultiplexer 422, 424, 426, 428 of demultiplexer unit 420. Ex. 1007, 4:68-70.

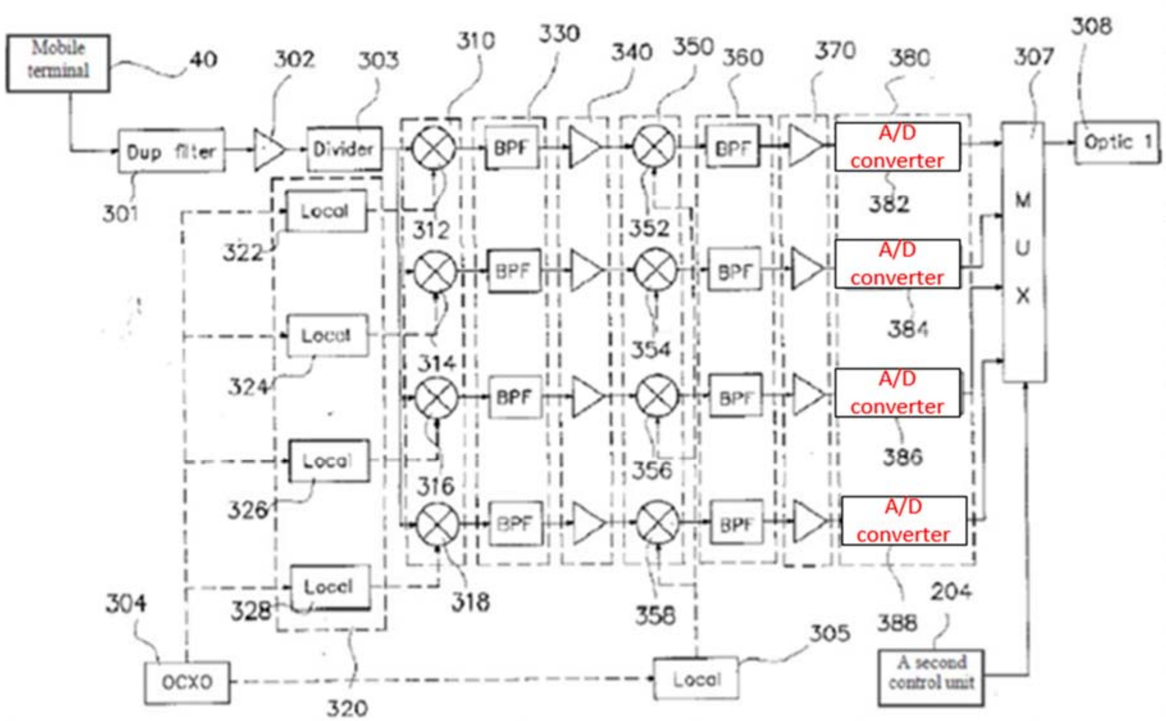
FIG. 5



Those demultiplexers at 420 receive data from individual remote slave units 30 at 410.

As depicted in Fig. 4, each slave unit 30 receives an analog signal from mobile terminals 40, divides the received analog signal into its component frequency bands at 303 and downconverts the frequency band signals to near DC at 310-370. Ex. 1007, 4:26-34. The downconverted band signals are then sampled at 380 to create 12-bit digitized radio frequency signals. *Id.*, 4:56-61. The multiplexer 307 multiplexes the four 12-bit samples with 4 bits of control data from 204 to form 52-bit serial data signals that are forwarded to master unit 20. *Id.*

FIG. 4



Referring back to Fig. 5, each demultiplexer 422, 424, 426, 428 receives a 52-bit signal from its respective slave unit 30. Each demultiplexer forwards 12-bits of sample data to the appropriate digital combiner associated with the proper frequency band for that 12-bit sample and forwards its 4 bits of control data to control unit 107. Upon receiving four 12-bit signals (one from each of demultiplexer 422, 424, 426, 428), each digital combiner 432, 434, 436, 438 "creat[es a] 14-bit intermediate frequency signal[] by combining four 12-bit intermediate frequency signals in the same frequency band." Ex. 1005, ¶¶80, 58; 1007, 5:16-17. Those 14-bit signals are then converted to analog signals at 440, upconverted, combined, and transmitted to the base station 10. *Id.*, 5:17-29.

Thus the combination of Oh and Schwartz renders obvious the host unit (Oh master unit 20) digitally sums the upstream digital RF samples (output from A/D converter unit 380 of slave unit 30) received from the digital expansion unit (Schwartz intermediate station 28) with corresponding digital RF samples received from the plurality of remote units (Schwartz remote station 22). Ex. 1005, ¶¶468-472.

3. Dependent Claim 15

(a) Element 1: "wherein each of the plurality of remote units frames the respective upstream digital RF samples for communication to the host unit as a respective upstream framed signal;"

Oh discloses element 1 for the reasons discussed above for claim 5, elements 1b. Ex. 1005, ¶473.

(b) Element 2: "wherein the host unit comprises at least one demultiplexer to extract the respective upstream digital RF samples from the respective upstream framed signals received from the plurality of remote units.

Oh discloses element 2 for the reasons discussed above for claim 5, elements 2-2a. Ex. 1005, ¶474.

4. Independent Claim 21

(a) Preamble: "A digital expansion unit for wireless radio frequency signal distribution within a coverage area in which one or more wireless units transmit in an upstream wireless radio frequency spectrum, the digital expansion unit comprising:"

Oh discloses the preamble for the reasons discussed above for claim 11 and claim 1, preamble. Ex. 1005, ¶475.

(b) Element 1: "a host unit interface to communicatively couple the digital expansion unit to a host unit;"

Oh discloses master unit 20 is coupled to multiple remote slave units 30 via optic lines 50.

FIG. 1

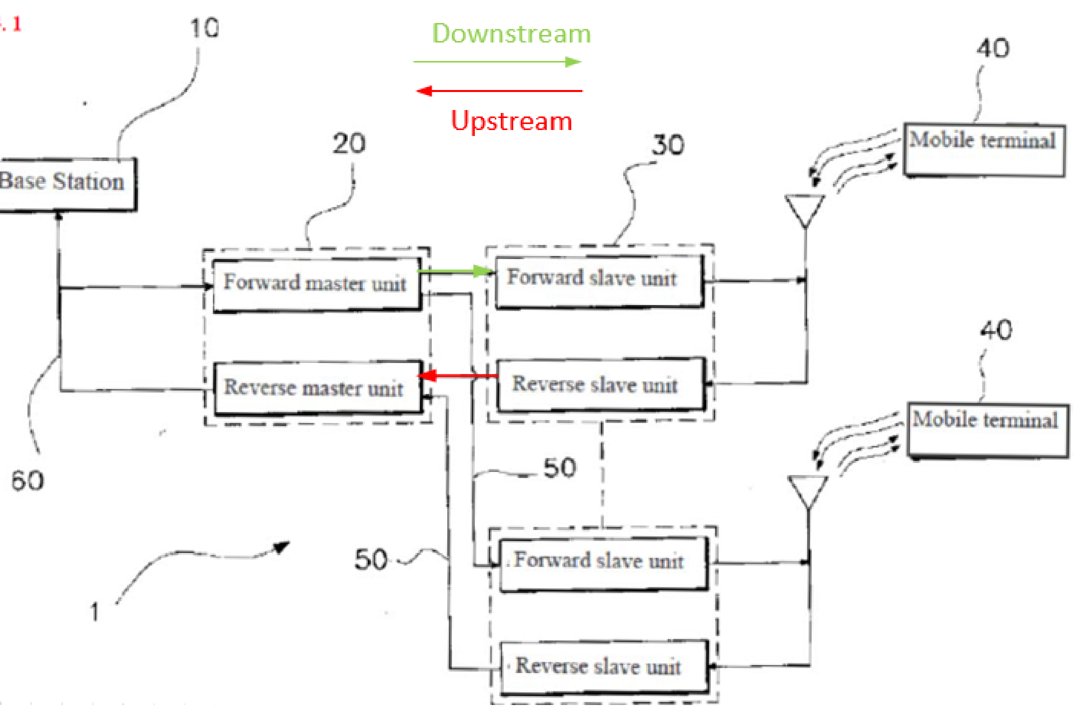
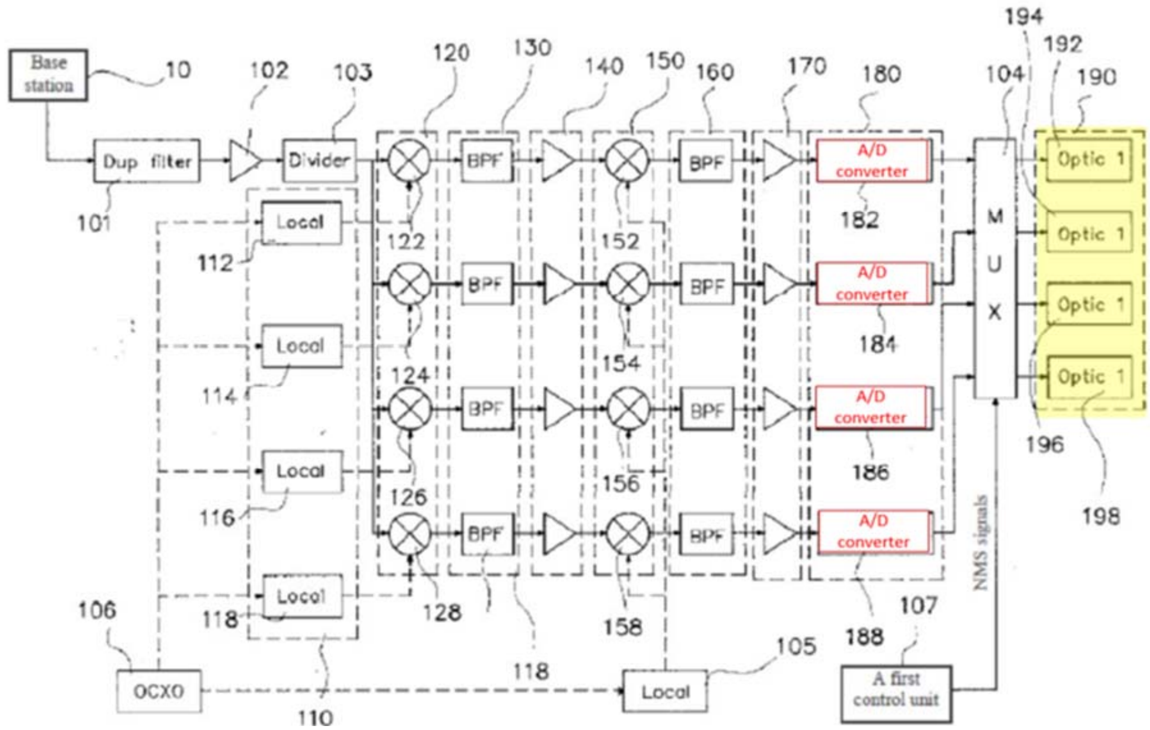


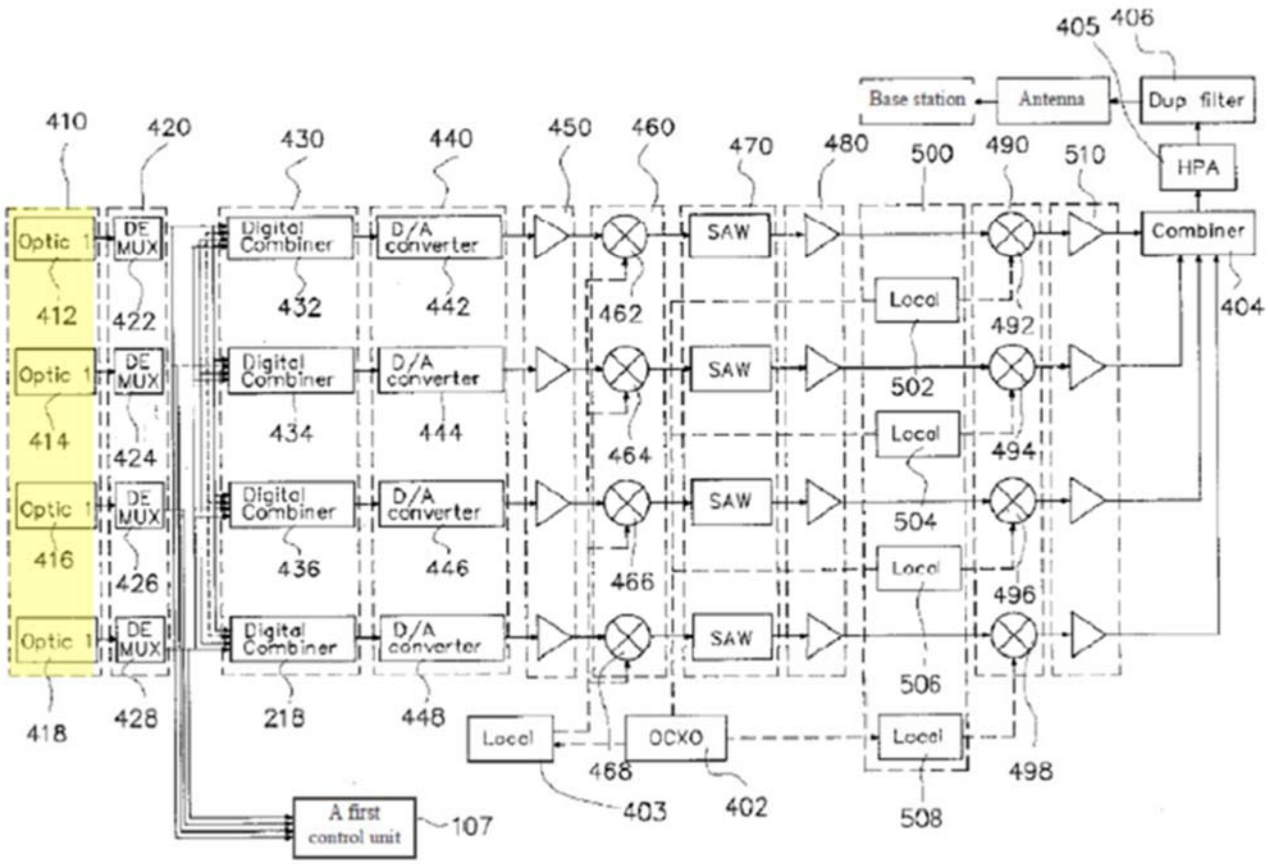
Fig. 2 of Oh depicts optic converter unit 190 that provides a downstream interface between forward master unit 100 of master unit 20 and forward slave unit 200 of remote slave units 30.

FIG. 2



And Fig. 5 illustrates optic converter unit 410 that provides an upstream interface from reverse master unit 300 of slave units 30 to reverse master unit 400 of master unit 20.

FIG. 5



Schwartz describes a digital expansion unit for the reasons provided above for element 1 of claim 11.

Thus Oh in view of Schwartz renders obvious a host unit interface (190, 410) to communicatively couple the digital expansion unit (Schwartz intermediate station 28) to a host unit (Oh master unit 20). Ex. 1005, ¶¶476-480.

(c) Element 2a: "a remote unit interface to communicatively couple the digital expansion unit to a plurality of remote units,"

Schwartz discloses remote stations 22 that are connected directly to the central station 20 at 34, as well as several remote stations 22 connected to expansion intermediate stations 28. Schwartz describes a pair of cables (*e.g.*, "downlink cable 24 and uplink cable 26" that "connect central station 20 directly to any number of intermediate stations 28 and/or remote stations 22." Ex. 1010, 4:35-38.

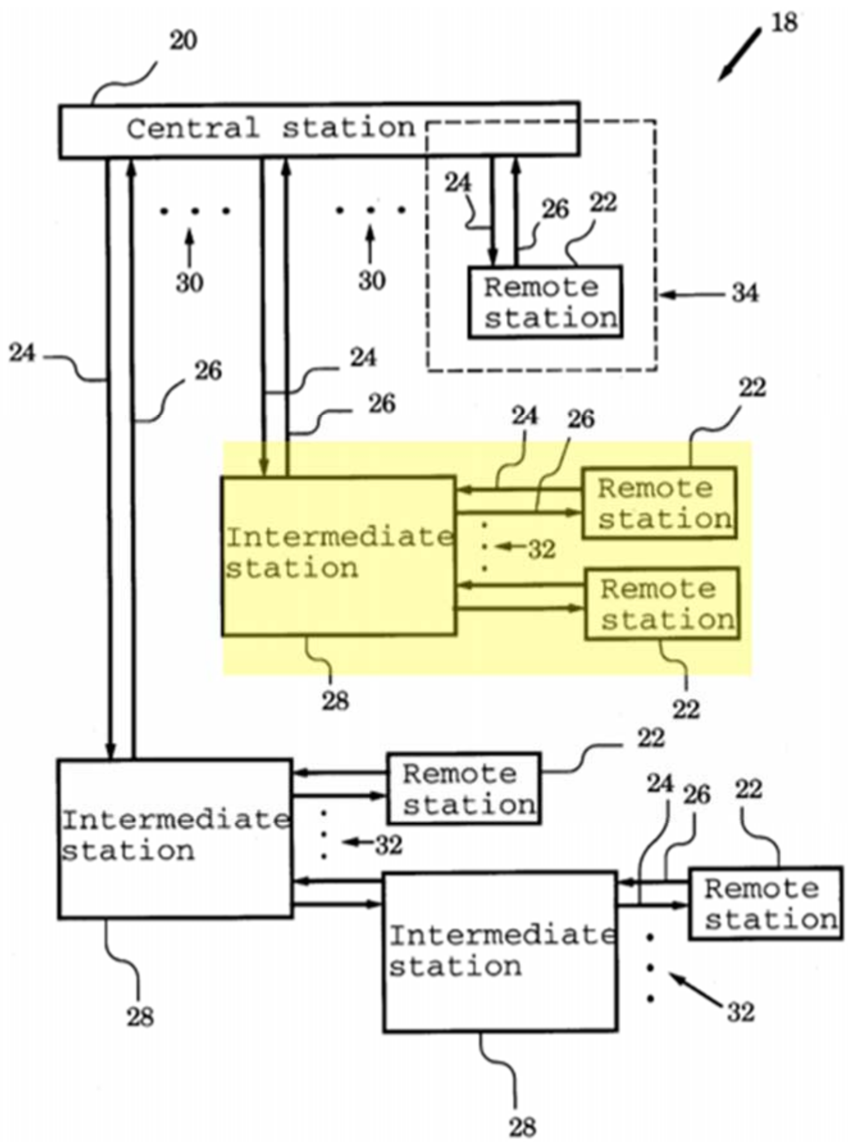


FIG. 1

Schwartz's intermediate stations 28 "preferably are repeaters" (4:38-39), where example intermediate station 28 implementation details are shown in Fig. 7a. Ex. 1010, 10:13-15.

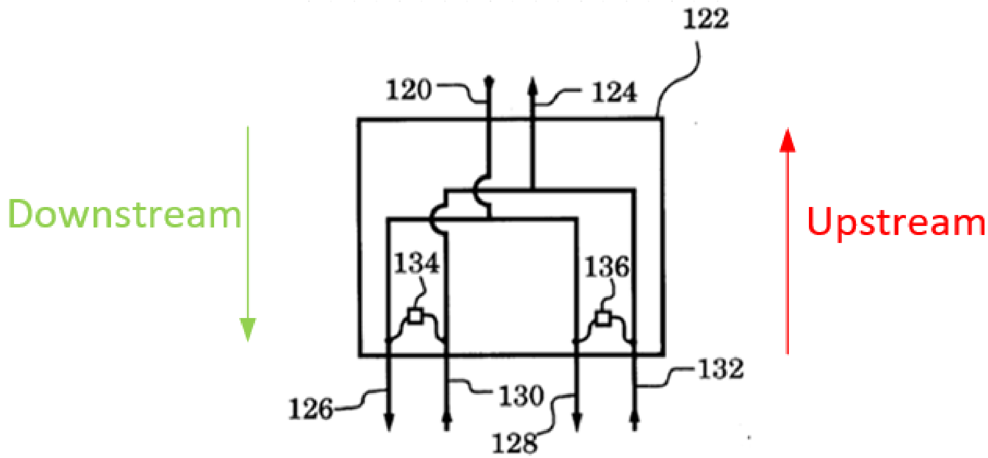


FIG. 7a

In the downstream direction (top to bottom in the figure), "downlink connection 120 splits into two secondary downlink connections 126 and 128 before exiting station 122." Ex. 1010, 10:15-18. In the upstream direction, "uplink connection 124 is fed by two secondary uplink connections 130 and 132." *Id.*, 10:19-20. In that uplink operation, signals from downstream units (*e.g.*, remote units) are received at 130, 132 and applied to a common uplink connection line 124, aggregating the analog signals received on those lines. Ex. 1005, ¶¶481-482.

Thus Oh in view of Schwartz renders obvious a remote unit interface (connection between 22/28) to communicatively couple the digital expansion unit (28) to a plurality of remote units (22). Ex. 1005, ¶483.

(d) Element 2b: "wherein each of the plurality of remote units is associated with a portion of the coverage area"

Oh discloses element 2b for the reasons discussed above for claim 1, element 2b. Ex. 1005, ¶484.

(e) Element 2c: "each of the plurality of remote units receives a respective original upstream analog wireless signal comprising the upstream radio frequency spectrum and any upstream transmissions from any of the wireless units that are within the portion of the coverage area associated with that remote unit"

Oh discloses element 2c for the reasons discussed above for claim 1, element 3. Ex. 1005, ¶485.

(f) Element 2d: "wherein each of the plurality of remote units generates respective upstream digital RF samples indicative of the respective original upstream analog wireless signal received at that remote unit,"

Oh discloses element 2d for the reasons discussed above for claim 1, element 4. Ex. 1005, ¶486.

(g) Element 2e: "wherein the remote unit interface is used to receive the upstream digital RF samples from the plurality of remote units,"

Oh discloses element 2e for the reasons discussed above for claim 12, element 1e. Ex. 1005, ¶487.

(h) Element 3: "a digital summer to digitally sum corresponding upstream digital RF samples received from the plurality of remote units to produce Summed upstream digital RF samples;"

Oh discloses element 3 for the reasons discussed above for claim 1, element 6. Ex. 1005, ¶488.

(i) Element 4: "wherein the digital expansion unit communicates at least a portion of the summed upstream digital RF samples to the host unit."

Oh discloses element 4 for the reasons discussed above for claim 11, elements 6-7. Ex. 1005, ¶489.

5. Dependent Claim 22

(a) Element 1: "wherein each of the plurality of remote units frames the respective upstream digital RF samples for communication to the digital expansion unit as a respective upstream framed signal;"

Oh discloses element 1 for the reasons discussed above for claim 15, element 1. Ex. 1005, ¶490.

(b) Elements 2-3: "wherein the digital expansion unit comprises at least one demultiplexer to extract the respective upstream digital RF samples from the respective upstream framed signals received from the plurality of remote units; wherein the digital expansion unit comprises a multiplexer to frame the summed upstream digital RF samples for communication to the host unit."

As depicted in Fig. 7a of Schwartz, those intermediate stations 28 forward RF signals received from upstream (*e.g.*, at 120) to multiple downstream units (*e.g.*, remote stations 22 and/or other intermediate stations 28 via 126, 128). And those intermediate stations 28 further receive RF signals from multiple downstream units (*e.g.*, at 130, 132), combine those received RF signals, and forward the combined signal to an upstream unit (*e.g.*, at 124).

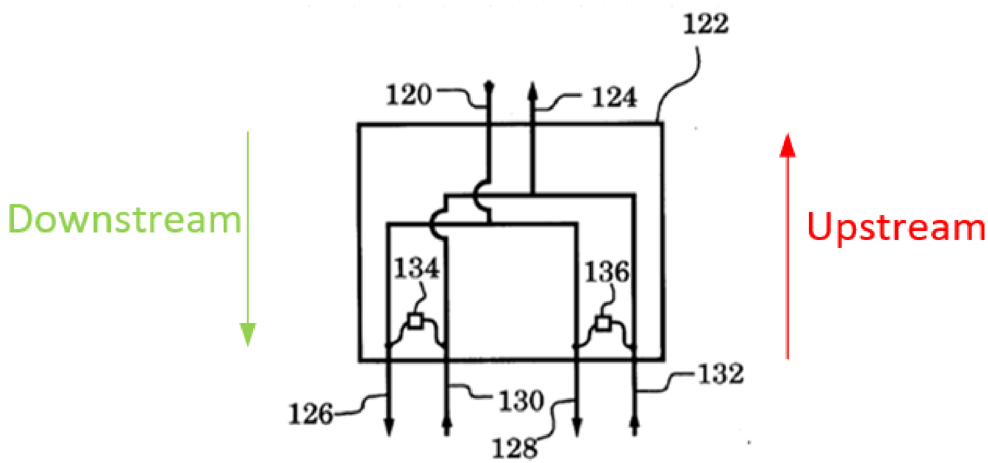
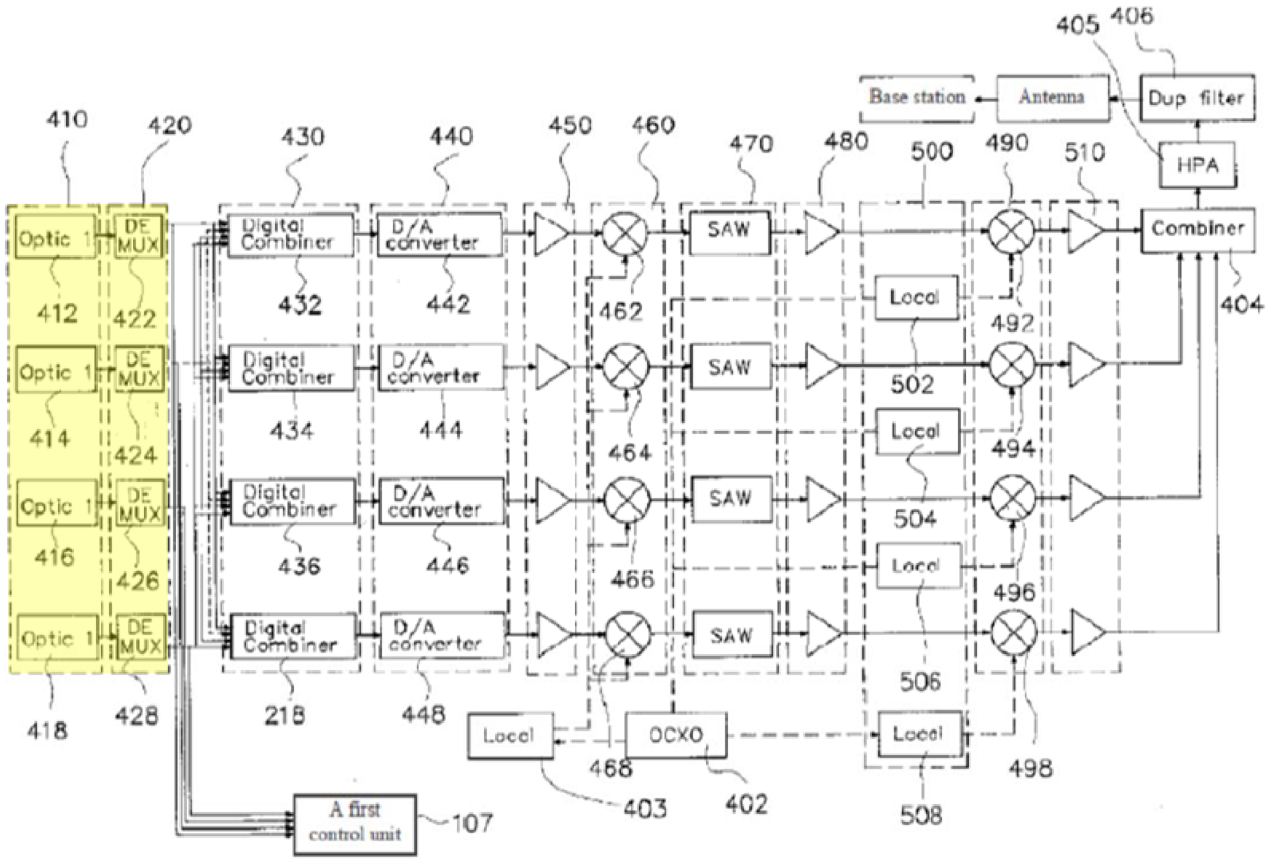


FIG. 7a

As previously discussed, Oh expressly discusses the types of conventional, all-analog systems described in Schwartz, a POSITA would have recognized compatibilities in those systems and that Oh's digital relay improvements would have been applicable to Schwartz-type topologies (*i.e.*, topologies that incorporate intermediate stations 28 for distribution network expansion).

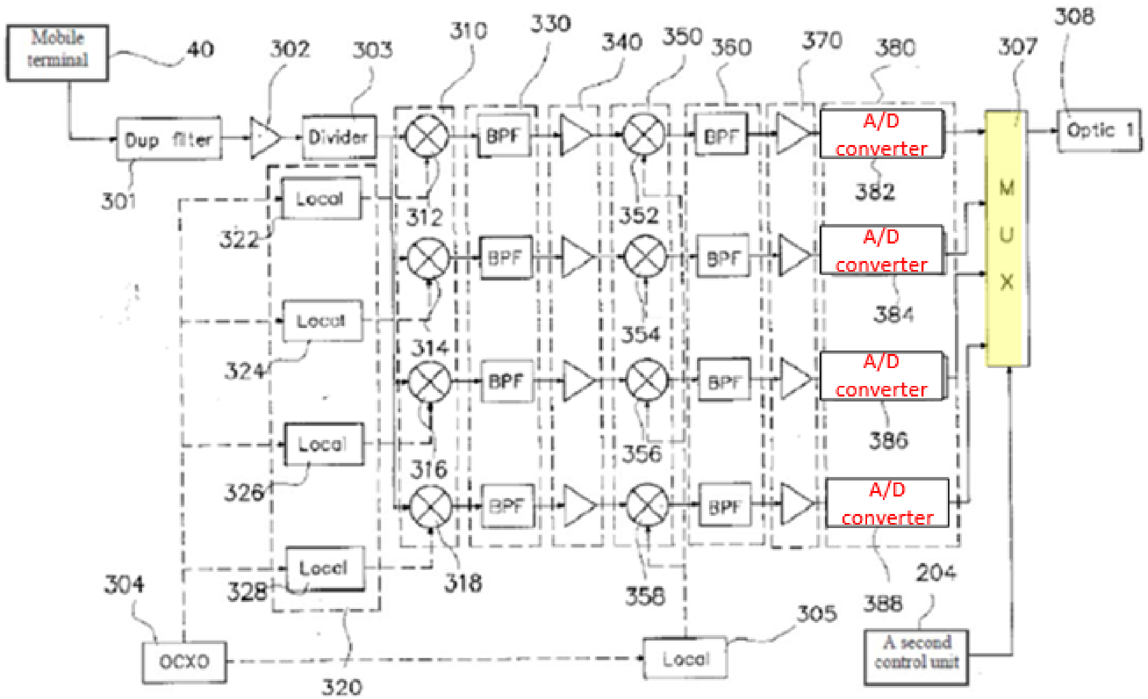
In Schwartz Fig. 7a, two analog signals received at 130, 132 are added to generate the forward signal at 124. Turning to Oh, signals are combined using demultiplexer unit 420 and digital combiner unit 430 to form band sum signals. More specifically, Oh describes each demultiplexer at 420 associated with each of the remote slave units routing digital sample data to its respective frequency band path in the reverse slave unit. Each demultiplexer 422-428 receives digital sample data and control data from one slave unit 30 and separates that digital sample data according to frequency band. *Id.*, 5:4-10. Those demultiplexers at 420 receive data from individual remote slave units 30 at 410.

FIG. 5



Upon generating four frequency band sums at an intermediate station based on digital data from multiple remote stations, it would be obvious to multiplex those four 12-bit band frequency samples, along with any intermediate station control data using a multiplexer, like multiplexer 307 in Oh's slave units, to form 52-bit signals for transmission to the central station/master unit over the optic line 50.

FIG. 4



Thus Oh renders obvious the digital expansion unit (Schwartz intermediate station 28) comprises at least one demultiplexer (Oh 420) to extract the respective upstream digital RF samples (output from A/D converter unit 380) from the respective upstream framed signals received (at 410) from the plurality of remote units (30); wherein the digital expansion unit (Schwartz intermediate station 28) comprises a multiplexer (Oh 307) to frame the summed upstream digital RF samples for communication to the host unit (20). Ex. 1005, ¶¶491-495.

6. Dependent Claim 26

(a) Element 1: "wherein each of the plurality of remote units frames the respective upstream digital RF samples for communication to the digital expansion unit as a respective upstream framed signal;"

Oh discloses element 1 for the reasons discussed above for claim 15, element 1. Ex. 1005, ¶496.

(b) Element 2: "wherein the method further comprises, at the host unit, for each of the plurality of remote units, extracting the respective upstream digital RF samples from the respective upstream framed signal received from that remote unit;"

Oh discloses element 2 for the reasons discussed above for claim 5, elements 2-2a. Ex. 1005, ¶497.

(c) Element 3: "wherein the method further comprises, at the host unit, framing the summed upstream digital RF samples for communication to the host unit."

Oh discloses element 3 for the reasons discussed above for claim 5, element 1b. Ex. 1005, ¶498.

VI. Mandatory Notices Pursuant to 37 C.F.R. § 42.8(a)(1)

Pursuant to 37 C.F.R. § 42.8(a)(1), the mandatory notices identified in 37 C.F.R. § 42.8(b) are provided below as part of this petition.

A. 37 C.F.R. § 42.8(b)(1): Real Parties-In-Interest

SOLiD, Inc., SOLiD Gear, Inc., SOLiD Technologies, Inc., and SOLiD Gear Pte, Ltd. are the real parties-in-interest for Petitioner.

B. 37 C.F.R. § 42.8(b)(2): Related Matters

The ’218 patent was the subject of litigation in *CommScope Technologies LLC v. SOLiD Gear, Inc. et al*., No. 3-20-cv-01285 (N.D. Tx.), filed on May 18, 2020. That litigation was dismissed without prejudice on January 6, 2021. IPR petitions for the remaining asserted patents of this litigation are being filed concurrently herewith.

The ’218 patent is also currently the subject of litigation in *CommScope Technologies LLC v. Dali Wireless Inc.*, No. 3-16-cv-00477 (N.D. Tx.), filed on February 1, 2016, now on appeal to the Federal Circuit in *CommScope Technologies LLC v. Dali Wireless Inc.*, 20-1817; -1818. Petitioner is uninvolved in that litigation.

CommScope Technologies LLC v SOLiD Technologies, Inc. High Court of Justice (Patents Court), Business and Property Courts of England & Wales, Claim number HP-2020-000017, is a further litigation involving the parties here.

C. 37 C.F.R. § 42.8(b)(3), (4): Lead And Back-Up Counsel And Service Information

Petitioner provides the following designation of counsel:

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Pursuant to 37 C.F.R. § 42.10(b), a Power of Attorney accompanies this petition. Please address all correspondence to lead and back-up counsel at the addresses above. Petitioner also consents to electronic service by email at the email addresses listed above.

VII. Conclusion

Petitioner therefore requests that the Patent Office order an IPR trial and then proceed to cancel the challenged claims.

Date: August 12, 2021

Respectfully submitted,

/s/ Matthew W. Johnson

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CERTIFICATE OF SERVICE

The undersigned hereby certifies that a copy of the foregoing petition for *Inter Partes* Review of U.S. Patent No. 8,326,218, including all Exhibits, was served on August 12, 2021 via Express Mail delivery directed to the attorney of record for the patent at the following address:

FOGG & POWERS LLC
4600 W 77th Street
Suite 305
MINNEAPOLIS MN 55435

Additionally, a courtesy copy of the foregoing petition for *Inter Partes* Review of U.S. Patent No. 8,326,218, and the accompanying Declaration of Dr. Jacob Baker, was sent on August 12, 2021 to CommScope's litigation counsel via email to the following addresses:

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Date: August 12, 2021

By: /s/ Matthew W. Johnson

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CERTIFICATE OF WORD COUNT UNDER 37 C.F.R. § 42.24(a)

I, the undersigned, do hereby certify that the attached petition contains 12,702 words, as measured by the Word Count function of Microsoft Word 2016. This is less than the limit of 14,000 words as specified by 37 C.F.R. § 42.24(a)(i).

Date: August 12, 2021

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APPENDIX OF EXHIBITS

EXHIBIT NO.	TITLE
1001	U.S. Patent No. 7,639,982 ("'982 patent")
1002	U.S. Patent No. 8,326,218 ("'218 patent")
1003	U.S. Patent No. 8,577,286 ("'286 patent")
1004	U.S. Patent No. 9,332,402 ("'402 patent")
1005	Declaration of Dr. R. Jacob Baker
1006	'982 Patent File History
1007	Korean Laid-Open Disclosure No: KR1999-0064537 ("Oh")
1008	Acampora Report
1009	Philip M. Wala, "A New Microcell Architecture Using Digital Optical Transport," Philip M. Wala ("Wala"),1993 43rd IEEE Vehicular Technology Conference, 585, (1993) ("Wala")
1010	U.S. Patent No. 5,883,882 ("Schwartz")
1011	K. Ishida et al., "A 10-GHz 8-b multiplexer/demultiplexer chip set for the SONET STS-192 system," IEEE J. Solid-State Circuits, 1936 (1991) ("Ishida")
1012	Zygmunt Haas, "A Mode-Filtering Scheme for Improvement of the Bandwidth-Distance Product in Multimode Fiber Systems," J.

	Lightwave Tech., Vol. 11, No. 7, 1125 (1993) ("Haas")
1013	U.S. Patent No. 5,379,455 ("Koschek")
1014	U.S. Patent No. 5,631,757 ("Bodeep")
1015	U.S. Patent No. 5,265,039 ("Curbelo")
1016	'218 Patent File History
1017	'286 Patent File History
1018	'402 Patent File History
1019	U.S. Patent No. 5,774,789 ("van der Kaay")
1020	U.S. Patent No. 5,606,736 ("Hasler")
1021	U.S. Patent No. 6,496,546 ("Allpress")
1022	U.S. Patent No. 5,969,837 ("Farber")
1023	U.S. Patent No. 4,812,846 ("Noro")
1024	CommScope Complaint
1025	U.S. Patent No. 4,779,064 ("Monser")
1026	Declaration of Maria P. Garcia
1027	U.S. Patent No. 3,783,385 ("Dunn")

1028	U.S. Patent No. 7,359,447 ("Sage")