

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

CISCO SYSTEMS, INC.

Petitioner

v.

ORCKIT IP, LLC

Patent Owner

Case IPR2023-00714

U.S. Patent No. 6,680,904

Claims 1-26

DECLARATION OF HENRY H. HOUH, PH.D.
ON BEHALF OF PETITIONER

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I, Henry H. Houh, declare as follows:

1. My name is Henry H. Houh.
2. I have been retained as an expert witness on behalf of Petitioner Cisco

Systems, Inc. to provide expert opinions on the validity of U.S. Patent No. 6,680,904 (the “’904 patent”).

I. Background

3. I received a Ph.D. in Electrical Engineering and Computer Science from the Massachusetts Institute of Technology (“MIT”) in 1998. I also received a Master of Science degree in Electrical Engineering and Computer Science in 1991, a Bachelor of Science degree in Electrical Engineering and Computer Science in 1989, and a Bachelor of Science degree in Physics in 1990, all from MIT.

4. I am currently self-employed as an independent technical consultant. I am also president of a company, Einstein’s Workshop, that provides supplemental science, technology, engineering, and mathematics (“STEM”) education to children of all ages.

5. I first entered telecommunications in 1987 when I worked as a summer intern at AT&T Bell Laboratories as part of a five-year dual degree program at MIT. I continued to work at AT&T Bell Laboratories as part of this MIT program. While at MIT, I was a teaching assistant (“TA”) in the Electrical

Engineering and Computer Science Department's core Computer Architectures course. I first was a TA as a senior for a role typically reserved for graduate students. I later became head TA. The course covered various topics in computer architectures, as well as programming. As a TA, I helped write homework assignments, lab assignments (including those that involved programming), and exams. I also taught in the recitation sections.

6. Later, as part of my doctoral research at MIT from 1991-1998, I was a research assistant in the Telemedia Network Systems ("TNS") group at the Laboratory for Computer Science. The TNS group built a high-speed gigabit network and created applications that ran over the network. Example applications included ones for remote video capture, processing, and display of video on computer terminals. In addition to working on the design of core network components, designing and building the high-speed links, and designing and writing the device drivers for the interface cards, I also set up the group's web server. Also, I helped to maintain, install, and upgrade the networking devices used within the group, along with other graduate students. Being a networking group, we regularly discussed topic of concern in networking, including network security and the kinds of attacks that were carried out over a network. I used several

network scanning applications, including Nmap, to assess the level of security in our own network.

7. I also helped to build the web pages that initiated the above-mentioned video sessions via a web interface. Vice President Al Gore visited our group in 1996 and received a demonstration of—and remotely drove—a radio-controlled toy car with a wireless video camera mounted on it that was built by our group. This toy car device received commands transmitted over a network from a remote computer, and video data from the toy car was transmitted wirelessly then over a computer network back to the user controller. On occasion, we allowed users visiting our web site to drive the toy car from their remote computer while they watched the video on their computer. The video stream was encoded by TNS-designed hardware, streamed over the TNS-designed network, and displayed using TNS-designed software.

8. I defended and submitted my Ph.D. thesis, titled “Designing Networks for Tomorrow’s Traffic,” in January 1998. As part of my thesis research, I analyzed local area and wide area flows to show a more efficient method for routing packets in a network, based on traffic patterns at the time. The traffic flow data included Ethernet, IP, TCP or UDP, and RTP header information, which I analyzed to come to the conclusions in my thesis.

9. From 1997 to 1999, I was a Senior Scientist and Engineer at NBX Corporation, a start-up that made business telephone systems for streaming packetized audio over data networks instead of using traditional telephone lines. NBX was later acquired by 3Com Corporation.

10. As part of my work at NBX, I designed the core audio reconstruction software algorithms for the telephones, as well as the packet transmission algorithms. I also designed and validated the core packet transport protocol used by the phone system. The protocol was used for all signaling in the phone system, including for the setup of conference calls. The NBX system also featured a computer interface for initiating phone calls, which could also initiate conference calls. The NBX system also supported the Telephony Application Programming Interface (“TAPI”) that allowed other computer programs to integrate with our system telephony features. I also programmed the first prototype of our phone which communicated using IP, and I demonstrated our IP phones working over the Internet when we attended a trade show in California. The phone connected over the Internet to our headquarters in Andover, MA. I also programmed a data capture and analysis system that provided data on the operation of the system.

11. From 1999-2004, I was employed by Empirix or its predecessor company, Teradyne. Empirix was a leader in test tools for telecommunications

protocols and systems, providing functional testing tools as well as load testing tools. From 2000-2001, I conceived and built a test platform for testing Voice-over-IP (VoIP). The first application on this new test platform was a cloud emulator for simulating the effects of transmitting VoIP over a busy network. The test platform was based on a network processor chip, which could be programmed to cut-through packets while processing packet data such as various protocol layer headers including addresses included therein and even packet data contents. I also designed a protocol analyzer built on the same platform. The application captured and performed protocol decoding at various layers in the protocol stacks of captured packets, including detailed Ethernet header decoding, IP header decoding, TCP header decoding, UDP header decoding, RTP header decoding, and many other specified protocols. The application was also designed to reconstruct entire conversations that spanned multiple packets.

12. At Empirix, I also rearchitected the design of the Web Test division's core product, e-Test Suite. E-Test Suite was a software program designed to perform functional and load testing of web applications. I was technical lead on the project, and also worked on programming a Javascript interpreter for the product. Javascript is the flexible programming layer that allows users to interact with web pages through actions such as clicking and dragging that allows web

page programmers to extend the functionality of a web page beyond clicking on links. I also designed and prototyped a web server security testing product, which scanned web servers for specific types of vulnerabilities, including looking for administrative logins which could be attacked with password attacks and buffer overflow attacks, and attacks such as SQL query injection attacks. We used the prototype on some customer web sites, with their permission, and successfully detected vulnerabilities.

13. In 2006, as part of my role at BBN Technologies, I helped found PodZinger Inc., now known as RAMP Inc. PodZinger utilized BBN's speech recognition algorithms to search through the spoken words in audio and video segments. While I was Vice President of Operations and Technology, PodZinger followed its initial prototype with a full streaming audio and video search solution. I also created a social networking web site, which BBN sold to a venture-funded startup company. In the process of creating the web site, I designed and specified the authentication and authorization protocols.

14. At my educational company, Einstein's Workshop, we teach programming to children of all ages, starting with Scratch programming for young elementary students and advancing through programming in Python and for game development for high school students. I conceived many of the programming

classes and have taught programming to novice and more advanced students. We also created an educational computer-aided design tool, called BlocksCAD. We received a grant, on which I was the principal investigator, to further develop BlocksCAD and successfully met our grant objectives. BlocksCAD was spun-off from Einstein's Workshop and has been part of various incubator/accelerator programs in education including LearnLaunch and Mass Challenge as well as Play Labs at the MIT Media Lab. Today, BlocksCAD is used worldwide in makerspaces as well as in schools throughout the U.S.

15. I have reviewed all of the exhibits cited in this declaration, including the following:

Exhibit No.	DESCRIPTION
1001	U.S. Patent No. 7,962,960 ("904 patent")
1002	Prosecution History of U.S. Patent No. 6,680,904
1004	<i>My Curriculum Vitae</i>
1005	PCT Publication No. W/O /14324 ("Vink")
1006	U.S. Patent No. 5,790,541 ("Patrick")
1007	U.S. Patent No. 6,631,136 ("Chowdhury")
1008	U.S. Patent No. 5,425,026 ("Mori")
1009	ATM Volume I: Foundation for Broadband Networks

16. I understand the '904 patent has a filing date of December 27, 1999. Thus, I have considered certain issues from the perspective of a person of ordinary skill in the art as described below as of the December 27, 1999 filing date of the '904 patent.

17. I have been retained by the Petitioner as an expert in the field of information technology and networking. I am working as an independent consultant in this matter and am being compensated at my normal consulting rate of \$680 per hour for my time. My compensation is not dependent on and in no way affects the substance of my statements in this Declaration.

18. I have no financial interest in the Petitioner. I similarly have no financial interest in the '904 patent and have had no contact with any of the named inventors of the '904 patent.

II. Relevant Law

19. I am not an attorney. For the purposes of this declaration, I have been informed about certain aspects of the law that are relevant to my opinions. My understanding of the law is as follows:

A. Claim Construction

20. I have been informed that claim construction is a matter of law and that the final claim construction will ultimately be determined by the Board. For the purposes of my analysis in this proceeding and with respect to the prior art, I have been informed that IPRs are currently reviewed under “the *Phillips* standard.”

21. I have been informed that under the *Phillips* standard, claim terms are given their plain and ordinary meaning as understood by a person of ordinary skill

in the art at the time of the invention in light of the claim language and the patent specification.

22. I have been informed that embodiments described in the specification are generally encompassed by the claims.

23. I have been informed that the patentee can serve as their own lexicographer. As such, if a claim term is provided with a specific definition in the specific, I should interpret that claim term in light of the particular definition provided by the patentee.

B. Obviousness

24. I have been informed and understand that a patent claim can be considered to have been obvious to a person of ordinary skill in the art at the time the application was filed. This means that, even if all of the requirements of a claim are not found in a single prior art reference, the claim is not patentable if the differences between the subject matter in the prior art and the subject matter in the claim would have been obvious to a person of ordinary skill in the art at the time the application was filed.

25. I have been informed and understand that a determination of whether a claim would have been obvious should be based upon several factors, including, among others:

- the level of ordinary skill in the art at the time the application was filed;
- the scope and content of the prior art; and
- what differences, if any, existed between the claimed invention and the prior art.

26. I have been informed and understand that a claim can be unpatentable in light of a single prior art reference if it would have been obvious to modify that reference to come up with the claimed subject matter.

27. I have been informed and understand that the teachings of two or more references may be combined in the same way as disclosed in the claims, if such a combination would have been obvious to one having ordinary skill in the art.

28. In determining whether a combination based on either a single reference or multiple references would have been obvious, it is appropriate to consider, among other factors:

- whether the teachings of the prior art references disclose known concepts combined in familiar ways, which, when combined, would yield predictable results;
- whether a person of ordinary skill in the art would have implemented a predictable variation, and would have seen the benefit of doing so;

- whether the claimed elements represent one of a limited number of known design choices, and would have a reasonable expectation of success by those skilled in the art;
- whether a person of ordinary skill would have recognized a reason to combine known elements in the manner described in the claim;
- whether there is some teaching or suggestion in the prior art to make the modification or combination of elements claimed in the patent; and
- whether the claim applies a known technique that had been used to improve a similar device or method in a similar way.

29. I understand that one of ordinary skill in the art has ordinary creativity and is not an automaton.

30. I understand that in considering obviousness, it is important not to determine obviousness using the benefit of hindsight derived from the patent being considered.

C. Ordinary Skill in the Art

31. I understand that, in the context of an invalidity analysis, a person having ordinary skill in the art (“POSITA”) is a hypothetical person who looks to prior art at the time of the invention.

32. I further understand that the factors that may be considered in determining the level of ordinary skill in the art include: (1) the problems encountered in the art; (2) the prior art solutions to the problems encountered in the art; (3) the rapidity of innovation; (4) the sophistication of the technology; and (5) the education level of active workers in the field. I understand that these factors need not all be taken into account for the analysis and that one or more of these factors may control.

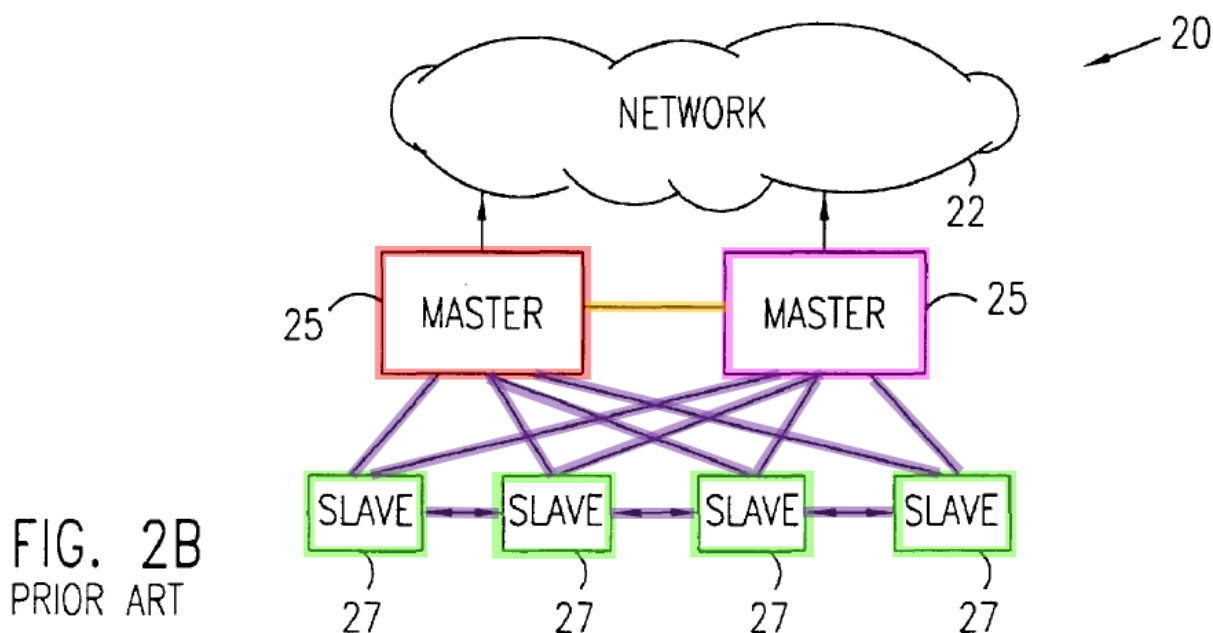
III. Summary of Opinions

33. It is my opinion that claims 1-26 of the '904 patent are rendered obvious by the prior art identified below:

Ground	Reference(s)	Basis (35 U.S.C.)	Invalid Claims
I	Vink, Patrick	§103	1-26
II	Vink, Patrick, AAPA	§103	1-26

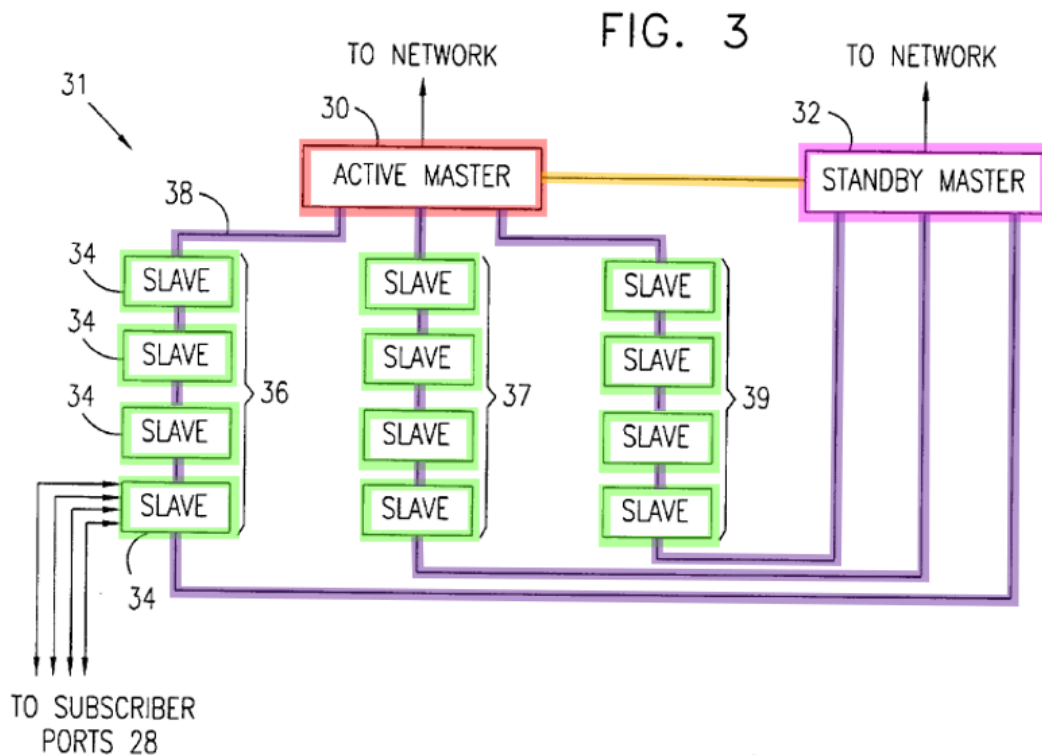
IV. Overview of the '904 Patent

34. The '904 patent purports to create a new communication system to “improve the robustness and reliability” of prior art systems. Ex. 1001, 2:1-3. According to the '904 patent, prior systems coupled master units “to multiple slave units 27 in a star configuration.” Ex. 1001, 1:36-37. As shown below, in the prior art redundant star configuration, “each slave unit is connected to two or more alternative master units.” Ex. 1001, 1:56-59.



35. The '904 patent explains that, as opposed to a star configuration, “the slaves are connected in one or more daisy chains between the active and standby masters, and are configured so that both downstream and upstream packets can be transmitted in either direction along each of the chains.” Ex. 1001, 2:10-15. “An advantage to the architecture of system 31 is that additional slaves may be added to the chains as needed, without having change the number of interfaces associated with masters 30 and 32.” Ex. 1001, 6:33-36. More specifically, the '904 patent's communication system 31 includes **two masters 30** and **32** and a **plurality of slaves 34**, where each the slaves are connected between the masters by **physical interface lines 38** in a number of daisy chains 36, 37, and 39, illustrated in Figure

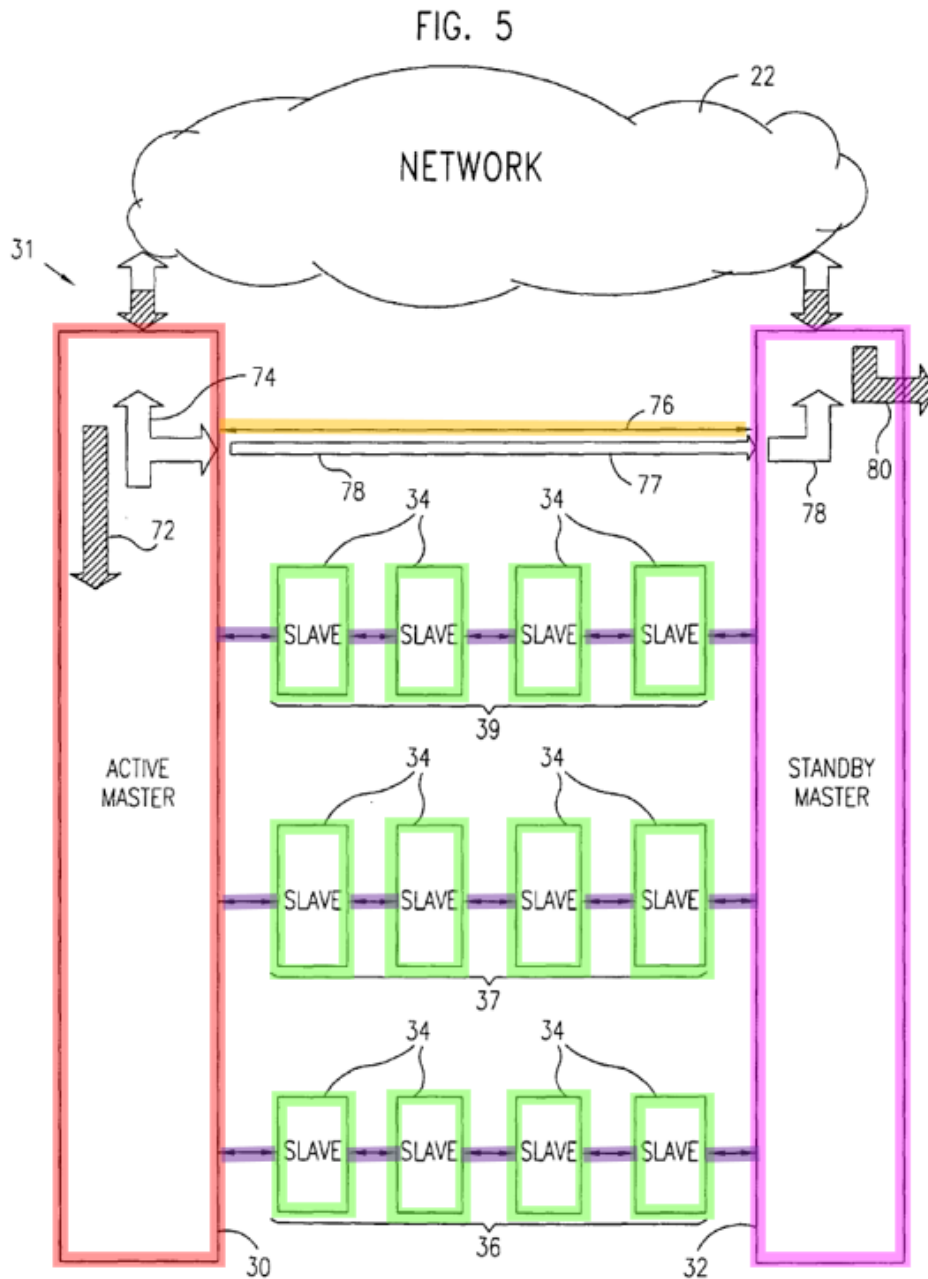
3, below. Ex. 1001, 6:22-28. I have added coloring to Figure 3 (and others throughout my declaration) to facilitate my explanation.



Ex. 1001, Figure 3.

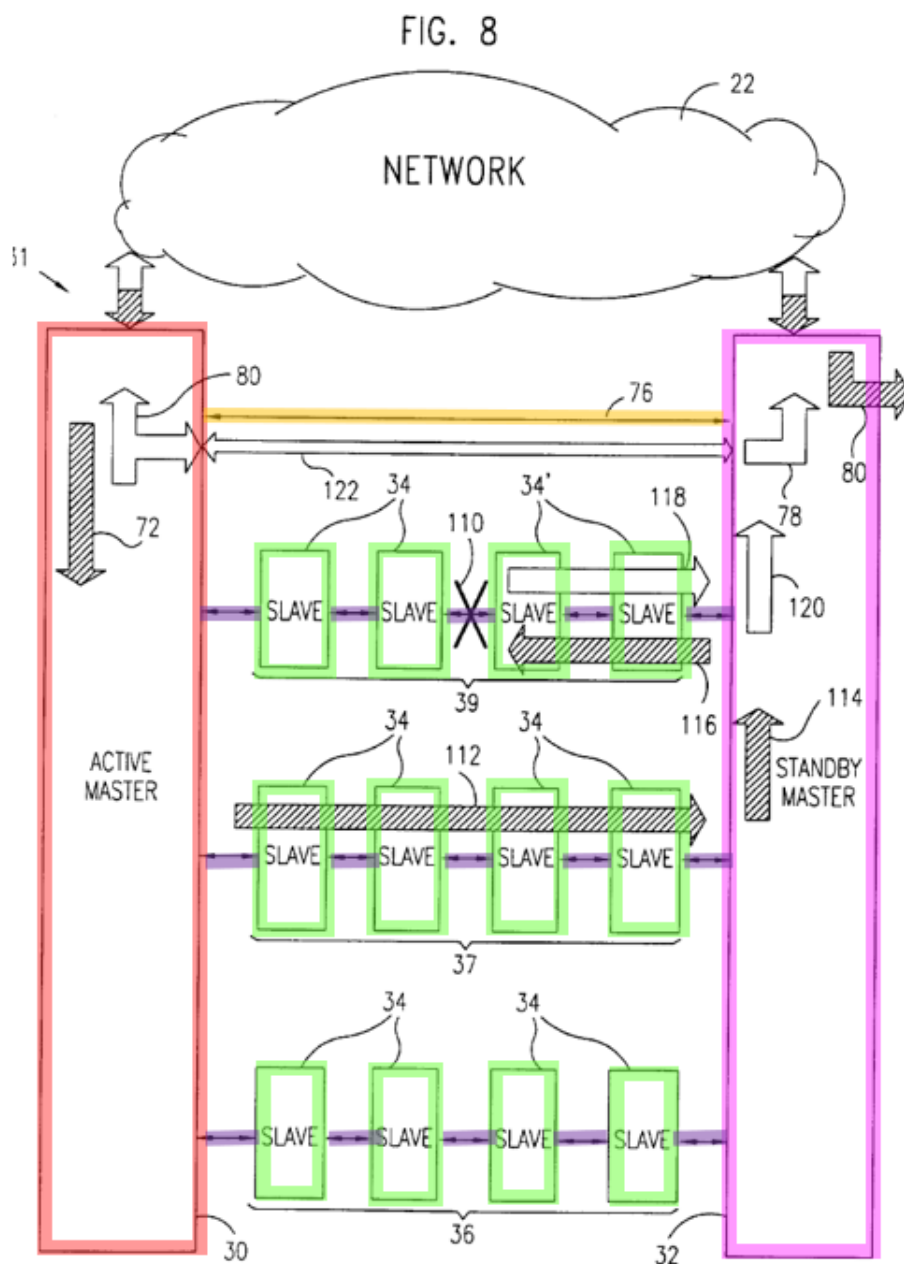
36. Under normal (no-fault) conditions, data flows downstream from the network 22 to both the **active master 30** and the **standby master 32**. See Ex. 1001, Figure 5. The downstream flow passing through the **active master 30** travels down to the **slaves 34** in each of the **daisy chains 36, 37, and 39**. The downstream flow passing through the **standby master 32** is discarded. See Ex. 1001, 8:31-41. The upstream data, *i.e.*, the data flowing from the slaves to the

network, is routed to the network 22 through **active master 30**, but then also passed to the **standby master 32** through the **protection interface 76**, which also sends the upstream data to the network. *See* Ex. 1001, 8:42-49.



Ex. 1001, Figure 5.

37. When a fault occurs, such as in a link between **slaves 34 and 34'** as shown in Figure 8, below, marked by an "X", the **active master 30** determines a new path for the downstream data packets through the next group of daisy-chained **slaves 37**, shown in the figure by dashed arrow 112. The **active master 30** then commands the **standby master 32** to route both the downstream and upstream data for the affected **slaves 34'** on **daisy chain 39** through routes 116 and 118. *See* Ex. 1001, 9:38-57. "[I]f a failure occurs in any one of the slaves or in a link between them, the traffic direction in the chain in which the failure has occurred is simply reversed so as to run through the standby master." Ex. 1001, 2:15-18. The traffic from **slaves 34'** is routed to the **standby master 32** (arrow 118, 120) and then transmitted back to the **active master 30** (arrow 122). Other **slaves 34** operate normally. *See* Ex. 1001, 9:57-65.



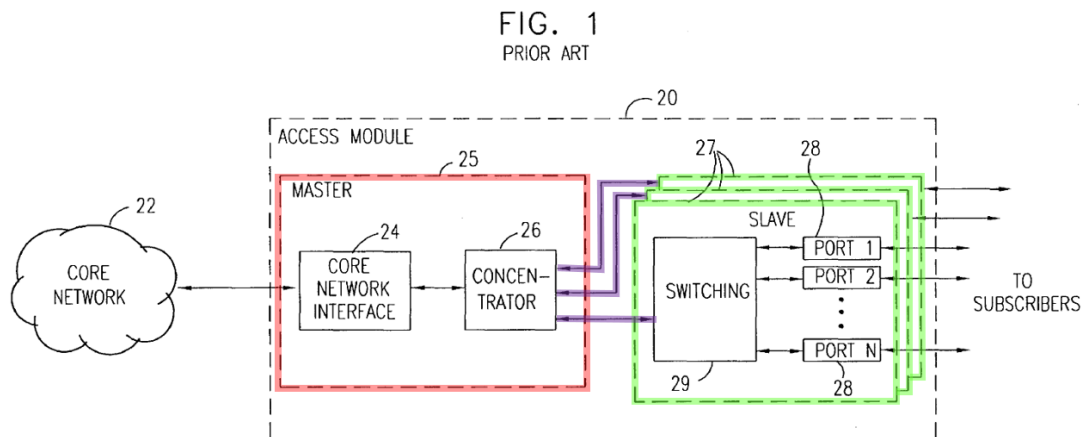
Ex. 1001, Figure 8.

A. Prosecution History of the '904 Patent

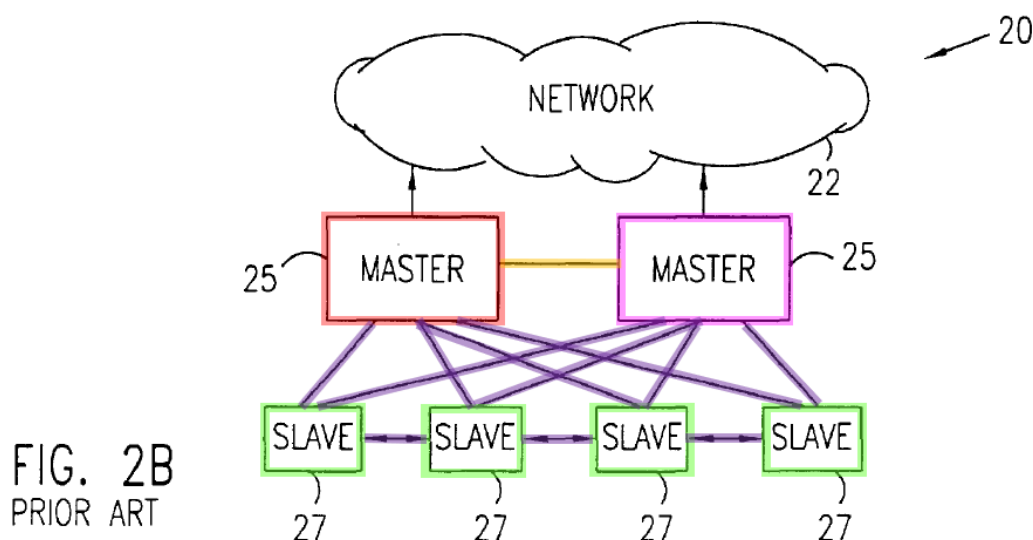
38. I have reviewed the file history of the '904 patent. Ex. 1002. I summarize the relevant information that I have reviewed pertaining to my opinion.

39. The file history has what appears to be the application number of the application (i.e., 09/472,683) and the December 27, 1999, filing date. The application number and the filing date are consistent with the information shown on the cover of the '904 patent. Ex. 1001, Cover. The application was filed with 26 total claims. Ex. 1002, 28-91. Claims 1, 4, 9, 11, 14, and 19 were independent.

40. On February 4, 2003, the Examiner rejected claims 1 and 12 under § 102(e) when viewing Figures 1 and 2B of the '904 patent, which were admitted to be known in the art, in other words, rejected over Applicant Admitted Prior Art ("AAPA"). Ex. 1002, 158-160.



Ex. 1001, Figure 1.



Ex. 1001, Figure 2B.

41. The Examiner further rejected claim 13, a dependent claim, under § 103(a) AAPA (Figures 1 and 2 of the '904 patent) in view of U.S. Patent No. 6,181,715 ("Phillips"), holding that the admitted prior art disclosed all claim limitations, except "the network comprises an Internet Protocol (IP) network." Ex. 1002, 160-161. Phillips discloses a method and system for emulated telephony over DSL; the examiner argued "[i]t would have been obvious... to employ a DSLAM unit connecting to an IP network as taught by Phillips into the system of the admitted prior art in figures 1, and 2B of the instant application in order to reduce the cost of requiring major investment in new infrastructure since DSL opens the most critical bottleneck in local-loop access to high-speed network such as STM and IP networks." Ex. 1002, 161.

42. The examiner objected to claims 15-18 because of an informality; the preamble of the independent claim 14 discloses a network access multiplexing system, whereas claims 15-18 referred to an apparatus. The examiner requested “apparatus” to be replaced with “system.” *See* Ex. 1002, 158. Claims 14, and 19-26 were allowed. *See* Ex. 1002, 161.

43. Applicant responded by amending claim 1 to include “a second slave unit connected to the first slave unit but not connected to the first or second master unit.” Ex. 1002, 172. Applicant amended claims 2,7, and 9 to be in independent form (eventually issuing as claims 4, 9, and 11). Ex. 1002, 172-75. Claims 14 and 19 were not amended. Ex. 1002, 176-179.

44. The Examiner issued a Notice of Allowance on September 3, 2003. Ex. 1002, 183.

45. The Examiner cited the following reasons for allowance:

- Regarding claims 1, 12, and 13, the prior arts fail to teach or fairly suggest a network access apparatus, which comprises first and second master units, and a second slave unit connected to the first slave unit but not to the first or second master unit, in combination with other limitations, as specified in the independent claim 1.

- Regarding claims 1-6, the prior arts fail to teach or fairly suggest a network access apparatus, which comprises first and second master units, each comprising a physical interface to a packet-switched network, wherein in normal operation, downstream data packets received from the network are passed from the first master unit to each of the daisy chains via the first slave unit in the chain, and upstream data packets received by the slaves in each chain from the subscriber lines are passed via the first slave unit in the chain to the first master unit for transmission over the network, in combination with other limitations,' as specified in the independent claim 2.
- Regarding claims 7-8, the prior arts fail to teach or fairly suggest a network access apparatus, which comprises first and second master units, wherein each of the first and the second master unit comprises a pre-switch, which in the event of a fault at a location in one of the daisy chains, re-routes at least a portion of the data packets exchanged with one or more of the slaves in the daisy chain in which the fault has occurred through another one of the daisy chains, in combination with other limitations, as specified in the independent-claim 7.

- Regarding claims 9-11, the prior arts fail to teach or fairly suggest a network access apparatus, which comprises a plurality of slave units, wherein each of the slave unit comprises a pre-switch, which receives the data packets from. one of the physical interface lines connected to the slave unit and passes those of the data packets that are addressed to any of the ports on the slave unit to the switch fabric, while passing packets not addressed to any of the ports on the slave unit for output through another of the physical interface lines, in combination with other limitations, as specified in the independent claim 9.
- Regarding claims 14-18, the prior art fails to teach or suggest in a network access multiplexing system comprises a pre-switch, coupled to receive packets from the first physical interface and responsive to address data carried by the packets, to sort the packets such that packets addressed to the slave unit are retained, and packets addressed to the succeeding units are passed to the second physical interface, in combination with other limitations, as specified in claim 14.
- Regarding claims 19-26, the prior art fails to teach or suggest a method for providing access to a network, comprises a step in the event of a fault in the daisy chain, conveying further downstream data

packets, received from the network by one of the master units, along the daisy chain in a second direction, opposite to the first direction, so as to deliver the further packets to the ports of at least some of the slave units, in combination with other limitations, as specified in claim 19.

Ex. 1002, 183-184.

46. The '904 patent issued on January 20, 2004. Ex. 1001, 1. As shown in this declaration, the cited prior art teaches these and the other features of the challenged claims.

V. Overview of the Prior Art

A. Vink (“WO 91/14324”)

47. Vink is an International Patent Publication published on September 19, 1991.

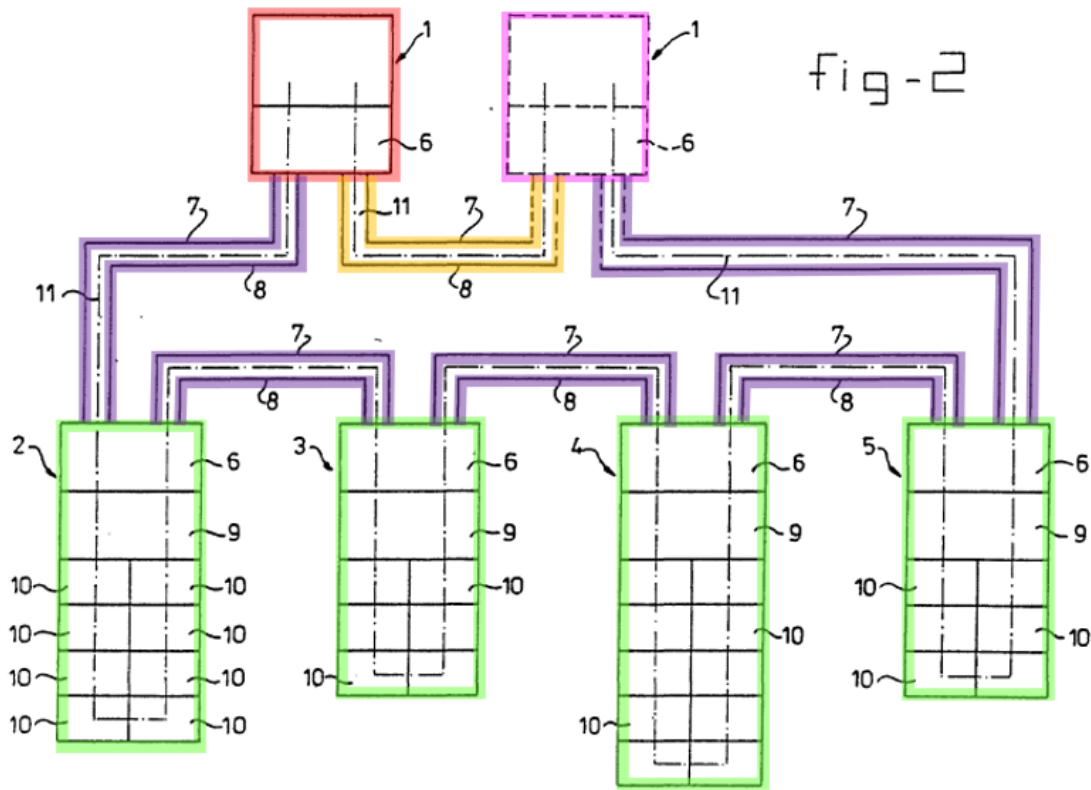
48. Vink is directed to a “method and a communication system for exchanging data in discrete or digital form with one or more input (I) and/or output (O) modules, by means of serial transfer of data bits under the controller of at least one master station (master).” Ex. 1005, 1:6-10. Vink explains that “LAN topologies generally used in practice are star, bus, ring, and tree configurations in which the data bits are transferred serially to the connected stations.” Ex. 1005,

1:24-26. “Because the information is transferred bit-serially via the network but, on the other hand, is generally processed in parallel by the stations connected via bus networks, such as the known VME bus and SCSI bus, used for coupling microcomputer systems and peripheral equipment, a further delay can arise as a consequence of the required parallel-to-serial (P/S) and serial to parallel (S/P) conversion...” Ex. 1005, 2:11-18.

49. Vink aims to “provide a method and a communication system for serial data bit transfer, suitable for exchanging data with a desired (large) number of information points, with which a relatively rapid response which is unambiguous in terms of cause-and-effect relationships is possible and which has a low-cost structure which is flexibly adaptable.” Ex. 1005, 5:10-14.

50. Vink discloses a “method of serially exchanging data bits, with a plurality of input (I) and/or output (O) modules, using at least one master station (master) to which the I/O modules are connected in a cascade arrangement, characterised by under the control of at least one master.” Ex. 1005, 5:15-19.

51. Vink’s system comprises, among other things, at least one master station, I/O modules, a control module and control means, a local data bus, one or more substations (slaves), and a transmission system. Ex. 1005, Abstract. I have reproduced Figure 2 of Vink below, with color annotations on key components.



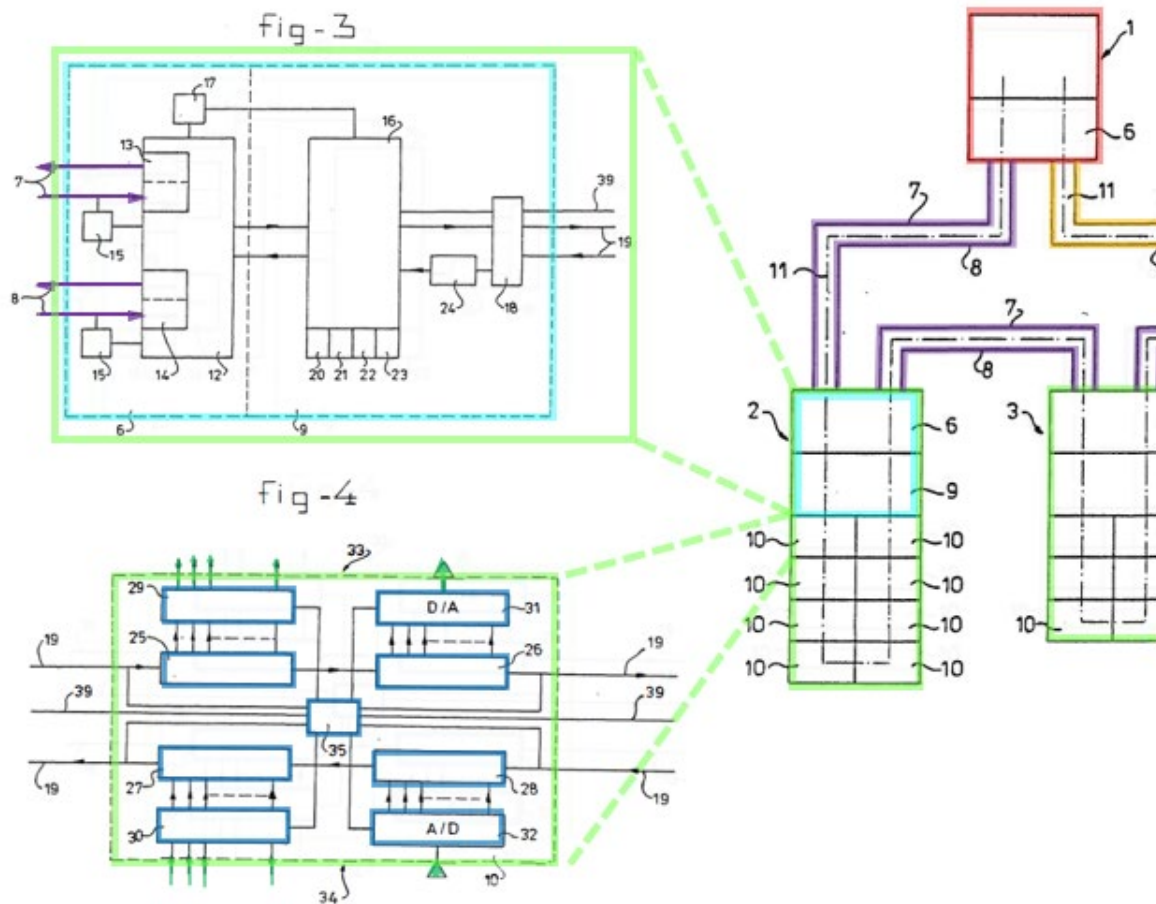
Ex. 1005, Fig. 2. Figure 2 above demonstrates the architecture of the communication system disclosed in Vink. The communication system has two **master stations 1** and a **plurality of substations (slaves) 2, 3, 4, and 5** that are connected in a serial cascade via **transmission lines 7, 8** (which can be coaxial or fiber optic cable). See Ex. 1005, 15:28-35. The two **master stations 1** are further connected by the **transmission lines 7, 8**.

52. Further, Vink discloses that each master has a transmitting/receiving unit 6, control unit 36, memory 37, and **control computer 38**, where the **control computer 38** “provides for and monitors the correct sequence of the data bits for a

relevant slave, related to the sequence in which the I/O modules are arranged.” Ex. 1005, 21:4-7.

53. The **control unit 36 and transmission/receiving unit 6** transmit and/or receive the data packets via the **transmission lines 7, 8** as decided by the **control computer 38**. *See* Ex. 1005, 20:30-21:4. “The software for controlling the communication system according to the invention is essentially concentrated in the master 1 which comprises... a control unit 36 for controlling the data flow via the transmission system 7, 8... **control computer 38** which contains the calculations and background information necessary for the process to be controlled via the I/O modules... [a] transmitting/receiving unit 6 provides for the monitoring of the transmission... [and a] control unit 36 from [which] the status information [is] received from the relevant slaves.” Ex. 1005, 20:30-21:9.

54. Each slave also contains one or more I/O modules, transmitting/receiving unit 6, and control module 9. *See* Figure 3.



Ex. 1005, Figures 2-4. In figure 2, the transmitting/receiving unit 6 transmits and/or receives packets to and/or from the **transmission lines 7, 8** and the other elements within the transmitting/receiving unit 6 and control module 9; these accept a packet addressed to the particular slave or forward the packets on to the next slave if they are intended for another slave. *See* Ex. 1005, 17:3-18:33.

B. Patrick (“US Patent No. 5,790,541”)

55. Patrick is a United States Patent filed on April 1, 1996.

56. Patrick is directed towards “data communications and data communications systems and devices and, more specifically, to an apparatus, method and system for distributed routing in a multipoint communication system.” Ex. 1006, 1:8-11.

57. Figure 1 below shows the architecture of Patrick’s communications system. As shown, the communications system has a primary station 101 connected to a network 105, and a plurality of secondary stations 110 connected in series via communication media 115 and 116. Ex. 1006, 3:9-15. The communication media 115 and 116, in a preferred embodiment, can be coaxial cable, fiber optic cable, twisted pair wires, and so on.” Ex. 1006, 3:15-19.

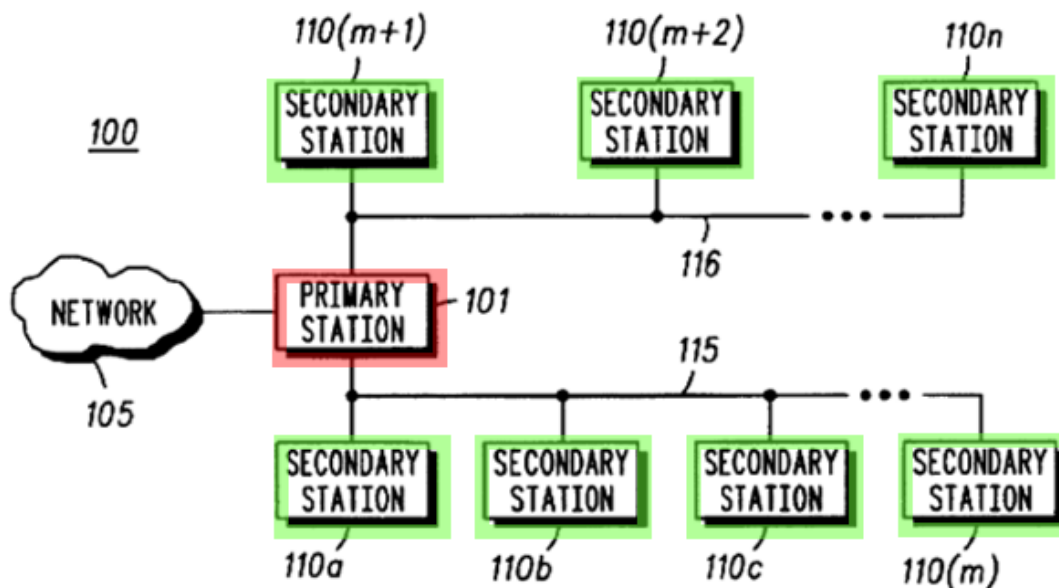


FIG. 1

Ex. 1006, Figure 1.

58. Patrick discloses that, although there is only a single primary station depicted in Figure 1, “the secondary stations 110a through 110n may be connected to more than one primary station.” Ex. 1006, 3:27-32.

VI. Level of Ordinary Skill in the Art

59. In my opinion, a person of ordinary skill in the art (“POSITA”) in the field of the ’904 patent as of its effective filing date of December 27, 1999, would have had a Bachelor’s degree in electrical engineering, computer science, or equivalent training, and approximately two years of work experience in information technology and networking. In my opinion, additional education could make up for less practical experience, and vice versa.

60. I met these requirements for POSITA at the time of the effective filing date of the ’904 patent.

VII. Claim Construction

61. I have reviewed the claims, specification, and file history of the ’904 patent.

62. I did not find any explicit definition of claim terms.

63. I have also been asked to determine if there are any particular claim terms that should be construed for the Board to understand how the prior art

references read on the challenged claims. I have identified “second master unit,” which is recited in claims 1-13 and 19-26, as a claim term that should be construed for the Board to understand how the prior art references read on the challenged claims.

64. Claims 1-13 and 19-26 recite “a first master unit,” “a second master unit,” and “slave units.” I have been informed that the Board does not need to construe every claim term, but need only construe terms to the extent that it is necessary to gain a clear understanding of the claims. In my opinion, construing the claimed “second master unit” is sufficient to aid the Board to understand how the “second master unit” is different from the other claimed “first master unit” and “slave units.”

65. First, the claims do not provide clarity as to how the first and second master units are different as they merely require “a physical interface to a packet-switch network” for both first and second master units (or “coupling first and second master unit to interface with the network”). *See* independent claims 1, 4, 9, 11, and 19. *See also* Ex. 1001, 6:22-26 (“System 31 comprises two mutually-linked masters 30 and 32, both of which are generally capable of performing the functions of master 25, including interfacing to network 22 and higher-level routing functions.”).

66. Second, the specification appears to ascribe one master unit to be an “active master” and the other master unit to be a “standby master.” *See* Ex. 1001, 6:38-44 (discussing “active master 30” and “standby master 32”). But the specification further states that “[t]he standby master is [also] structurally substantially identical to the active master.” Ex. 1001, 9:8-9. Moreover, not only are the active and standby masters structurally “substantially identical,” the specification notes the standby master can sometimes be considered as a slave unit. *See* Ex. 1001, 9:23-27 (“Optionally, active master 30 and standby master 32 include their own local ports (not shown in the figures). In this case, the standby master is preferably treated as an additional slave on one of the chains, typically chain 39, and its ports have the same setup as all of the slave ports.”).

67. Hence, in my opinion, understanding the unique function performed by the standby master will aid the Board to understand how the claimed “first master unit,” “second master unit,” and “slave units” are different.

68. The specification provides additional details about the functions of the active master, standby master, and slave units. Under “normal operation” conditions, the active master routes “downstream traffic from the network ... down chains 36, 37 and 39 to the respective slaves 34 [, and u]pstream traffic from the slaves is likewise routed up the chains to master 30. Active master 30 bicast

upstream packets to the network and to standby master 32. The standby master conveys copies of the upstream packets to the network, as well.” Ex. 1001, 6:38-47.

69. In other words, although both the active master and standby master route upstream traffic from the slaves up to the network, the function that clearly distinguishes the active and standby masters is that *upstream traffic from the slave is sent from the active master to the standby master*. Ex. 1001, 2:23-24 (“the upstream packets are bicast by the active master to both the core network and to the standby master.”), 6:43-44 (“Active master 30 bicast upstream packets to the network and to standby master 32.”), 9:16-22 (“Upstream data packets received by the standby master ... from active master 30...”).

70. Accordingly, in my opinion, construing the claimed “second master unit” to mean “a standby master that receives upstream packets from the first master unit during normal operations” provides clarity as to how the claimed “second master unit” is different from the claimed “first master unit” and the “slave units.”

71. For all other claim terms, I have applied the ordinary and customary meaning of the claim terms as understood by a POSITA in my analysis provided herein.

VIII. Specific Grounds for Challenge

72. The sections below demonstrate in detail how claims 1-26 of the '904 patent are not patentable over prior art.

A. Ground I: Vink in View Of Patrick Renders Obvious Claims 1-26

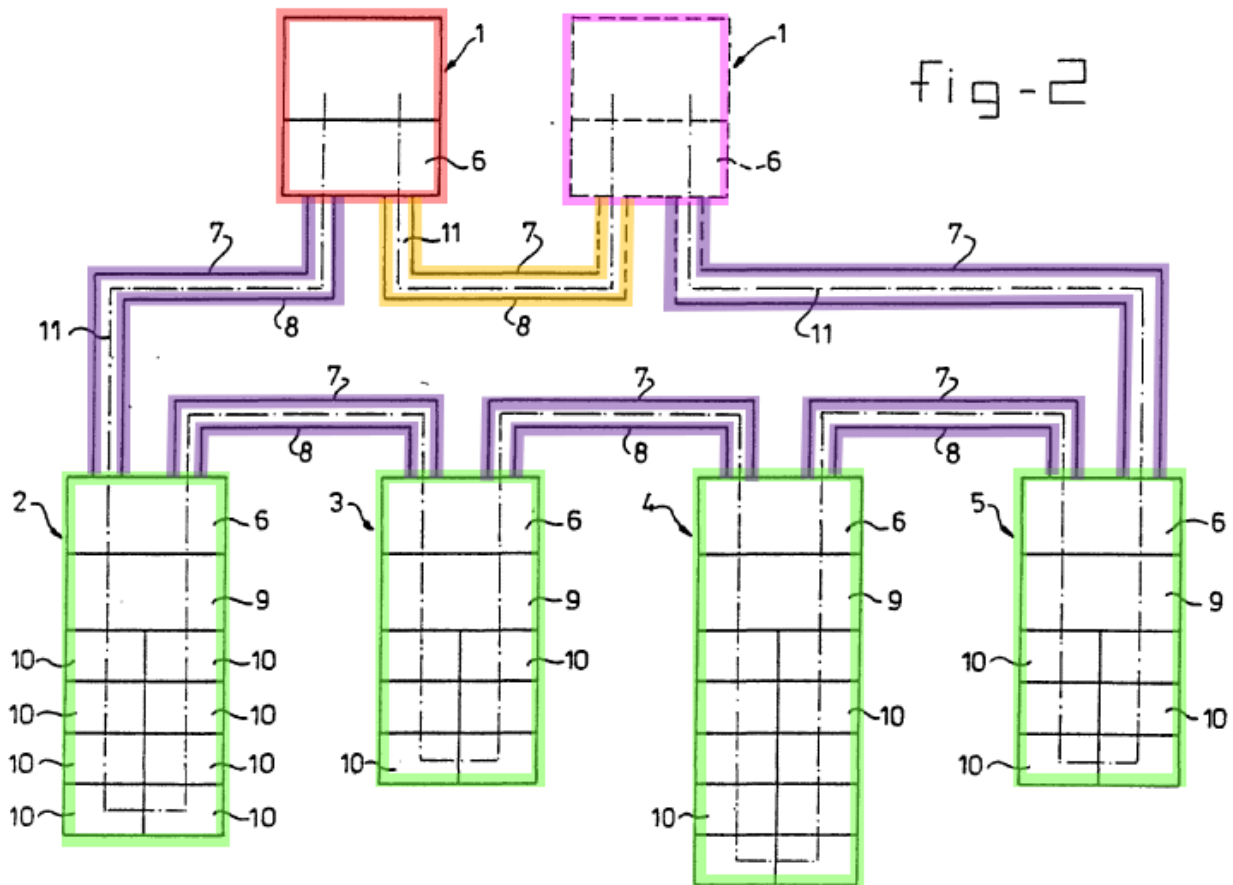
73. A POSITA would have had numerous reasons to combine Vink with Patrick (Ground 1) and further with AAPA (Ground 2), such as to provide to gain access to an external network. I have additionally provided additional reasons why a POSITA would have combined Vink with Patrick (and further with AAPA) whenever appropriate further below in my analysis as I discuss particular limitations whenever appropriate.

1. A POSITA Would Have Been Motivated To Combine Vink with Patrick (Ground 1)

74. A POSITA would have been motivated to combine Vink with Patrick, such as to provide to gain access to an external network, as taught by Patrick, to Vink's communication system.

75. Vink's communication system is schematically shown in Figure 2, reproduced below. As shown, Vink's "communication system for exchanging data ... [is] under the control of at least one **master station** (master)." Ex. 1005, 1:6-10. Specifically, four different **substations (slaves) 2, 3, 4, 5** are connected in series to two different **master units (master) 1**. See Ex. 1005, Abstract. For example,

Vink discloses a “method and a communication system for the bit-serial exchange of data.” Ex. 1005, Title. Vink’s exemplary communication system is a Local Area Network (LAN). *See* Ex. 1005, 1:11-15.



Ex. 1005, Figure 2.

76. Vink does not explicitly show its communication system being connected to an external network. But Vink’s communication system is not restricted to this particular embodiment. Ex. 1005, 22:10-12 (“It will be clear that the invention is not restricted to a communication system containing the

embodiments, discussed by way of example, of the master, slaves and I/O models.”). Vink states that a “person skilled in the art can make many alterations and additions without deviating from the inventive idea underlying the invention.” Ex. 1005, 22:12-14.

77. One obvious modification that a POSITA would have been motivated to make is to open up Vink’s communication system to an external network, such as taught by Patrick. As shown below, Patrick’s communication system is shown in Figure 1 to be connected to an external network. More specifically, Patrick shows a primary station that is connected to an external network and a number of different secondary stations. *See* Ex. 1006, Abstract (“communication system ... characterized by a topology having a **primary node** connected to a first network, such as the Internet, and connected via an intermediate network to a multiplicity of **secondary nodes**, which are further connected via a secondary network to a plurality of terminals, such as personal computers.”). And Patrick further teaches that “the **secondary stations 110_a through 110_n** may be connected to **more than one primary station**.” Ex. 1006, 3:27-32.

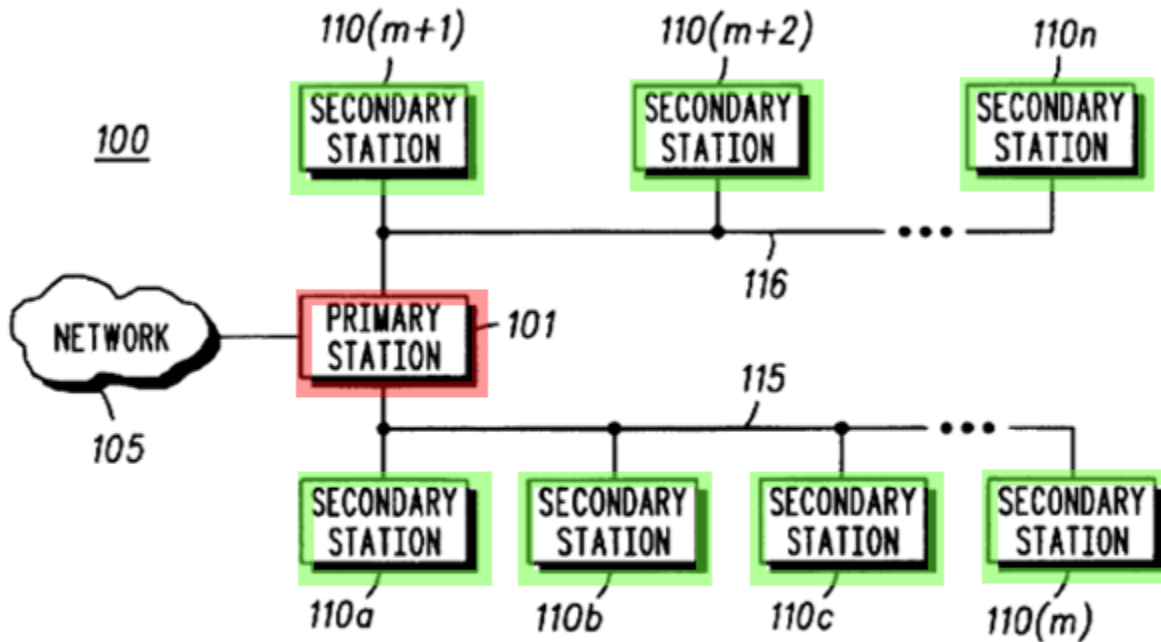
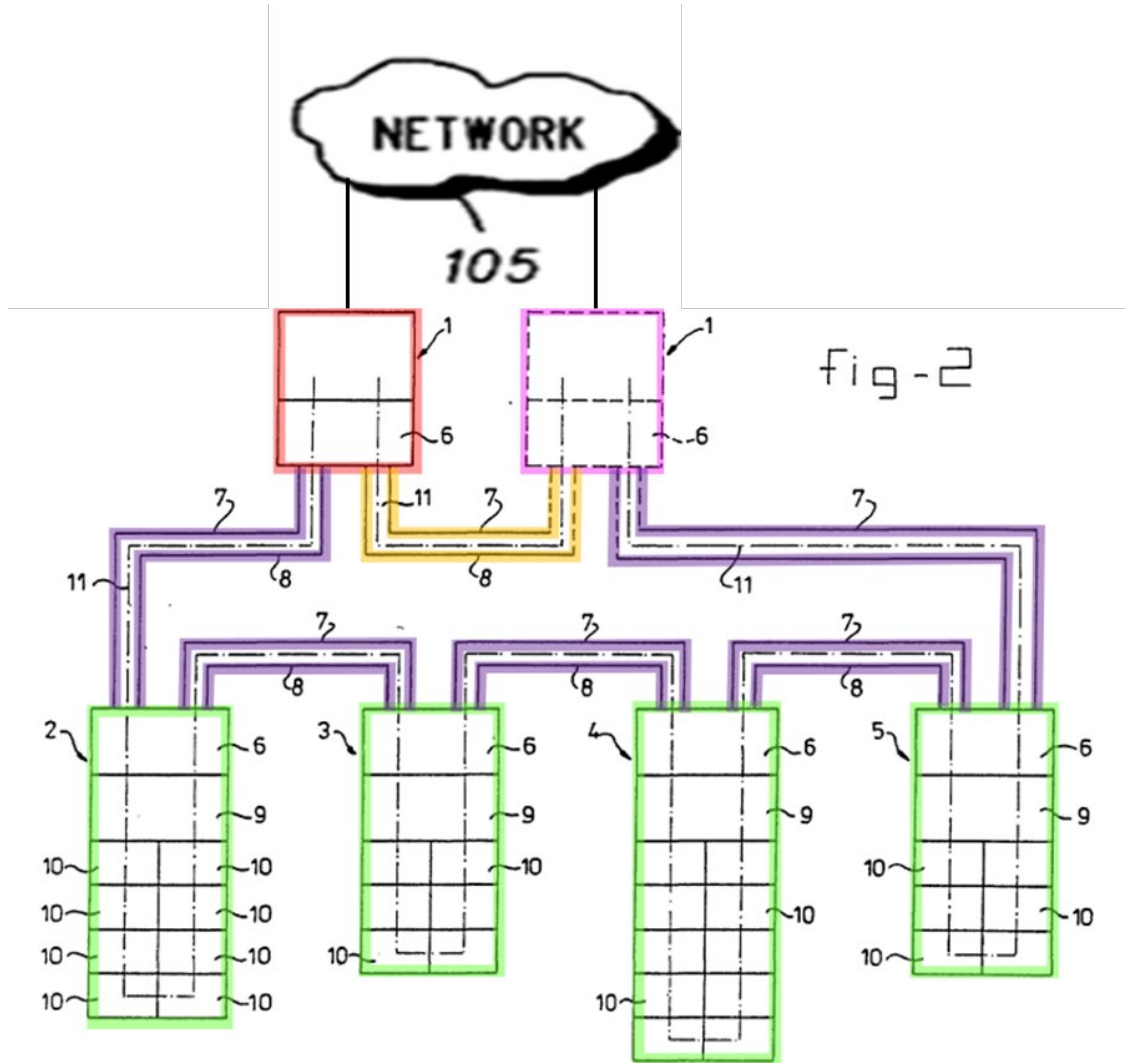


FIG. 1

Ex. 1006, Figure 1.

78. It would have been obvious to connect Vink's master's to an external network, just like Patrick teaches. The modified figure below shows Patrick's external network connection superimposed onto Vink's communication system.



79. A number of reasons underly the motivation to combine Vink with Patrick as shown above. Specifically, a POSITA would have been motivated to modify Vink's system in view of Patrick's teachings to provide the option in Vink's system for the master units to be connected to an external packet-switched network.

80. Patrick teaches the CableComm™ system, which was known in the art. “[T]he topology of such a communication system may be described as having a primary node (such as one formed by a primary station), connected via an intermediate network to many secondary nodes (such as those formed by secondary stations), which are then connected to corresponding terminals (forming a secondary network). Ex. 1006, 1:41-46. A POSITA would recognize that the topology of the communication system disclosed in Patrick closely mirrors the topology of the system described in Vink, including a primary station(s) (masters), secondary nodes (slaves), terminals (ports), etc.

81. Patrick discloses that in its system, “primary equipment may be connected to any variety of networks or other information sources, from the Internet, various online services, telephone networks, to video/movie subscriber service.” Ex. 1006, 1:31-34. Thus, combining Vink’s communication system with an external network, would have been obvious to a POSITA at the time. Further, a POSITA would have been able to combine Vink and Patrick with a reasonable expectation of success, because both Vink and Patrick teach similar communication systems that allows different nodes to communicate with each other. Techniques and methodology to connect Vink’s communication system to an external network by connecting Vink’s master to an external network was

readily apparent and routinely carried out in the art, such as taught by Patrick. The modification simply permits Vink's system to have contact with an external network, and a POSITA would have readily recognized that without contact with an external network, Vink would only have operated internally, functioning purely as a local system. Connecting the communication system described by Vink to an external network would have benefitted by gaining access to more information and being able to connect to more computers and servers to exchange information than what would have been available on an internal-only network.

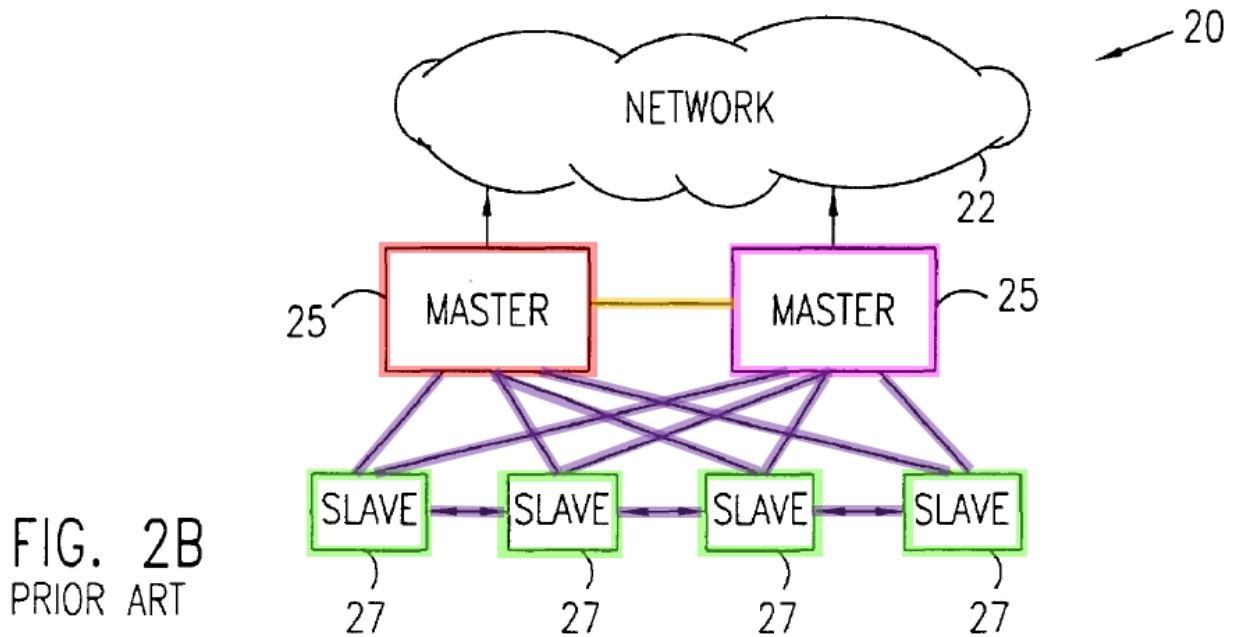
82. Such communication systems as disclosed by Patrick that are connected to external networks share the benefit of participating the in upstream and downstream data flows in each system. *See* Ex. 1006, 1:34-40 ("With the CableCommTM system, digital data may be transmitted both in the downstream direction, from the primary station or controller (connected to a network) to the secondary station of an individual user (subscriber access unit), and in the upstream direction, from the secondary station to the primary station (and to a network)."). As discussed above, such participation in an external communication network would provide the subscribers with greater access to information and being able to connect with more computers and servers, which would have been an obvious improvement to such systems.

2. A POSITA Would Have Been Motivated To Combine Vink with Patrick and AAPA (Ground 2)

83. A POSITA would have been further motivated to combine Vink with Patrick and AAPA, such as to provide to gain access to an external network, as taught by Patrick and AAPA, to Vink's communication system.

84. I have previously explained why a POSITA would have had numerous reasons to combine Vink's communication system with Patrick. And AAPA further confirms these reasons.

85. Just like Patrick, AAPA admits that a communication system having **two masters** connected to an external network and to a number of different **slave nodes** were well-known. Indeed, AAPA explicitly shows two masters connected to an external network (and to each other), which is exactly the modification that I explained previously in combining Vink's communication with the teachings of Patrick.



Ex. 1001, Figure 2B.

86. A number of reasons underly the motivation to combine Vink with Patrick and AAPA as I explained above. But additionally, AAPA discloses another well-known communication system called Digital Subscriber Line (DSL). In the late 90's, a POSITA would have understood that DSL was an inexpensive method of providing broadband service through the existing telephone system to allow telephone companies to provide access to the internet. Ex. 1001, 1:10-14 (DSL "enables broadband digital data to be transmitted over twisted-pair wire, which is the type of infrastructure that links most home and small business subscribers to their telephone service providers."). A POSITA would have been motivated to further combine Vink and Patrick with AAPA because "DSL thus

opens the most critical bottleneck in local-loop access to high-speed networks, such as Asynchronous Transfer Mode (ATM) and Internet Protocol (IP) networks.” Ex. 1001, 1:17-20. Moreover, it would have been obvious to a POSITA to connect the I/O units of Vink to DSL access units to allow the system of Vink and Patrick in order to provide broadband internet access to telephone subscribers. Doing so would allow the system to efficiently provide internet access to a number of users and receive revenue for such services. By combining Vink’s communication system with another external network, such as the ATM or IP networks disclosed in AAPA, a POSITA would have a reasonable success of opening known critical bottlenecks in such systems, which would improve the speeds of such systems.

87. Combining Vink’s communication system with an external network, such as taught by both Patrick and AAPA, would have been obvious to a POSITA at the time. Further, a POSITA would have been able to combine Vink with Patrick and AAPA with a reasonable expectation of success, because Vink, Patrick, and AAPA all teach similar communication systems that allows different nodes to communicate with each other. Techniques and methodology to connect Vink’s communication system to an external network by connecting Vink’s master to an external network was readily apparent and routinely carried out in the art, such as taught by Patrick and AAPA. Indeed, this was admittedly well-known in

the art as evidenced by AAPA. The modification simply permits Vink's system to have contact with an external network. Without contact with an external network, Vink would only have operated as a purely local system. Connecting the communication system describe in Vink to an external network would have benefitted by gaining access to more information than what would have been available on an internal-only network.

88. Such communication systems as disclosed by Patrick and AAPA that are connected to external networks share the benefit of participating the in upstream and downstream data flows in each system. *See* Ex. 1006, 1:34-40 (“With the CableCommTM system, digital data may be transmitted both in the downstream direction, from the primary station or controller (connected to a network) to the secondary station of an individual user (subscriber access unit), and in the upstream direction, from the secondary station to the primary station (and to a network).”). As discussed above, such participation in an external communication network would provide the subscribers with greater access to information, which would have been an obvious improvement to such systems.

3. Independent Claims 1, 4, 9, and 11

i. [1pre, 4pre, 9pre, 11pre] Network access apparatus, comprising:

89. I understand that the preamble may not be limiting. Nevertheless, Vink in combination with Patrick (for Ground 1) and further with AAPA (for Ground 2) suggests the preamble.

90. I have explained above in Sections VIII.A.1 [A POSITA Would Have Been Motivated To Combine Vink with Patrick (Ground 1)] and VIII.A.2 [A POSITA Would Have Been Motivated To Combine Vink with Patrick and AAPA (Ground 2)] why a POSITA would have been motivated to combine the teachings of Vink with Patrick (for Ground 1) and further with AAPA (for Ground 2). Those discussions apply equally here as well.

91. At any rate, I understand that the Applicant conceded that preamble was well-known during prosecution. *See* Ex. 1002, 160-161, 169-181; Ex. 1001, Figure 2B.

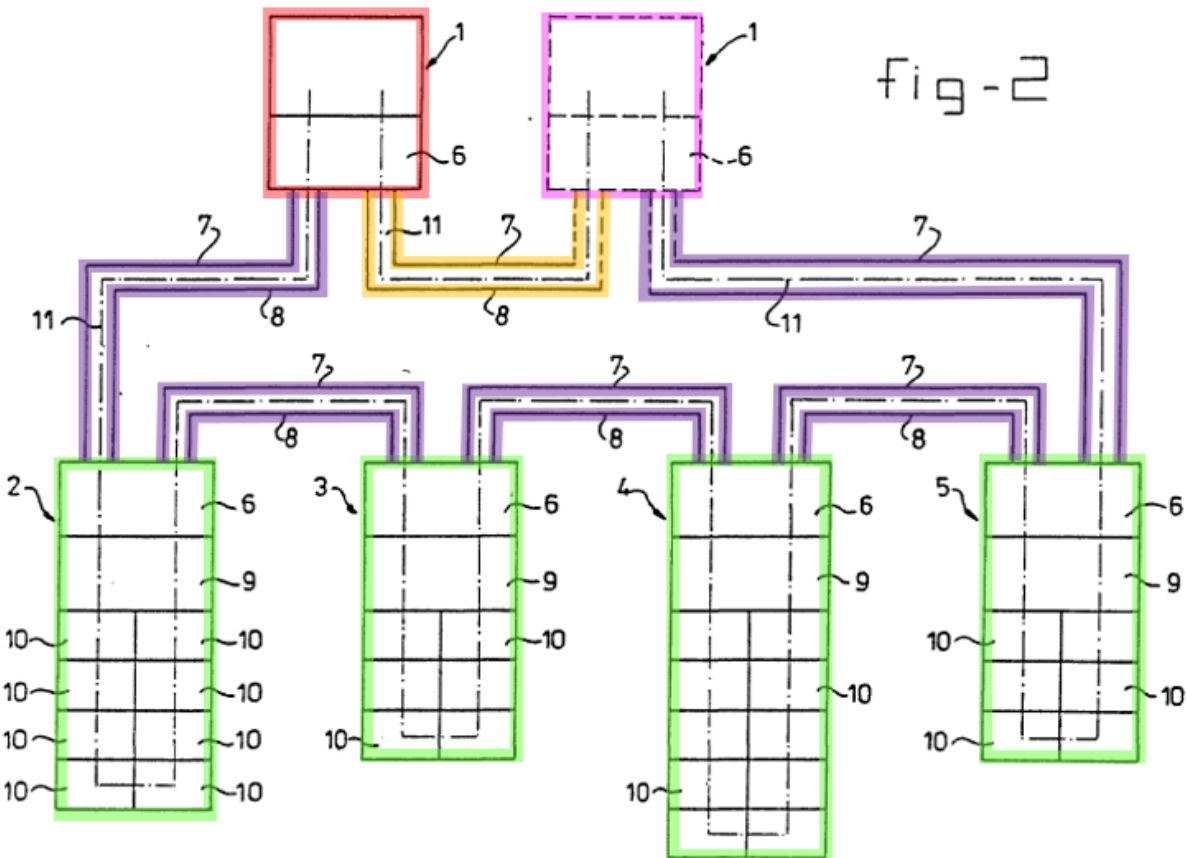
ii. [1a, 4a, 9a, 11a] first and second master units, each comprising a physical interface to a packet-switched network;

92. Vink in combination with Patrick (for Ground 1) and further with AAPA (for Ground 2) suggests this limitation.

93. **First**, Vink discloses a “method and communication system for serially exchanging data,” such as “Local Area Networks (LAN’s).” Ex. 1005, 1:11-15. LANs are known to rely on packet-switching. Ex. 1005, 1:24-29. Moreover, as I explained above in Section VIII.A.3.i [1pre, 4pre, 9pre, 11pre], VIII.A.1 [A POSITA Would Have Been Motivated To Combine Vink with Patrick (Ground 1)] and VIII.A.2 [A POSITA Would Have Been Motivated To Combine Vink with Patrick and AAPA (Ground 2)], a connection to an external packet-switched network would have been obvious based on the combination of Vink with Patrick (for Ground 1) and further with AAPA (for Ground 2).

94. **Second**, Vink discloses a system “under the control of at least one **master station**.” Ex. 1005, Abstract. In Figure 2, Vink clearly shows that its system can have two masters, in other words, a **first master** and a **second master**. Further, Vink discloses that a “multi-master concept” can be implemented. Ex. 1005, 16:19-24 (“a plurality of masters ... is illustrated in Figure 2 by the broken lines. In such a multi-master concept, one of the masters is in general active in relation to data exchange, while one or more other masters only have a passive role therein.”).

95. Figure 2 of Vink, reproduced below, illustrates the components of Vink's communication system. Within the system are two masters (a first and a second master), and transmission lines 7, 8 entering and exiting each master.

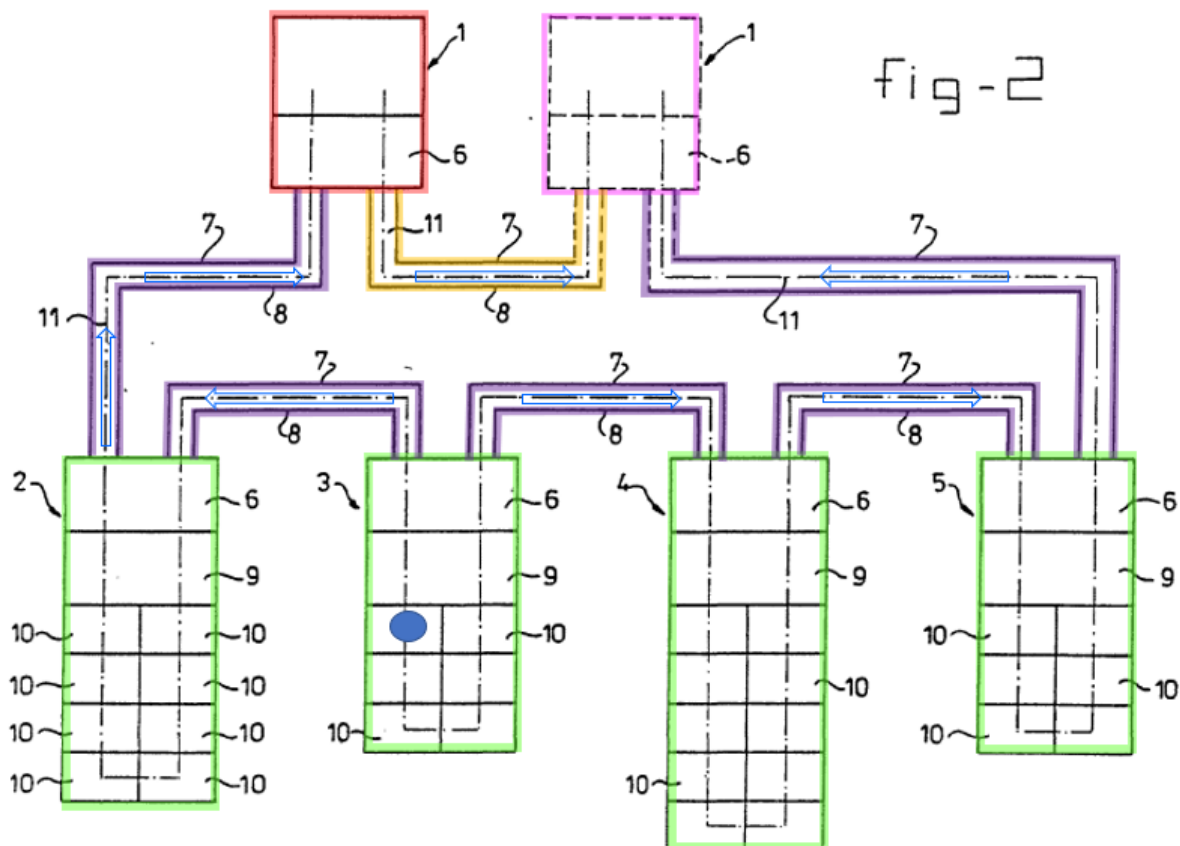


Ex. 1005, Figure 2.

96. Vink further explains that the two masters in the system communicate with the **plurality of substations (slave units)** via physical **transmission lines 7, 8**. Ex. 1005, 22:1-9, 15:28-35 (“The transmission lines 7, 8 may, for example, consist of coaxial cable, optical fibre cable and the like.”).

97. Moreover, the combination of Vink with Patrick (for Ground 1) and further with AAPA (for Ground 2) suggests that the **passive master 1** is a “standby master that receives upstream packets from the first master unit during normal operations,” meeting the construction of the “second master unit.”

98. I provide an exemplary transmission of upstream data packets that originate from slave 3 as one particular example. As shown below, I have drawn a blue circle to indicate the origin of the upstream data packet and open blue arrows to indicate the direction of upstream data flow.



99. As shown, there are only two possible direction the upstream data can flow: (1) from **slave 3** to **slaves 4** and **5** and up to the **passive master 1**; or (2) from **slave 3** to **slave 2**, to **active master 1**, then to **passive master 1** across the **transmission lines 7, 8**—the latter of which meets the proper construction of the claimed “second master unit.” But regardless of which way the data flow, the **passive master 1** would have been able to “receive all the information which is intended for the **active master**,” Ex. 1005, 16:26-31, while “receiving from the slaves (2, 3, 4, 5) via transmission system (7, 8) the data bits originating from the I/O modules (10) [of the slave units].” Ex. 1005, 23:22-36. Choosing to send upstream data packets from the **active master 1** to **passive master 1** across the **transmission lines 7, 8** would have been an obvious variant to try that would have been readily apparent to a POSITA.

100. And sending it either direction would have been an obvious variant that could have been readily carried out by a POSITA with a reasonable expectation of success because Vink explicitly teaches it is possible to send the data packets in any direction. Specifically, Vink teaches that a “very flexible system is obtained in an embodiment of the invention in that the at least one master and slaves are designed to transmit or receive packets of data bits via a

transmission system ring in one and/or the other direction.” *e.g.*, Ex. 1005, 14:28-31.

101. In fact, as the AAPA itself admits, sending upstream data from the **active master 1** to **passive master 1** across the **transmission lines 7, 8** was commonly employed as a means to enable “fault protection.” Specifically, the AAPA admits that “[t]his redundancy in transmission is in accordance with fault protection mechanisms used in high-speed networks *known in the art*, such as the standard ‘1+1 APS’ (automatic protection switching) technique used in SONET.” Ex. 1001, 8:49-52; *see also* Ex. 1009, 52-55 (discussing the well-known “1+1 protecting switching”). Specifically, “this redundancy” refers to “[t]he active master bicast[ing] these [upstream] packets, sending them both to network 22 and to standby master 32 over a protection interface 76 between the two masters, as indicated by an arrow 77.” Ex. 1001, 8:42-47.

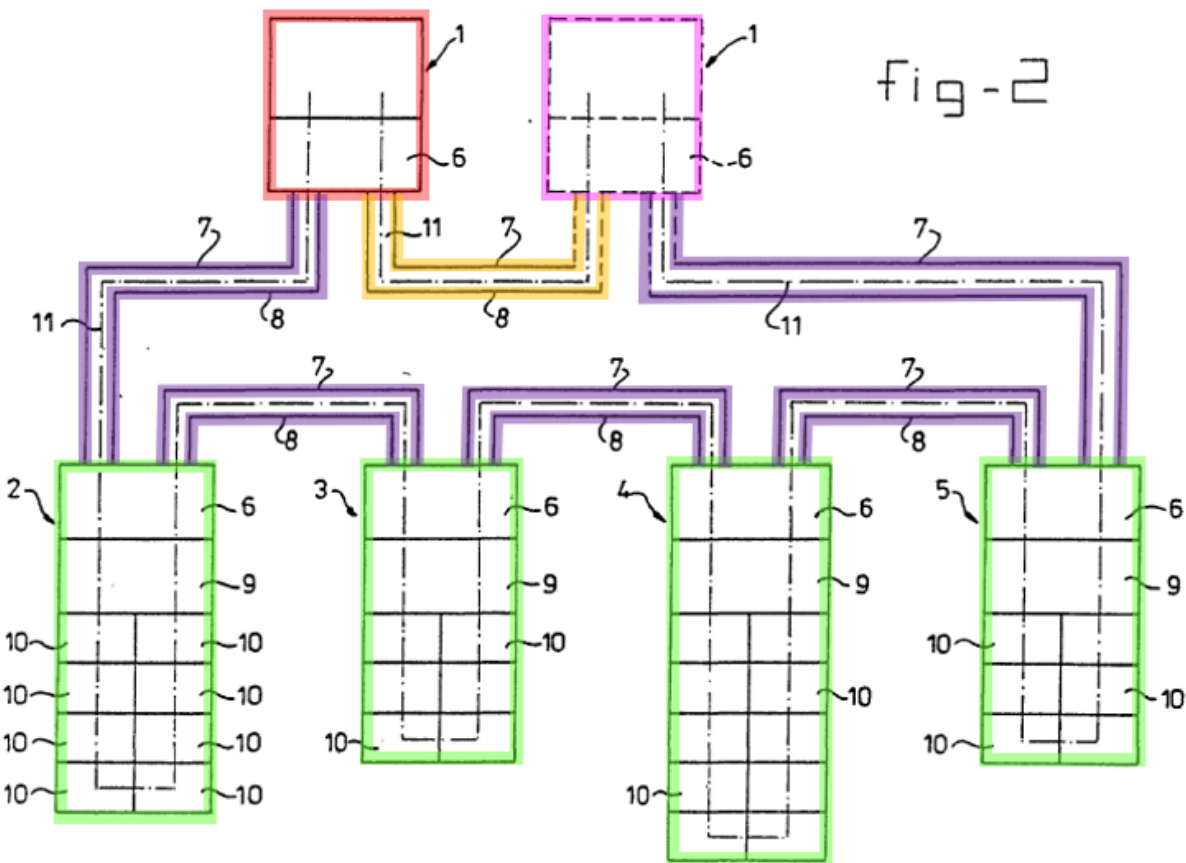
102. And just as AAPA taught, it would have been a trivial modification to employ such “fault protection mechanism” that is already “known in the art” with Vink’s communication system to allow upstream packets to be sent from the **active master 1** to **passive master 1** across the **transmission lines 7, 8** during normal operations. Such redundancy, as AAPA admitted, would have been beneficial to quickly mitigate any fault events that may have occurred.

103. At any rate, I understand that the Applicant conceded that limitation [1a, 4a, 9a, 11a] was well-known during prosecution. *See* Ex. 1002, 160-161, 169-181; Ex. 1001, Figure 2B. Indeed, Applicant did not contest the Examiner's rejection that "each master unit 25 [is] connected to the ATM network 22, therefore, each **master unit** 25 inherently includes a **physical interface** to the network 22." Ex. 1002, 159.

iii. [1b, 4b, 9b, 11b] a plurality of **slave units**, each **slave unit** comprising one or more **ports to respective subscriber lines**; and

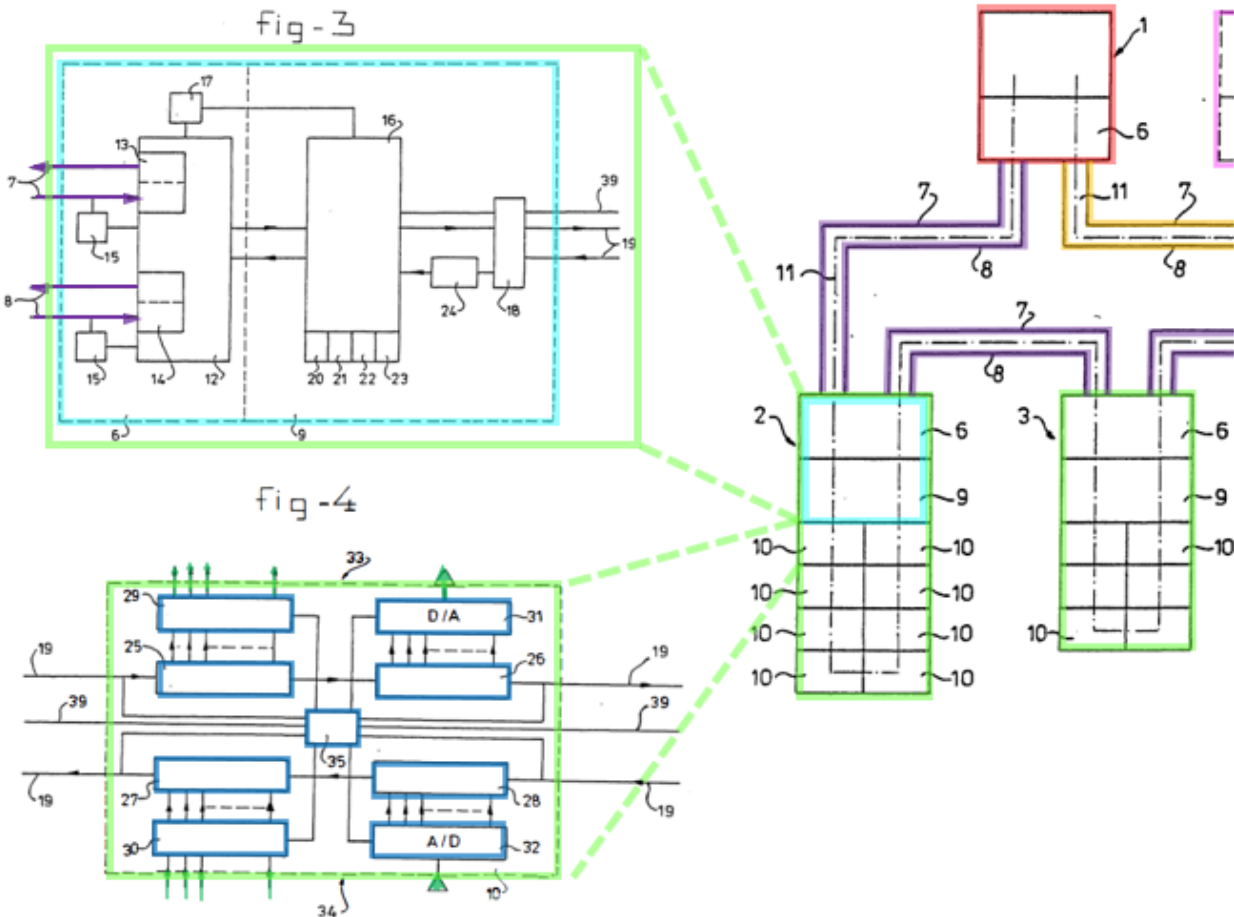
104. Vink in combination with Patrick (for Ground 1) and further with AAPA (for Ground 2) suggests this limitation.

105. Vink discloses **substations (slaves)**, as shown in Figure 2 as **slaves 2, 3, 4, and 5**.



Ex. 1005, Figure 2. Vink discloses that each of the slaves contains **transmitting/receiving unit 6** and **control module 9**, and one or more **I/O (input/output) modules**. Ex. 1005, 15:35-16:1. Each of the I/O modules, as shown in Figure 4, contain an **input side** and an **output side** that provides and takes data to and from the local data bus 19 and the control line 35. The “**parallel digital output** and **parallel digital input**” are connected to buffers 29 and 30, Ex. 1005, 19:19-21. Vink further shows in Figure 4 that the “[d]ata bits are transmitted

from and to the relevant I/O modules via the connections, provided with an arrow,
to the local data bus 19.” Ex. 1005, 19:16-18.



Ex. 1005, Figure 4.

106. A POSITA would have readily recognized that the inputs and outputs within each I/O modules include ports. At a minimum, the addition of ports to the I/O modules would have been a trivial modification. The inputs and outputs in the

I/O modules already permit direct connections. Vink teaches that, in certain embodiments, certain elements on the input and/or output side of each I/O module can be simplified. Ex. 1005, 10:13-30. A POSITA would have understood that the flexibility in design of the I/O modules is required due to the fact that other entities that could be connected to the slave unit have a variety of structures. This flexibility permits a multitude of entities to be connected to the slave, and a POSITA would have understood that the best way to incorporate these entities would have been by way of a port.

107. A POSITA would have further recognized that these connections lead to subscriber lines, as discussed in the following paragraphs. Vink teaches that the I/O modules are enabled to present data bits supplied by the master at their output side and to record data bits for the master supplied at the input side. Ex. 1005, 23:14-21. These data bits can be supplied by/present to *other devices* that are connected to the I/O modules. Ex. 1005, 7:9-16 (“The sampling instants of I/O modules or *the devices connected thereto* can be accurately set by means of the control information supplied, as intended.”).

108. Further, Patrick and AAPA teach these limitations. Patrick teaches that the secondary stations (slaves) are subscriber access units, where the subscriber access units can be “connected to a personal computer, workstation, [or]

other data terminal equipment (“DTE”), for example, in households having new or preexisting cable television capacity.” Ex. 1006, 1:34-40. Patrick also teaches that the secondary stations (slaves) can contain an ethernet port for connection to other subscriber units. Ex. 1006, 4:59-5:1. As shown in Figure 3 below, the **slave units 110n** each include the **ethernet port** and **connections to data terminal equipment**.

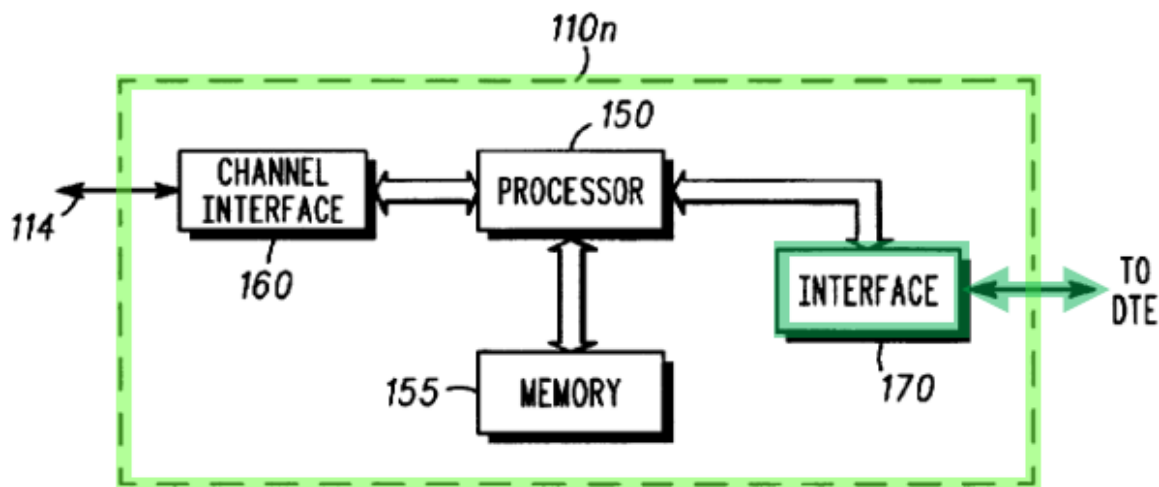


FIG. 3

Ex. 1006, Figure 3.

109. AAPA teaches that “[e]ach slave unit typically comprises a switching core 29, coupled to a plurality of ports 28 serving respective subscriber premises via suitable DSL modems.” Ex. 1001, 1:45-48. Indeed, Applicant conceded that limitation [1b, 4b, 9b, 11b] was well-known during prosecution. *See* Ex. 1002,

160-161, 169-181; Ex. 1001, Figure 2B. Applicant did not contest the Examiner's rejection that the "admitted prior art in figure 1 of the instant application discloses a DSLAM system 20 implementing a multi-shelf architecture. The DSLAM 20 has a plurality of slave units 27, and each slave unit comprises a *plurality of ports to respective subscriber premises* via suitable DSL modems, page 2, lines 11-14." Ex. 1002, 159.

110. It would have been obvious to combine Vink with Patrick (for Ground 1) and further with AAPA (for Ground 2) to include ports that would have been connected to subscriber lines. Implementing ports into the Vink's input and output sides of the I/O modules would have been a trivial modification, one that has been incorporated in the field for years before the priority date of this patent (such as ethernet ports). A POSITA would have understood that such a connection would have been implemented with a reasonable expectation of success, thus permitting flexibility in the entities that can be connected to Vink's system, flexibility which Vink has already considered.

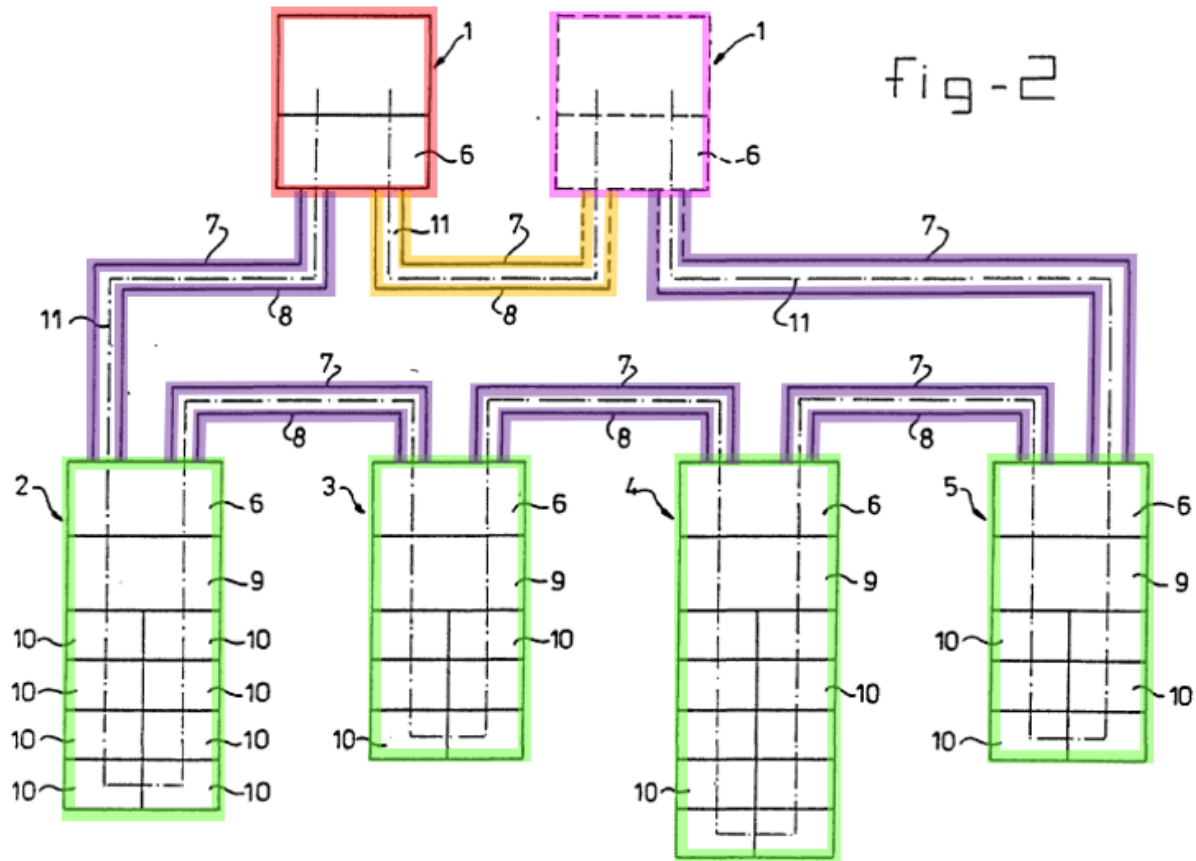
- iv. [1c, 4c, 9c, 11c] a plurality of **physical interface lines**, which link the **slave units** in one or more daisy chains, in which the **slave units** are mutually connected in series by the **physical interface lines** therebetween, each daisy chain comprising at least a **first slave unit** connected one of the **physical interface lines** to the **first master unit**, [...] and a **last slave unit** connected by another of the **physical interface lines** to the **second master unit**.

111. Vink discloses this limitation.

112. Vink discloses **transmission system 7, 8** to link the slave units and the master units. The **transmission lines 7, 8** may be physical lines, such as “coaxial cable, optical fibre cable and the like.” Ex. 1005, 15:34-35.

113. Vink discloses that the slaves are connected by the **transmission lines 7, 8** serially, or in a cascade. Ex. 1005, Abstract (“Method and communication system for *serially* exchanging data...”); Ex. 1005, 5:15-18 (“...using at least one master station (master) to which the I/O modules are connected in a *cascade* arrangement”). A cascade and a daisy-chain configuration both connect the

entities in a linear fashion, one after the other.



Ex. 1005, Figure 2.

114. Vink discloses that the **transmission lines 7, 8** connect the first master to the first slave. Figure 2 shows that the **first master** (shown in red) is connected to the **first slave** (slave 2).

115. Vink further discloses that the **transmission lines 7, 8** connect the last slave to the second master unit. Figure 2 shows that the **last slave** (slave 5) is connected to the **second master** (shown in pink).

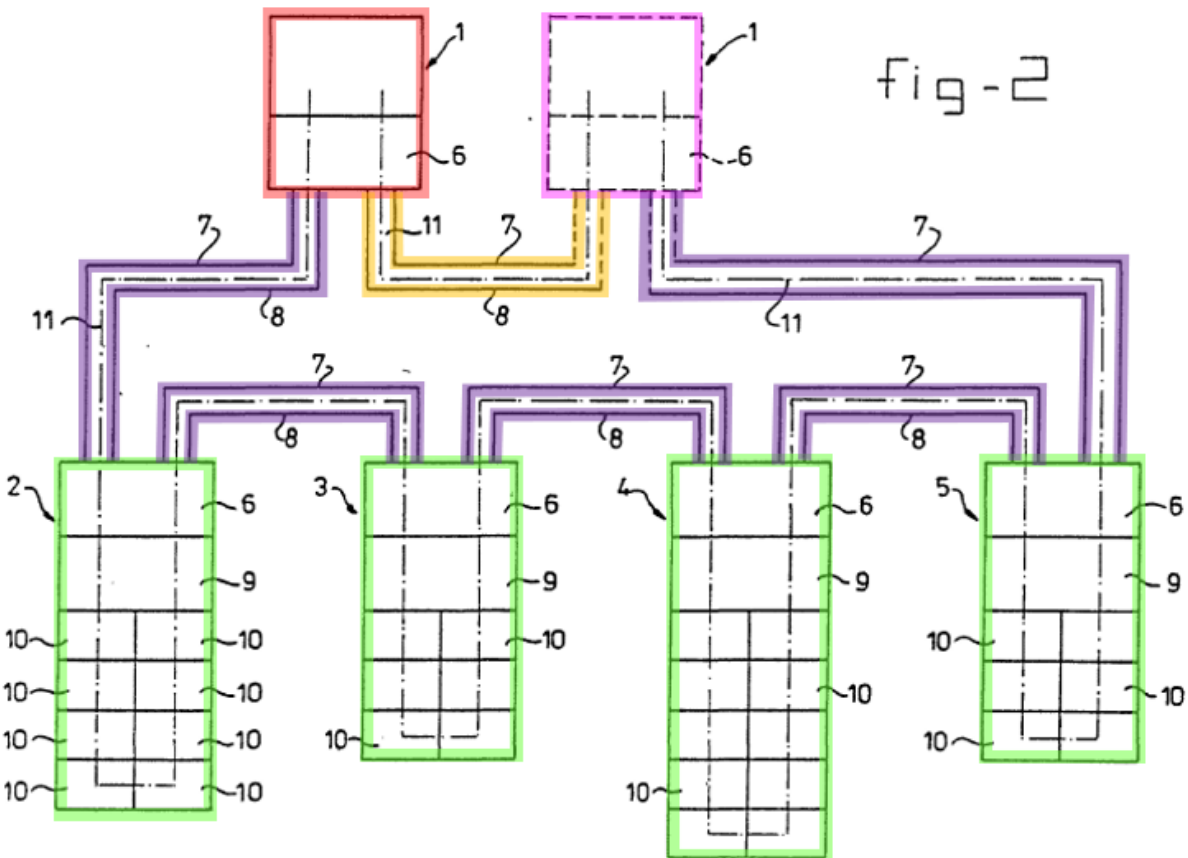
116. At any rate, I understand that the Applicant conceded that limitation [1c, 4c, 9c, 11c] was well-known during prosecution. *See* Ex. 1002, 160-161, 169-181; Ex. 1001, Figure 2B. Indeed, Applicant did not contest the Examiner's rejection that the "the bi-directional arrows which links the slave units 27-fig. 2B in daisy chain constitute a plurality of physical interface lines," "the slave units 27-fig. 2B are mutually connected in series by the physical interface lines," and "the shown daisy chain having the first slave unit 27-fig. 2B connected to the first master unit via a physical interface line, and the last slave unit 27-fig. 2B connected to the second master unit via another physical interface line" teach these limitations. Ex. 1002, 159-160.

v. [1d] a **second slave unit connected to the first slave unit but not to the first or second master unit,**

117. Vink discloses this limitation.

118. Vink discloses that the slaves are connected in a cascade. Ex. 1005, 5:15-18 ("...using at least one master station (master) to which the I/O modules are connected in a ***cascade*** arrangement"). Connection in a cascade is a serial connection, one after the other. Thus, a second entity in the chain will only be connected to the first and third entities, and no others.

119. As shown in Figure 2, the **second slave** (slave 3) is connected to the **first slave** (slave 2) and the **third slave** (slave 4), but not to the **first master** or **second master** unit.

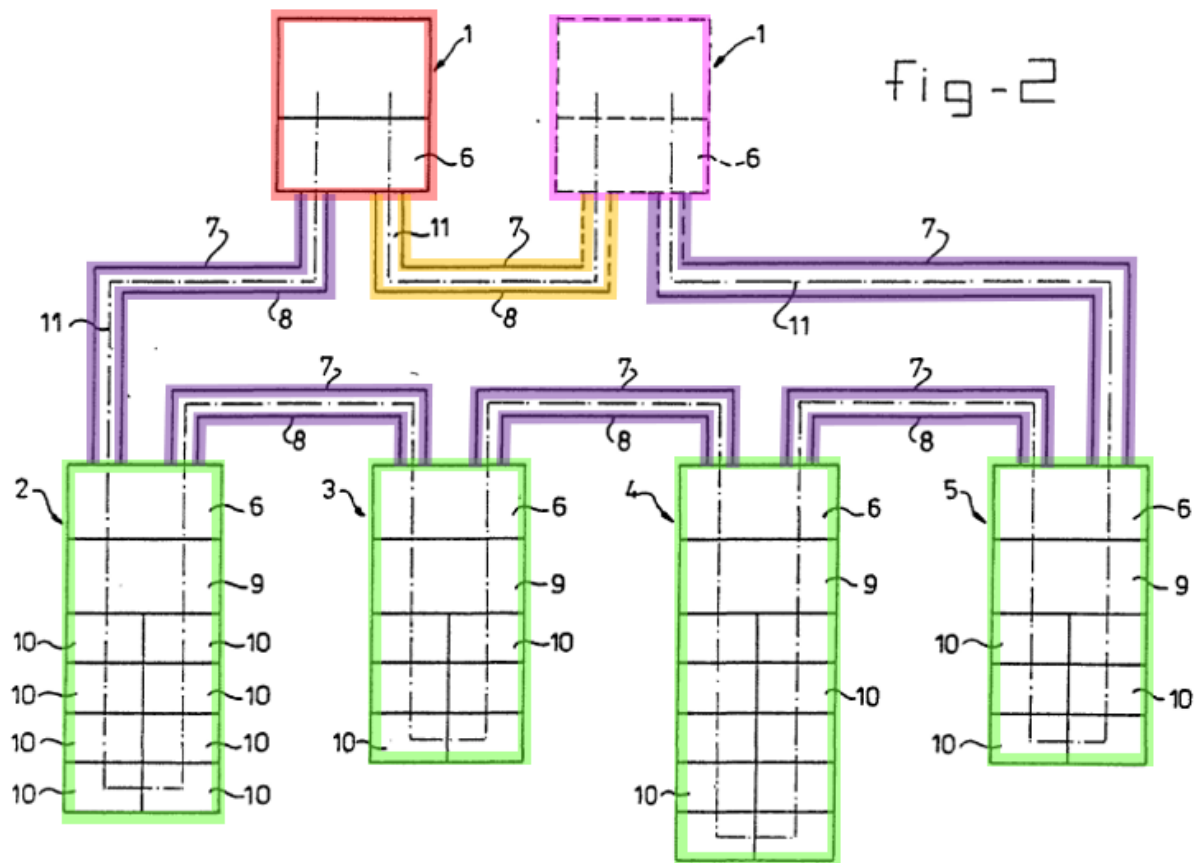


Ex. 1005, Figure 2.

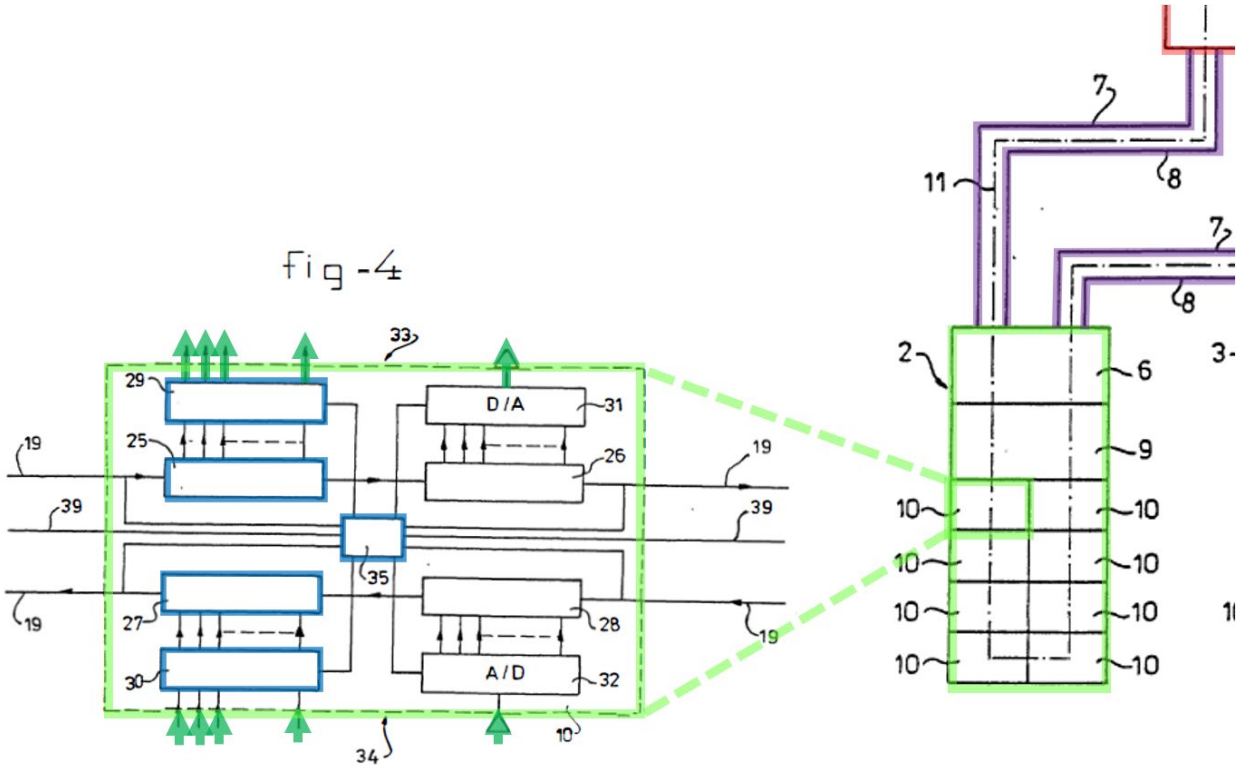
- vi. [4d] wherein in normal operation, downstream data packets received from the network are passed from the **first master unit** to each of the daisy chains via the **first slave unit** in each chain, and upstream data packets received by the **slaves** in each chain from the **subscriber lines** are passed via the **first slave unit** in the chain to the **first master unit** for transmission over the network.

120. Vink in combination with Patrick renders obvious this limitation.

121. Vink teaches “data packets ... are passed from the **first master unit** to each of the daisy chains via the **first slave unit** in each chain” and “data packets received by the **slaves** in each chain from the **subscriber lines** are passed via the **first slave unit** in the chain to the **first master unit**.” For example, Vink teaches that data from the **master 1** is supplied to the **output side 33** of the I/O modules 10 (i.e., the ports to the subscriber lines) in each of the **slave units** and that data from the **input side 34** of the I/O modules 10 (i.e., the ports from the subscriber lines) are supplied to the **master 1**. *See* Ex. 1005, claim 1 (“supplying control information to the I/O modules (10) to enable the I/O modules (10): to present in a mutually synchronised manner, at their output side (33), the data bits supplied by the at least one master (1), to record in a mutually synchronised manner, at their input side (34), data bits for supply to the at least one master (1).”).



Ex. 1005, Figure 2.



Ex. 1005, Figure 4.

122. Specifically, as Patrick teaches, data is normally transmitted in the downstream direction from the network down to the slaves via the master and in the upstream direction from the slave to the network via the master. *See* Ex. 1006, 1:34-40 (“With the CableCommTM system, digital data may be transmitted both in the *downstream direction, from the primary station or controller (connected to a network) to the secondary station* of an individual user (subscriber access unit), and in the *upstream direction, from the secondary station to the primary station (and to a network).*”), 1:60-64 (“Many end users (secondary stations, also referred

to as subscriber access units) transmitting *upstream to a primary station, with one or more primary stations transmitting downstream to the secondary stations.*”).

123. As such, in the modified system in with Vink’s communication system is connected to an external network, a POSITA would have understood that downstream data packets received from the external network would have passed from the **first master** into the communication network via the **first slave 2** and that upstream data packets to be sent to the external network would have been passed from the **first slave unit 2** to the **first master** shown in Figure 2 because Vink teaches a serial bit transfer of the data through the **transmission lines 7, 8** that forms a daisy chain of **slaves 2, 3, 4, and 5**. See Ex. 1005, Abstract (“Method and communication system for serially exchanging data... The I/O modules (10) can be connected in groups to the at least one master (1) via one or more substations (slave) (2, 3, 4, 5) and a transmission system (7, 8) for serial bit transfer.”); Ex. 1005, 14:28-31 (discussing Vink’s communication system is “designed to transmit or receive packets of data bits via a transmission system ring in one and/or the other direction.”), Ex. 1005, 11:9-11 (“The master station and the substations of said communication system each form a node between which information is bit-serial exchanged.”), Ex. 1005, 16:8-10 (“The data bits are serially transferred both in the transmission system 7, 8 ...”). Sending downstream

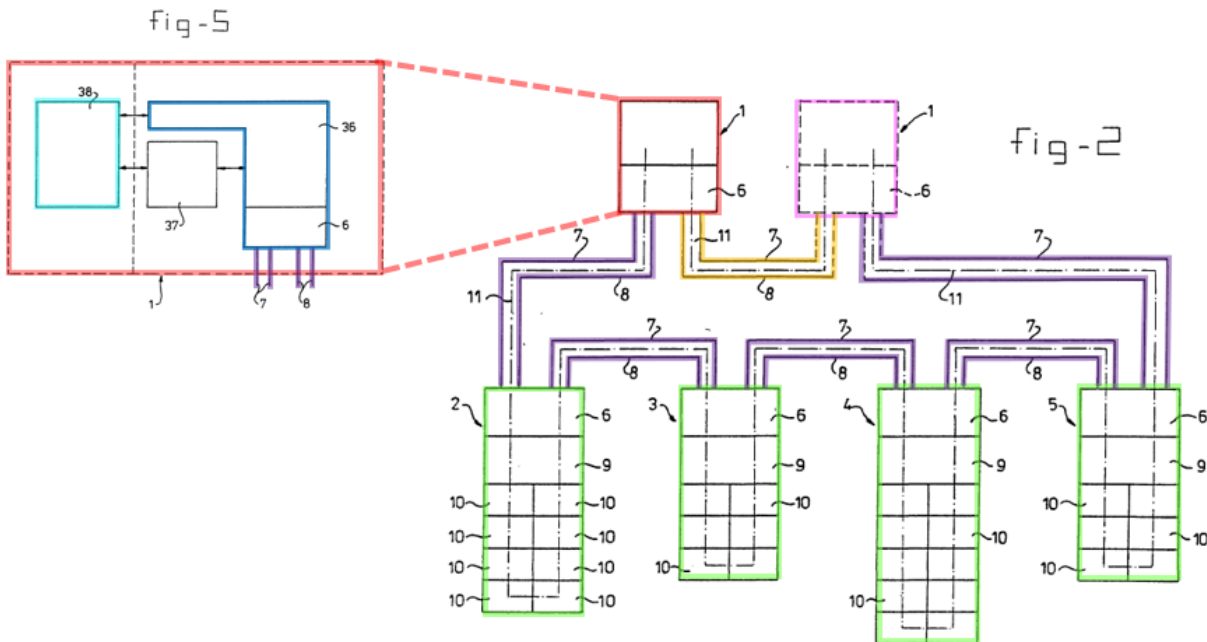
and upstream data in such a manner is merely one of a handful of ways to transmit information across Vink's communication system that utilizes bit-serial transfer of data. A POSITA would not have any difficulties in implementing such flow of downstream and upstream data traffic in such a bit-serial exchange communication system. Making such a modification to enable flow of downstream and upstream data flow from an external network through the master and the first slave in a serial manner would have been a trivial modification that a POSITA would have been able to implement with ease.

vii. [9d] wherein each of the first and second master units comprises:

124. Vink discloses this limitation.

125. Figure 5 of Vink illustrates the components in each of the first and second master units--namely the transmitting/receiving unit 6, control unit 36 and control computer 38. See Ex. 1005, 20:30-38 ("The software for controlling the communication system according to the invention is essentially concentrated in the master 1 which comprises, in an exemplary embodiment of the invention as shown in Figure 5, a control unit 36 for controlling the data flow via the transmission system 7, 8, with an associated memory 37 for storing and exchanging information with a control computer 38 which contains the calculations and background information necessary for the process to be controlled

via the I/O module.”); Ex. 1005, 16:24-26 (“All the masters are so designed that they can assume the function of the active master, for example in the event of faults.”).



Ex. 1005, Figures 2 and 5.

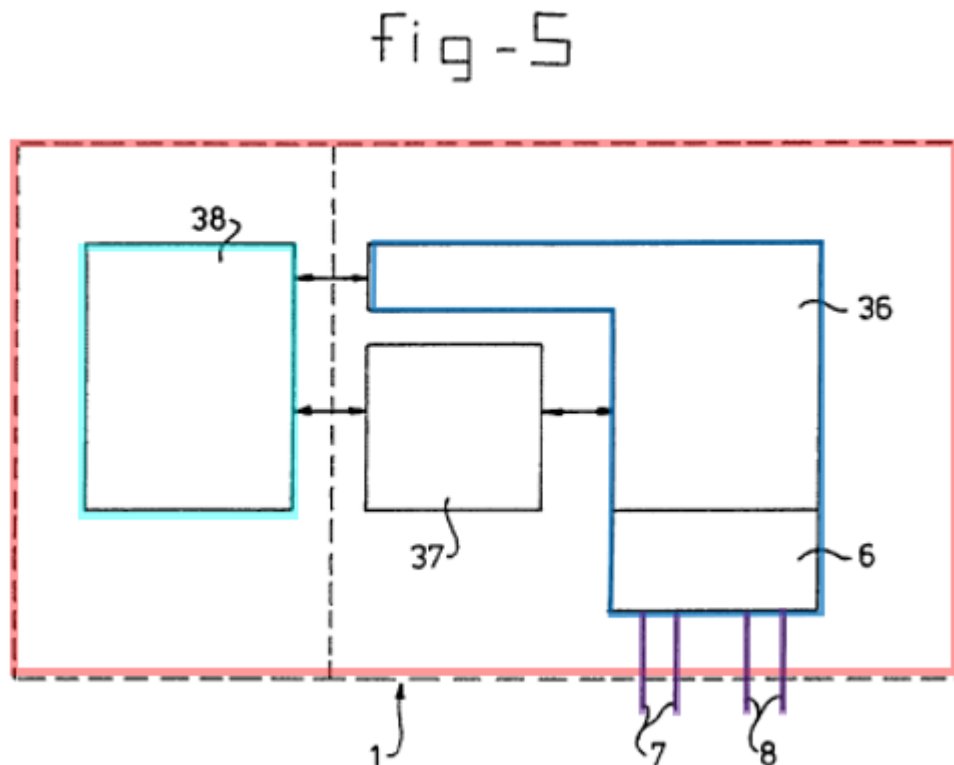
- viii. [9e] a switch, configured to route data packets between the respective physical interface and the one or more daisy chains; and

126. Vink discloses this limitation.

127. To be clear, each of the masters have a switch and each of the slaves have a switch. I will color the components that correspond to a switch in blue, but provide an underline for the components that correspond to the switch for a

master. I will *not* underline the components that correspond to the **switch** for a **slave**.

128. Vink discloses that the masters have the capability of functioning as a “**switching centre**” so that the **master** is able to reach as many connected **slaves** as possible in a fault situation.” Ex. 1005, 14:31-33 (“**masters**... are capable of functioning as a **switching centre**.”). As shown below in Figure 5, the components of the **master** with this capability are the transmitting/receiving unit 6 and control unit 36.



Ex. 1005, Figure 5.

129. Vink explains that the control unit 36 “extract[s]” information about the particular slave located along the daisy chain the data packets should be sent to. *See* Ex. 1005, 21:3-9 (“[T]he control computer 38 provides for and monitors the correct sequence of the data bits for a relevant slave, related to the sequence in which the I/O modules are arranged. The information about this sequence is extracted by the control unit 36 from the status information received from the relevant slaves.”). Vink further explains that “control unit 36 ... control[s] the data flow via the transmission system 7, 8.” Ex. 1005, 20:33-34. The “transmitting/receiving unit 6 provides for the monitoring of the transmission” and “the transmitting/receiving unit 6 also provides for the switching of the transmission ring or of the communication direction of the data flow.” Ex. 1005, 21:3-14.

130. Because the transmitting/receiving unit 6 and control unit 36, when taken together, route packets between the interface lines and the daisy chain, this limitation is satisfied.

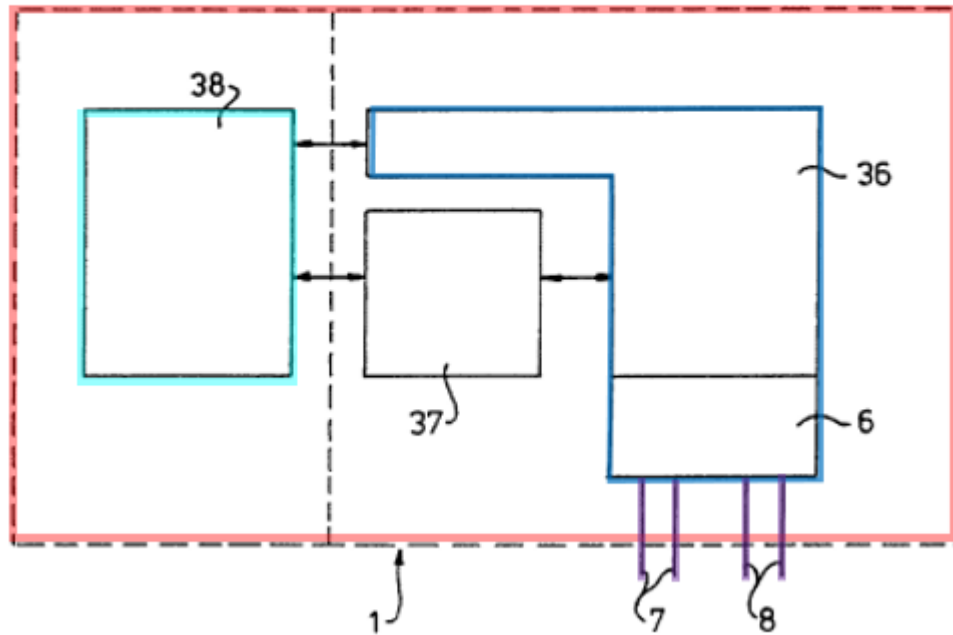
- ix. [9f] a pre-switch, which in the event of a fault at a location in one of the daisy chains, re-routes at least a portion of the data packets exchanged with one or more of the slaves in the daisy chain in which the fault has occurred through another one of the daisy chains.

131. Vink in combination with Patrick renders obvious this limitation.

132. Vink discloses a control computer 38 in each of the **first** and **second master units**, which functions as a pre-switch. As before, I have colored the components that correspond to a pre-switch for a **master** in light blue underline. For the components that correspond to the pre-switch for a **slave**, I will *not* underline those components.

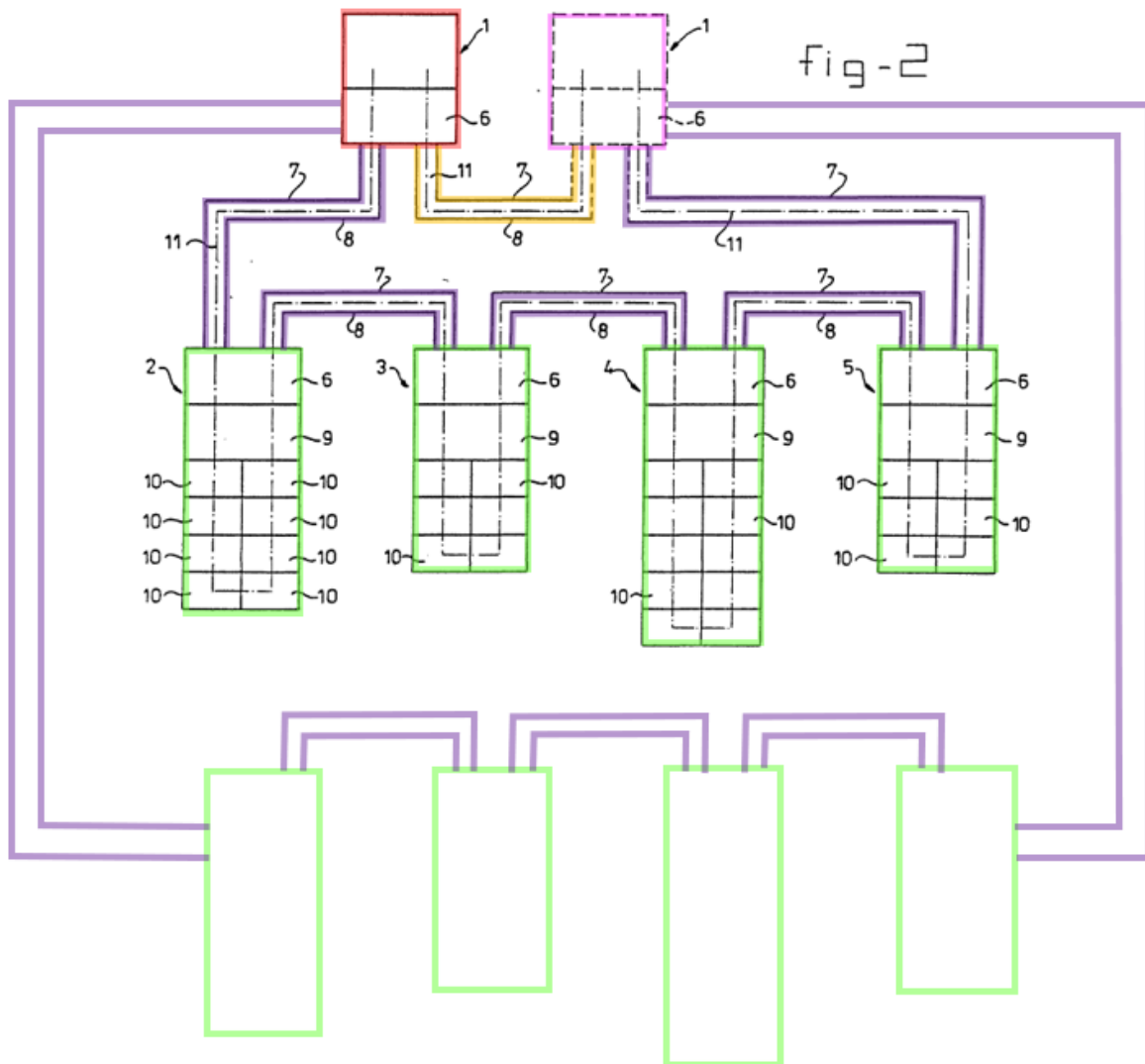
133. The control computer 38 determines the routing of data packets to the correct slave unit based on where the I/O modules are located in the daisy chain. Specifically, Vink teaches that “the control computer 38 provides for and monitors the correct sequence of the data bits for a relevant slave, related to the sequence in which the I/O modules are arranged.” Ex. 1005, 21:4-7.

fig - 5



Ex. 1005, Figure 5.

134. Vink shows only a single daisy chain in Figure 2, but discloses the possibility of “a transmission system containing more than two rings.” Ex. 1005, 16:16-17. I have schematically illustrated below another daisy chain that a POSITA would have been able to readily add to Vink’s communication system shown in Figure 2.



Ex. 1005, Figure 2 (modified to show an additional daisy chain of slaves).

135. Adding a second daisy chain would have been a trivial modification.

In fact, communications systems having multiple daisy chains was well-known in the art. For example, Patrick, as shown in Figure 1, discloses multiple daisy chains connected to a single master unit. And Patrick teaches that “utilizing more or

fewer branches, segments or sections of any communication medium,” (Ex. 1006, 3:30-32), were well within the skill of a POSITA.

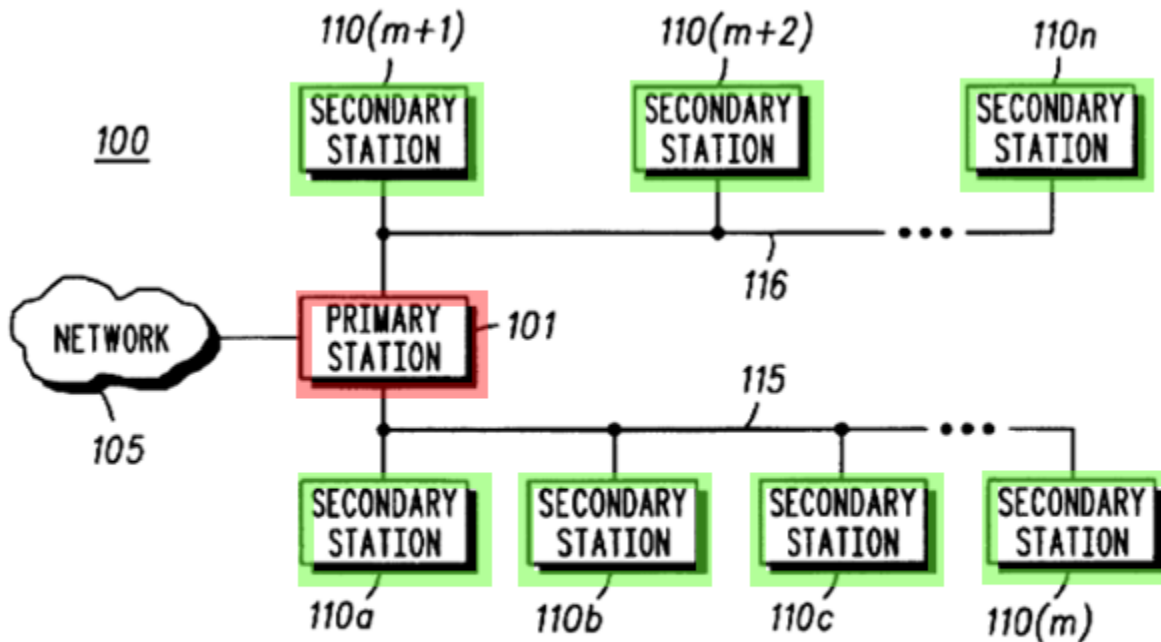


FIG. 1

Ex. 1006, Figure 1.

136. A POSITA would have been motivated to add additional daisy chains because simply adding additional slaves in a single daisy chain would eventually lead to a system in which the delay associated with delivering data packets to the last slave located furthest away from the active master would become unwieldy and raises the possibility of a node failure affecting the chain. A POSITA would have been able to optimize the total number of slaves on each daisy chain (e.g.,

four slaves on each daisy chain in the modified system shown above) to be able to determine the optimal transport delay between the active master to the last slave in each of the daisy chain.

137. Adding an additional daisy chain to Vink amounts to nothing more than providing additional slaves on one additional “segment[] or branch[] of a communication medium,” (Ex. 1006, 3:26), to allow connections to additional slaves.

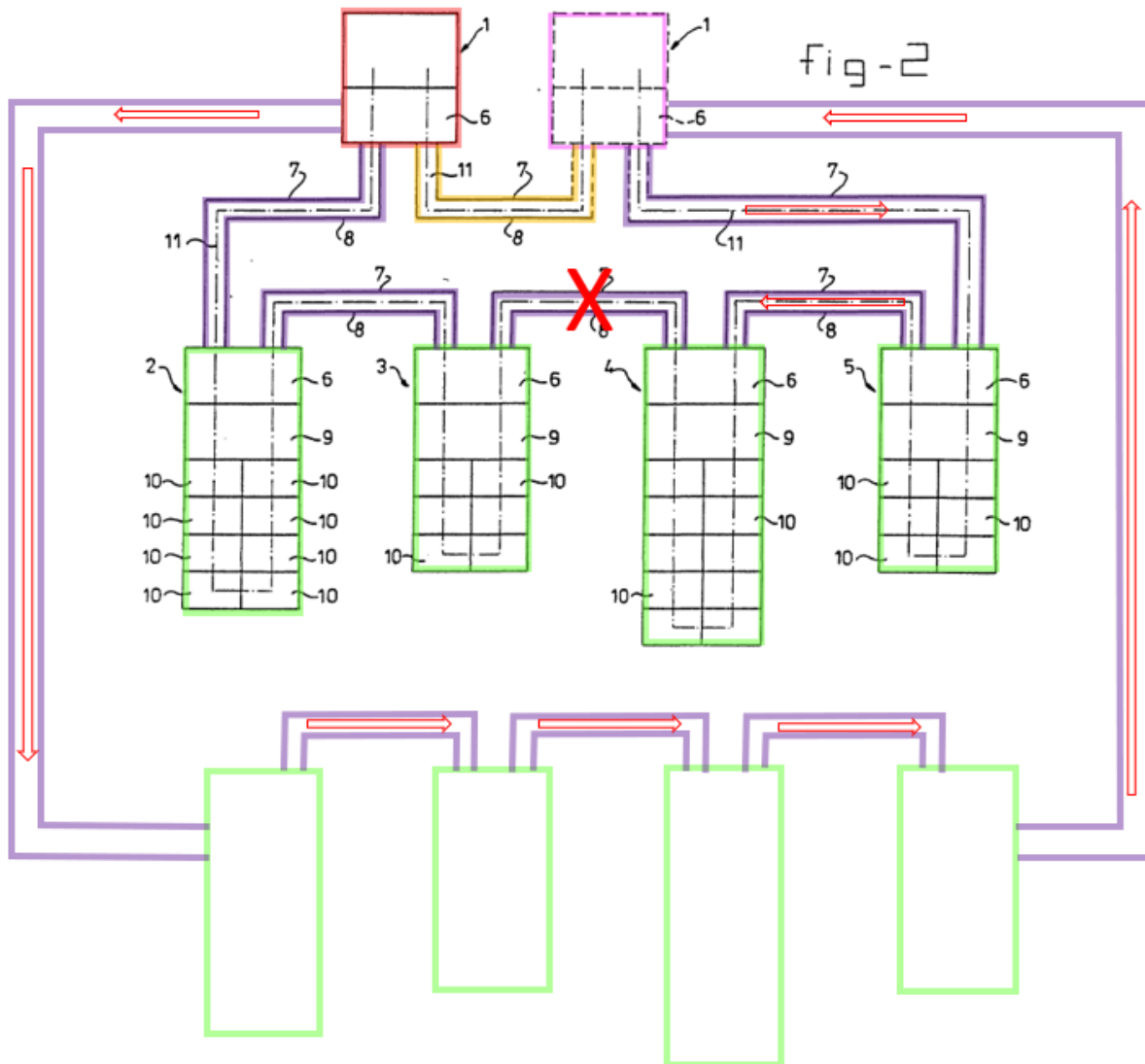
138. And to be clear, the **control computer 38** re-routes data packets whenever there is a fault in one of the daisy chains, such as to switch the direction of the data flow. *See* Ex. 1005, 9:4-7 (“It is furthermore possible, in the event of malfunctions in the transmission system, for example during the switching of transmission or communication direction, nevertheless to exchange the correct data bits with the correct slave.”); Ex. 1005, 21:10-16 (“In the case where the transmission system is constructed, as shown in Figure 2, as a multiple ring transmission system, the transmitting/receiving unit 6 also provides for the switching of the transmission ring or of the communication direction of the data flow. All this being on the basis of the information obtained about whether the connection to the transmission system is or is not operating correctly.”). This ensures that data can reach as many slaves as possible even when fault event has

occurred. *See* Ex. 1005, 14:28-34 (“A very flexible system is obtained ... in that the at least one master and slaves are designed to transmit or receive packets of data bits via a transmission system ring in one and/or the other direction. Master and/or slaves constructed in this way are capable of functioning as a switching centre so that, for example, the master is able to reach as many connected slaves as possible in a fault situation.”).

139. At a minimum, the [control computer 38](#) could easily be modified to direct the data packets on any of the desired daisy chains to ensure intended delivery of the data packets to a target slave because the [control computer 38](#) is already able to change the direction in which of the transmission rings (7, 8) transports the data packets. *See* Ex. 1005, 21:4-7 (“[T]he correct sequence of the data bits for a relevant slave, related to the sequence in which the I/O modules are arranged...”); Ex. 1005, 26:4-8 (“Communication system... wherein the at least one master (1) and the slaves (2, 3, 4, 5) are arranged to transmit or receive data bits via a transmission ring (7,8) in one and/or the other direction.”).

140. I have below added an “X” to illustrate a fault that occurs in the transmission lines 7, 8 that is in the original daisy chain. The red arrows indicate the direction of downstream data flow, in which the downstream data is intended for delivery to slave 4. As shown, it would be possible to deliver the data packets

through the second daisy chain up to the second master, which then passes the data packets serially to slave 5 which then passes it on to slave 4.



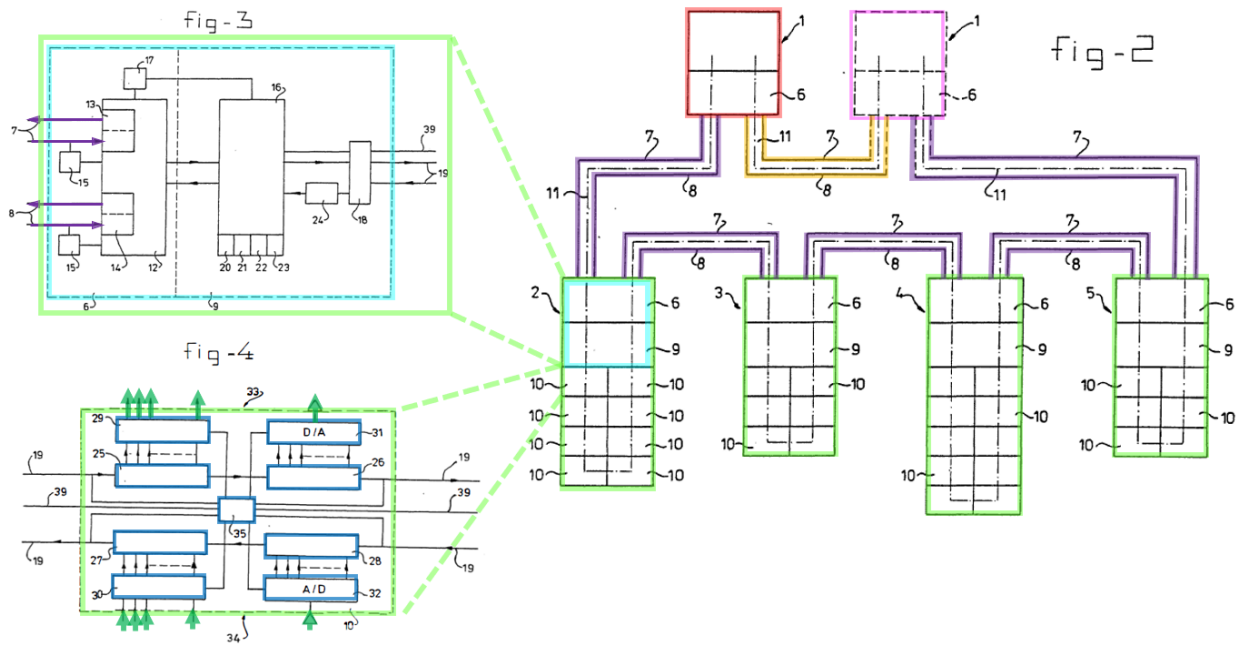
141. There is only one other possible re-rerouting of data that is possible, other than the one that is discussed here. And this other possibility is discussed further below with respect to claim 5, which is to send the downstream data from **active master** to **passive master** across **transmission lines 7, 8** and then to send

data to **slaves 4** through **slave 5**. However, the rerouting of the data by adding the additional daisy chain (as I discussed above) would have provided a POSITA with the predictable benefit of ensuring successful packet transmission across the communication system even if a fault develops in the **transmission lines 7, 8** between the **active master** and the **passive master**. At a minimum, it would have been obvious to at least try either transmission mechanism. In fact, depending on the target slave and the total number of slaves in a daisy chain, it would have been obvious to choose from either of these two delivery mechanisms that optimize the overall transport delay.

x. [11d] wherein each of the **slave units comprises:**

142. Vink discloses this limitation.

143. Figures 3 and 4 of Vink are more detailed views for each **slave unit** that includes the **transmitting/receiving unit 6**, **control module 9**, and **I/O module(s) 10**. *See* Ex. 1005, 15:8-10 (“Figure 3 shows a block diagram of an exemplary embodiment of the transmission unit and the control module of a substation in Figure 2.”); Ex. 1005, 15:11-12 (“Figure 4 shows a block diagram of an exemplary embodiment of an I/O module.”); Ex. 1005, 19:1-2 (“A possible embodiment of an I/O module 10 is shown in block diagram in Figure 4”).



Ex. 1005, Figures 2, 3, and 4.

- xi. [11e] a switch fabric comprising one or more switches, which convey data packets to respective ports on the switch to which the packets are addressed; and

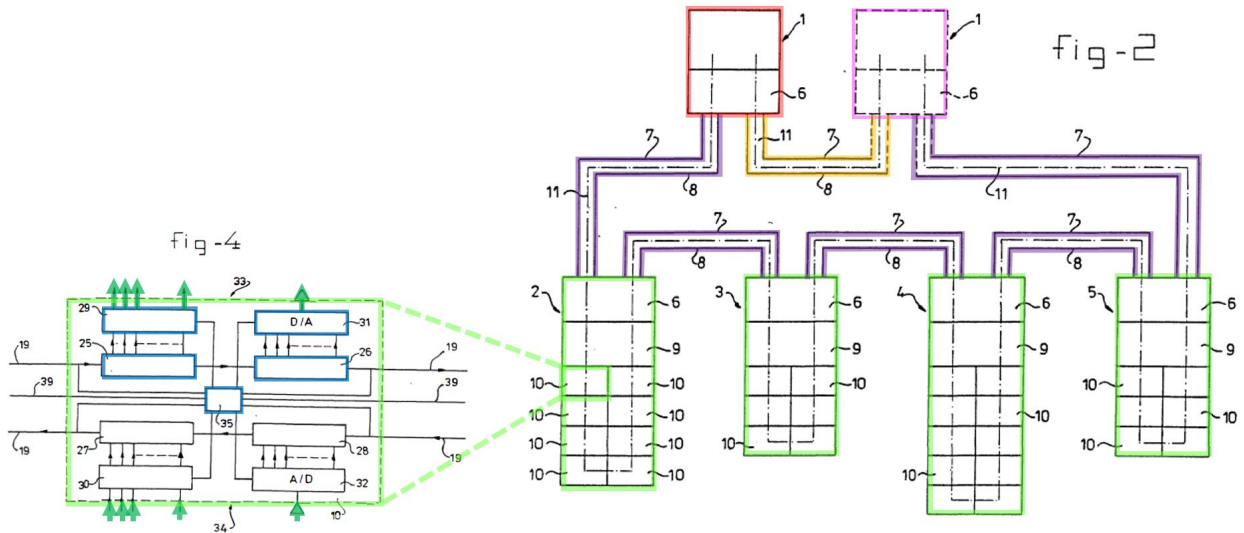
144. Vink discloses this limitation.

145. As I explained above, each of the **masters** have a switch and each of the **slaves** have a switch. I have colored the components that correspond to a switch for a **master** in blue underline. Here, for the components that correspond to the switch for a **slave**, I will *not* underline those components.

146. Vink discloses that the “**slaves** constructed in this way are capable of functioning as a switching centre ...” Ex. 1005, 14:31-33; Ex. 1005, 21:10-14.

Specifically, the shift registers 25, 26, buffers 29, 30, and control means 35

shown in Figure 4 together perform the functions of the claimed switch in each of the **slaves**. All of these components are located within an **I/O module 10** within each **slave**.

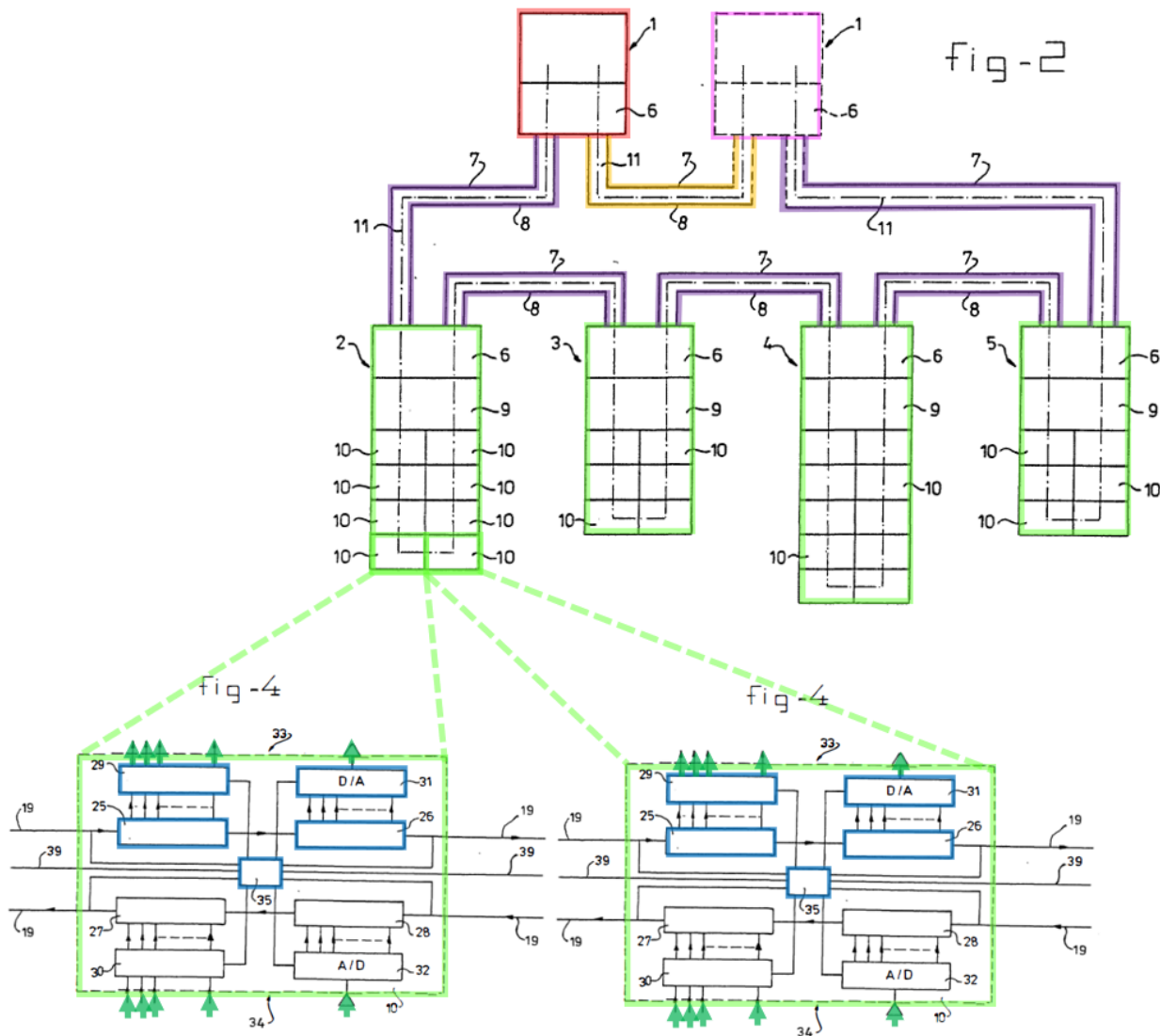


Ex. 1005, Figures 2 and 4.

147. To illustrate how the **shift registers 25, 26, buffers 29, 30, and control means 35** in each I/O module functions as a switch, it is instructive to first discuss how data flow from the **transmission lines 7, 8** through each of the **slave units**. Figure 3 shows that, before the data packets reach the **I/O modules**, they are transmitted from **transmission line 7, 8** and enter **slave units (2, 3, 4, 5)** through the **transmitting/receiving unit 6**, which in turn conveys data packet to

through local data bus 19. Ex. 1005, 15:36-16:1 (“Each slave 2, 3, 4, 5 comprises a control module 9 which is connected to the associated transmitting/receiving unit 6 and to which one or more input (I) and/or output (O) module(s) are connected.”); Ex. 1005,, 17:32-35 (“The respective I/O modules 10 are connected in cascade to said local data bus 19 (not shown in Figure 3); .

149. Below, I schematically illustrate two I/O modules that are serially connected to together. The data is transported using local data bus 19 and control line 39 sends control signals across the different I/O modules. Ex. 1005, 17:33-35 (“A control line 39 is provided for controlling the I/O modules 10.”).



Ex. 1005, Figures 2 and 4.

150. Vink teaches that the data packets sent to each I/O module 19 are conveyed to the output 33 through local data bus 19, specifically through **shift registers 25, 26** and **buffers 29, 30**, through a control signal line 19 under the control of control means 35. Ex. 1005, 19:4-8 (“When the data bits intended for the relevant I/O module are all, for example, received in the shift register, the

relevant information can be read out, if necessary in parallel, by means of a control signal without disrupting the bit transfer.”) ; Ex. 1005, 19:14-18 (“The shift registers 25 and 26 are located in cascade at the output side 33 ... Data bits are transmitted from and to the relevant I/O module via the connections, provided with an arrow [in Figure 4], to the local data bus 19.”); Ex. 1005, 19:28-32 (“Connected to the buffers 29, 30 and the converters 31, 32 are control signal lines which are activated from the control module 9 via the control line 39 and the control means 35, respectively, for the presentation of data bits at the output side 33 and the recording of data bits at the input side 34.”); Ex. 1005, 8:25-34 (“Yet a further embodiment of the method according to the invention, with which only the data bits intended for, and originating from the I/O modules connected to a local data bus are transferred on said data bus, comprises the steps of: adding address information, under the control of the at least one master (1), to the data bits intended for the I/O modules (10) connected to a respective slave (2, 3, 4, 5), and detecting the address information by the slaves (2, 3, 4, 5) and only exchanging with the connected I/O modules (10) the data bits intended therefor.”).

151. Thus, the **shift registers 25, 26, buffers 29, 30, and control means 35** (the switch components) convey the data packets to the **input and output ports** on the particular I/O module to which the packets are addressed.

152. Because each I/O module 10 contains the switch components **shift registers 25/26**, **buffers 29/30**, and **control means 35**, every I/O module has a switch, where these multitude of switches across the I/O modules constitute a “fabric” of switches that interconnect with each other, satisfying the claimed “switch fabric.”

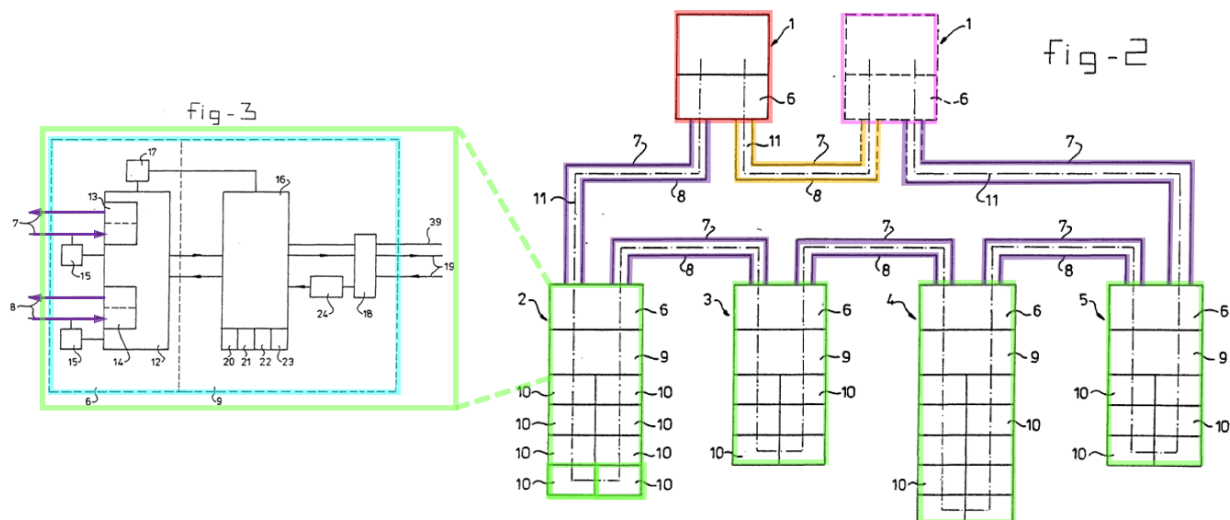
- xii. [11f] a **pre-switch**, which receives the data packets from one of the **physical interface lines** connected to the **slave unit** and passes those of the data packets that are addressed to any of the **ports** on the **slave unit** to the switch fabric, while passing packets not addressed to any of the **ports** on the **slave unit** for output through another of the **physical interface lines**.

153. Vink discloses this limitation.

154. As explained above, I have colored the components that correspond to a **pre-switch** for a **master** in light blue underline. Here, for the components that correspond to the **pre-switch** for a **slave**, I will *not* underline those components.

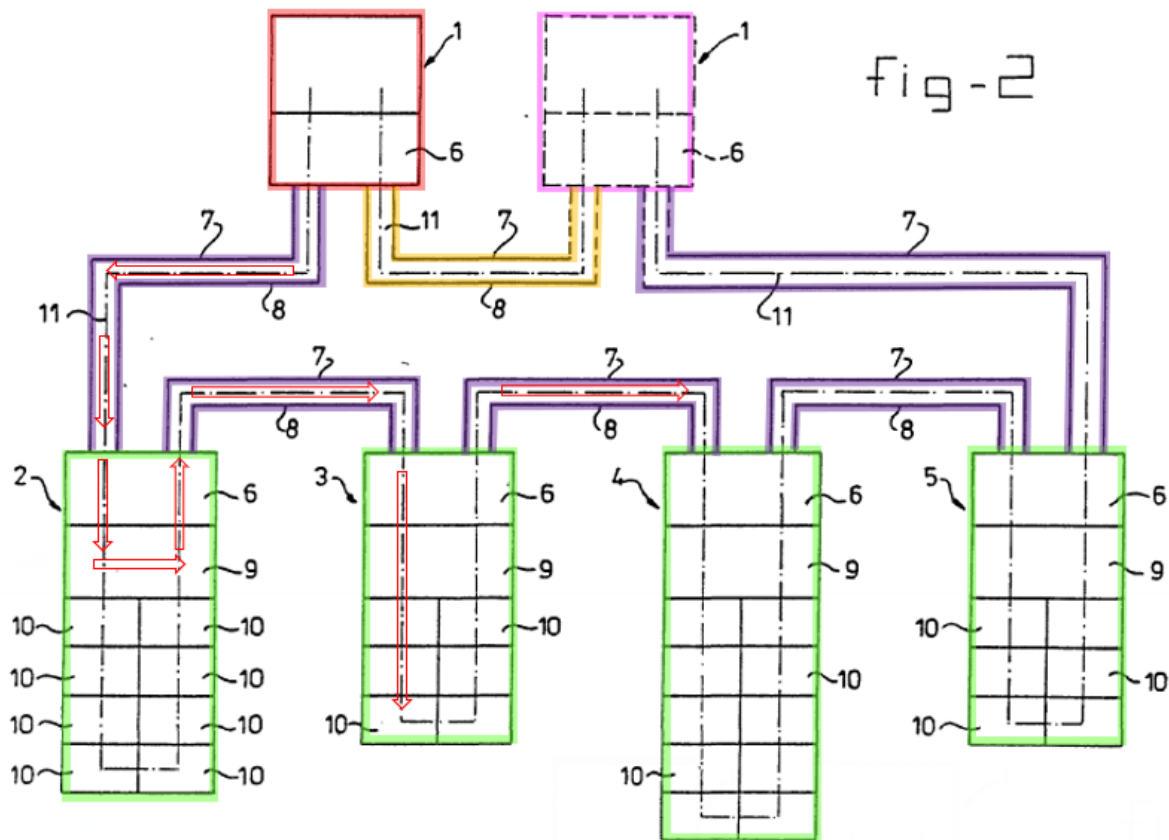
155. Vink discloses that each **slave unit** comprises a **control module 9** and a **transmitting/receiving unit 6** (the claimed “**pre-switch**”). As explained in the previous limitation, **transmitting/receiving unit 6** receives data packets from the **transmission lines 7, 8** that are addressed to the I/O modules 10 and the **control module 9** sends the data intended for the I/O modules in that particular slave serially down along the cascade of I/O modules. *See* Ex. 1005, 15:36-16:10

(“Each slave 2, 3, 4, 5 comprises a control module 9 which is connected to the associated transmitting/receiving unit 6 and to which one or more input (I) and/or output (O) module(s) are connected. ... A dash-dot line 11 diagrammatically shows the data flow in the communication system. The data bits are serially transferred both in the transmission system 7, 8 and to the level of the I/O modules 10.”).



Ex. 1005, Figures 2 and 3.

156. Each **slave** retains only the data packets addressed to the I/O modules within it, as determined by the **transmitting/receiving unit 6 and control module 9**. For example, data intended for one of the I/O modules in **slave 3** will bypass the I/O modules in **slave 2**, as I schematically indicated below using red arrows.

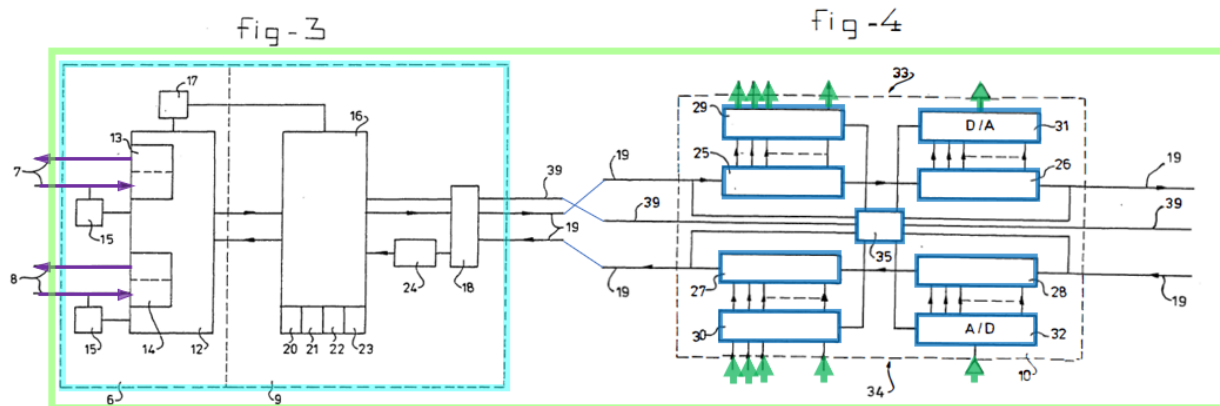


Ex. 1005, Figure 2.

157. That is, if a packet is not addressed to a particular I/O module in the slave, the **transmitting/receiving unit 6** and **control module 9** passes the other data packets to the next **transmission line 7, 8**. See Ex. 1005, 8:25-34 (“Yet a further embodiment of the method according to the invention, with which only the data bits intended for, and originating from[,] the I/O modules connected to a *local* data bus are transferred on said data bus, comprises the steps of: adding address information, under the control of the at least one master (1), to the data bits

intended for the I/O modules (10) connected to a respective slave (2, 3, 4, 5), and detecting the address information by the slaves (2, 3, 4, 5) and only exchanging with the connected I/O modules (10) the data bits intended therefor.”); Ex. 1005, 19:28-32 (“Connected to the buffers 29, 30 and the convertors 31, 32 are control signal lines which are activated from the control module 9 via the control line 39 and the control means 35, respectively, for the presentation of data bits at the output side 33 and the recording of data bits at the input side 34.”); Ex. 1005, 21:10-14 (“In the case where the transmission system is constructed, as shown in Figure 2, as a multiple ring transmission system, the transmitting/receiving unit 6 also provides for the switching of the transmission ring or of the communication direction of the data flow.”); Ex. 1005, 25:20-24 (“Communication system ... wherein the control module (9) is provided with selection means (20-22) for only transmitting data bits intended for, or originating from the I/O modules (10) connected to said control module (9) via the local data bus (19).”).

158. In contrast, the data packets that are intended for a particular I/O module within a **slave** are directed to, **output 33** traveling first through local data bus 19, 39 and then through **shift registers 25, 26, buffers 29, 30**, and **control means 35**.



Ex. 1005, Figures 3 and 4.

4. Dependent Claim 5

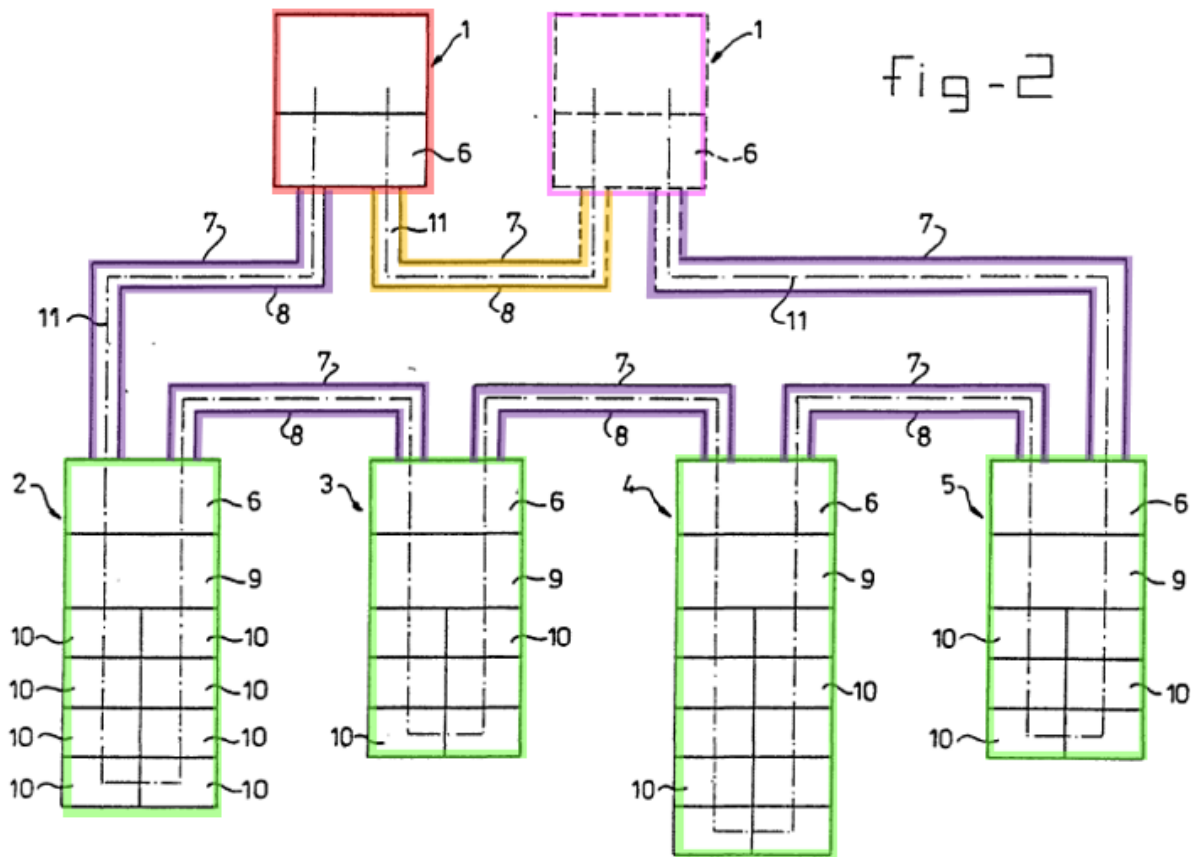
i. [5pre] Apparatus according to claim 4, and

159. Vink in combination with Patrick (for Ground 1) and further with AAPA (for Ground 2) renders obvious claim 4.

ii. [5a] comprising a protection interface, which couples the second master unit to the first master unit, and over which interface data packets are conveyed between the first and second master units in case of a fault.

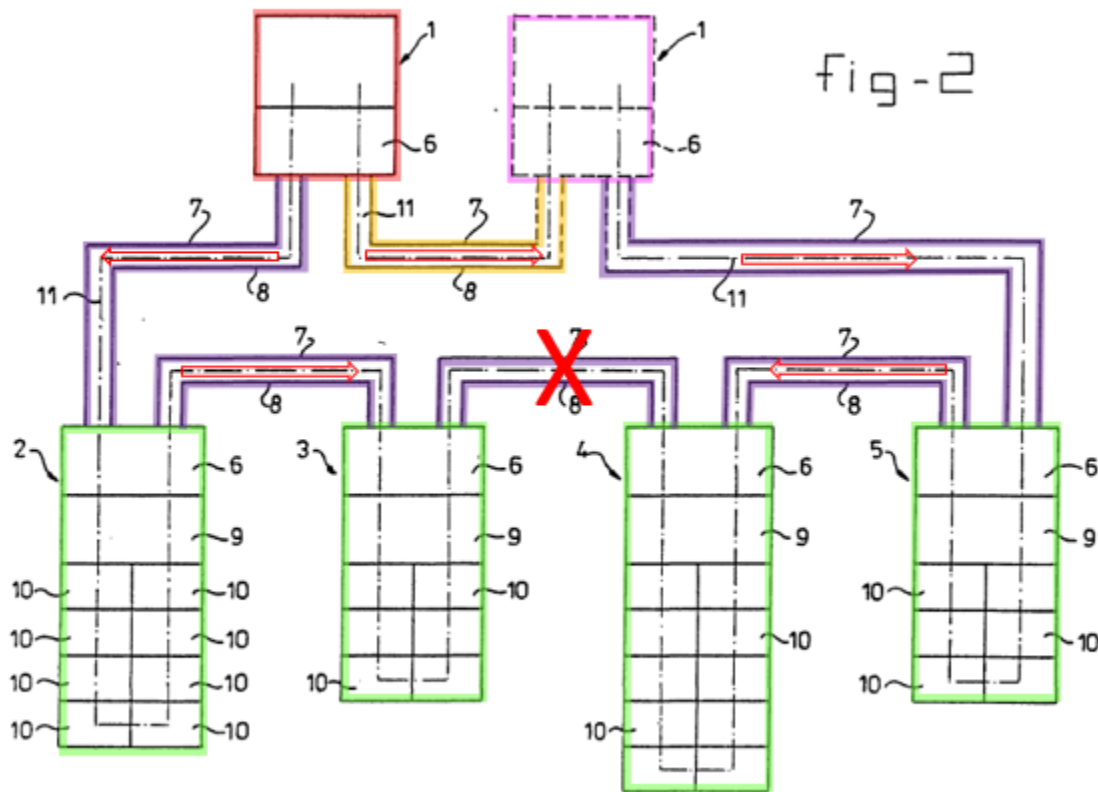
160. Vink alone suggests or Vink in combination with AAPA suggests this limitation.

161. Vink discloses a connection (transmission lines 7, 8) between active master 1 and passive master 1, as shown in Figure 2.



Ex. 1005, Figure 2.

162. If a fault occurs in the transmission lines 7, 8 between slaves 3 and 4, (shown by the red "x"), data traffic traveling in normal conditions is halted at slave 3.



Ex. 1005, Figure 2 (annotated).

163. However, Vink discloses that the second master (passive master) can perform all of the functions of the first master (active master) in the case of a fault. The passive master 1 can assume the role of the active master 1 in the case of a fault because they then “receive all of the information which is intended for the active master.” Ex. 1005, 16:21-31 (“In such a multi-master concept, one of the masters is in general active in relation to data exchange, while one or more other masters only have a passive role therein. All the masters are so designed that they

can assume the function of the active master, for example *in the event of faults*.

The passive masters are easily able to detect errors of the active master because, as a consequence of their cascade arrangement and the serial transfer of data bits in the communication system according to the invention, *they receive all the information which is intended for the active master.*”); Ex. 1005, 24:24-34

(“Method ... comprising under the control of the at least one master (1): forming a packet of data bits ... via the transmission system (7,8) between the at least one master (1) ... information can be exchanged, between packets of data bits and/or control information.”).

164. For the **passive master** to receive information from **active master** in the case of a fault, one obvious way to transmit information is to send the information across the **transmission line 7, 8**. A POSITA would have understood that, in order for the **passive master** to “assume the function of the **active master**” in the case of a fault, the **active master** will need to communicate with the **passive master**; one obvious way for the **two masters** to communicate would have been through the **transmission line 7, 8**. A POSITA would have recognized that there are a finite number of ways for the **two masters** to communicate with each other, and would have recognized that in the event of a fault, communication over the **transmission line 7, 8** would have been a trivial manner of sending that

information. A POSITA would have had a reasonable expectation of success of achieving communication between the two masters by using the method and system disclosed in Vink.

165. At a minimum, Vink in combination with AAPA suggests this limitation. A well-known fault protection mechanism that is commonly used is the 1+1 Automatic Protection Switching technique, which was admittedly well-known by the '904 patent itself. *See* Ex. 1001, 8:49-52 (“This redundancy in transmission is in accordance with fault protection mechanisms used in high-speed networks known in the art, such as the standard ‘1+1 APS’ (automatic protection switching) technique used in SONET.”); *see also* Ex. 1009, 52-55 (discussing the well-known “1+1 protecting switching”). Specifically, the '904 patent states that “[t]he active master bicast[s] [upstream] packets, sending them both to network 22 and to standby master 32 over a protection interface 76 between the two masters, as indicated by an arrow 77.” Ex. 1001, 8:42-47. It would have been obvious to combine such well-known fault protection mechanism to send information across the **transmission line 7, 8** in the event of a fault, as that would have been well within the skill of a POSITA to be able to do so. A POSITA would have been motivated to utilize any known fault protection scheme to further increase the robustness of the overall communication system.

5. Dependent Claim 6

i. [6pre] Apparatus according to claim 5,

166. Vink in combination with Patrick (for Ground 1) and further with AAPA (for Ground 2) renders obvious claim 5.

ii. [6a] wherein the first master unit bicast the upstream data packets that it receives from the slave units to the network and, via the protection interface, to the second master unit, which transmits the upstream data packets to the network.

167. The discussions I provided above in Sections VIII.A.3.vi [4d] and VIII.A.4.ii [5a] apply equally to how Vink in combination with Patrick suggests “wherein the first master unit bicast the upstream data packets that it receives from the slave units to the network and, via the protection interface, to the second master unit.”

168. Vink in combination with Patrick also suggests the second master (passive master) “transmit the upstream data packets to the network.” Vink teaches that “[a]ll the masters are so designed that they can assume the function of the active master, for example in the event of faults.” Ex. 1005, 16:24-26. Therefore, a POSITA would have readily recognized that just as the first master unit would have sent the upstream data to the network, so, too, would the second

master unit send the upstream data to the network, which would allow **second master unit** to assume the function of the **first master unit**.

169. In fact, AAPA admits that this limitation was admittedly well-known. As I explained above in Section VIII.A.4.ii [5a], a well-known fault protection mechanism that is commonly used is the 1+1 Automatic Protection Switching technique, which was admittedly well-known by the '904 patent itself. *See* Ex. 1001, 8:49-52 (“This redundancy in transmission is in accordance with fault protection mechanisms used in high-speed networks known in the art, such as the standard ‘1+1 APS’ (automatic protection switching) technique used in SONET.”); *see also* Ex. 1009, 52-55 (discussing the well-known “1+1 protecting switching”). Specifically, the '904 patent states that “[t]he active master bicast[s] [upstream] packets, sending them both to network 22 and to standby master 32 over a protection interface 76 between the two masters, as indicated by an arrow 77. The standby master also transmits the upstream packets over network 22, as indicated by an arrow 78.” Ex. 1001, 8:42-49.

170. It would have been obvious to combine such well-known fault protection mechanism to send information across the **transmission line 7, 8**, and for the **second master unit** to send the upstream data to the network because a POSITA would have wanted to protect the connection to the network with the 1+1

APS fault protection mechanism in case failure arises in one of the links from the masters to the network. It is merely an application of a well-known fault protection mechanism to a well-known communication system architecture that a POSITA would have been able to readily implement and a POSITA would have been motivated to utilize such known fault protection scheme to further increase the robustness of the overall communication system.

6. Dependent Claim 7

i. [7pre] Apparatus according to claim 4,

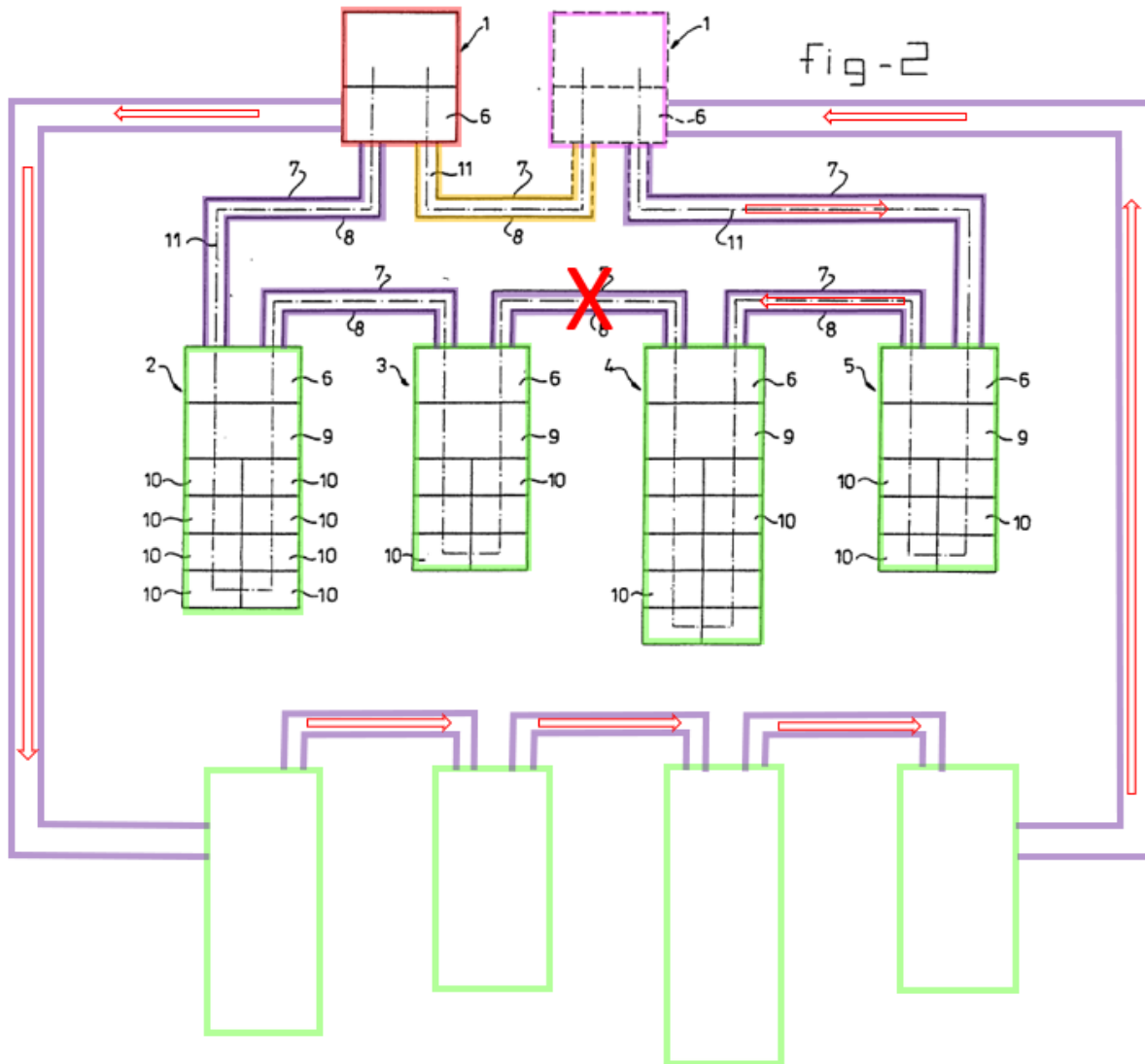
171. Vink in combination with Patrick (for Ground 1) and further with AAPA (for Ground 2) renders obvious claim 4.

ii. [7a] wherein in case of a fault at a location in one of the daisy chains, data flow in a portion of the daisy chain between the location of the fault and the **second master unit is reversed, so that the downstream data packets are passed from the **second master unit** to the **slave units** in the portion of the daisy chain via the **last slave unit** in the chain, and the upstream data packets are passed by the **last slave unit** to the **second master unit**.**

172. The discussions I provided above in Sections VIII.A.3.ix [9f] and VIII.A.4.ii [5a] apply equally to how Vink in combination with Patrick renders obvious “wherein in case of a fault at a location in one of the daisy chains, data flow in a portion of the daisy chain between the location of the fault and the **second master unit** is reversed, so that the downstream data packets are passed

from the **second master unit** to the slave units in the portion of the daisy chain via the **last slave unit** in the chain.”

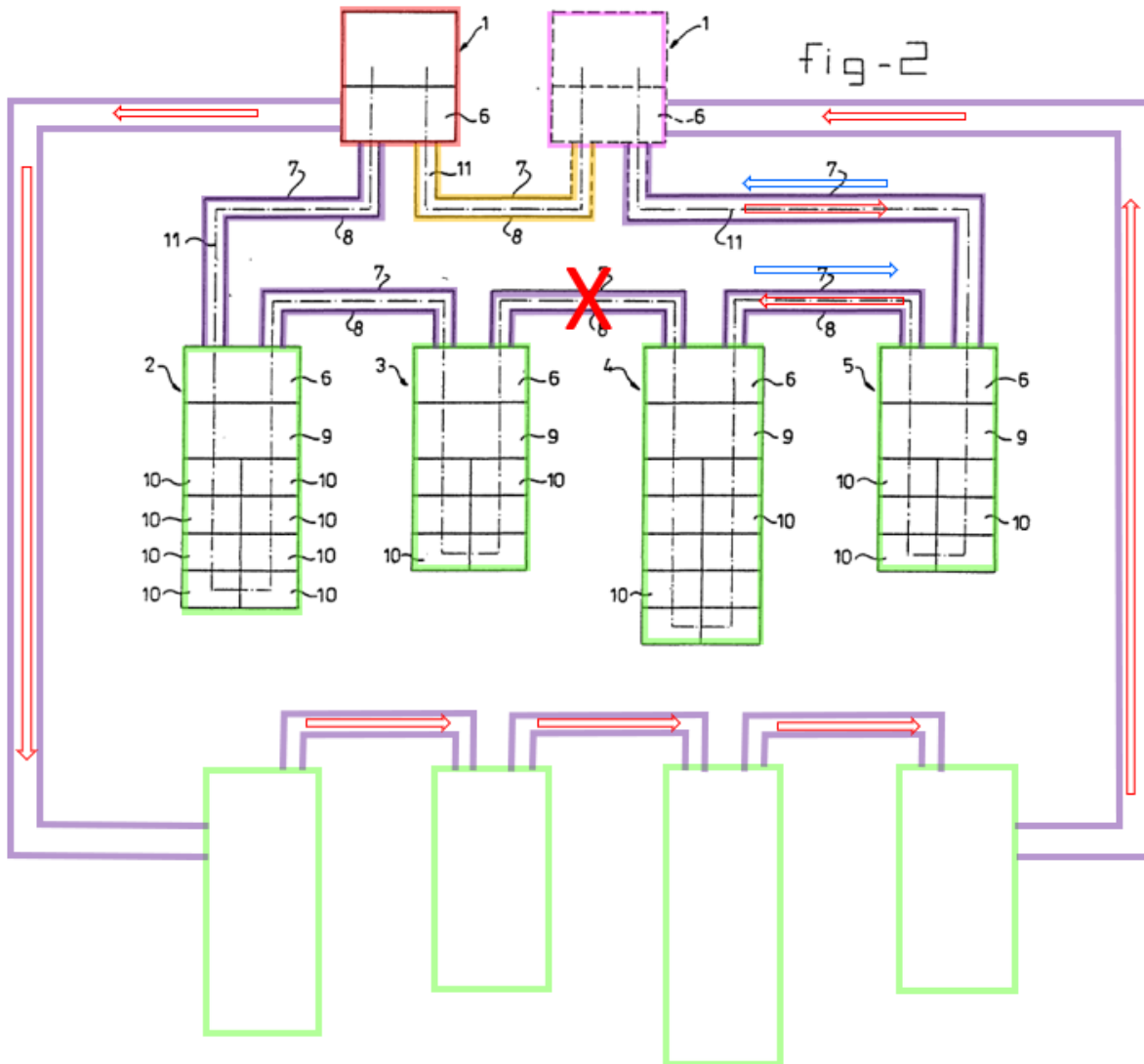
173. However, I will further elaborate on my opinions related to Section VIII.A.3.ix [9f] here to streamline the discussion with respect to claim 8 below (which depends on claim 7). To briefly summarize, as shown in annotated Figure 2 below, a POSITA would have modified Vink’s system after re-routing data to the second daisy chain to allow transmission of downstream data to flow from **slave unit 5** and then to **slave unit 4** in the original daisy chain. And a POSITA would have had a reasonable expectation of success to reach the affected slaves in this manner, as it is the logical choice to reach such slaves in the event of a fault and because Vink discloses that the master(s) and slaves can switch the direction of data flow as it desires. Ex. 1005, 14:29-31 (“[T]he at least one master and slaves are designed to transmit or receive packets of data bits via a transmission system ring in one and/or the other direction.”).



Ex. 1005, Figure 2 (annotated).

174. Vink also suggests “the upstream data packets are passed by the **last slave unit** to the **second master unit**.” A POSITA would have known, upon recognizing a fault in the transmission line 7, 8 that is left of slave 4, sending the upstream data packets to slave 5, as I have schematically illustrated using a blue arrow, would have been the other obvious possible data transmission route. And

that upstream data would continue from slave 5 to the **second master** for transmission up into the external network (not shown), because it has the same capabilities as the **first master**. *See* Ex. 1005, 16:24-26 (“All the masters are so designed that they can assume the function of the active master, for example in the event of faults.”). In other words, as illustrated by the blue arrows, a POSITA would have readily recognized that upstream data from **slave 4** flows to the **second master** (for transmission up to the external network) through the **last slave 5** in the daisy chain. This is a minor modification because re-routing packets across useable paths (instead of paths with faults) would have been obvious to a POSITA with a reasonable expectation of success.



Ex. 1005, Figure 2 (modified).

7. Dependent Claim 8

i. [8pre] Apparatus according to claim 7,

175. Vink in combination with Patrick (for Ground 1) and further with AAPA (for Ground 2) renders obvious claim 7.

- ii. [8a] wherein the downstream packets for the **slave units** in the portion of the daisy chain between the location of the fault and the **second master unit** are conveyed to the **second master unit** from the **first master unit** via another one of the daisy chains.

176. The discussions I provided above in Sections VIII.A.3.ix [9f] and VIII.A.6.ii [7a] apply equally to how Vink in combination with Patrick renders obvious limitation [8a].

8. Dependent Claim 10

- i. [10pre] Apparatus according to claim 9,

177. Vink in combination with Patrick (for Ground 1) and further with AAPA (for Ground 2) renders obvious claim 9.

- ii. [10a] wherein the **pre-switch** re-routes the data packets such that substantially no reconfiguration of the **switch** is required responsive to the fault.

178. Vink discloses, in each of the **first master unit** and **second master unit**, a **control unit 36** and **transmitting/receiving unit 6** (that reads on the claimed **switch**) and **control computer 38** (that reads on the claimed **pre-switch**). See Sections VIII.A.3.vii [9d], VIII.A.3.viii [9e], and VIII.A.3.ix [9f].

179. In the event of a fault, Vink teaches that **control computer 38** “re-routes the data packets” “such that substantially no reconfiguration of the switch is required.” First, the **control computer 38** changes the calculations that route the data packets to their proper destination in a way such that “the master is able to

reach as many connected slaves as possible in a fault situation.” Ex. 1005, 14:33-34; *see also* Ex. 1005, 20:35-38, 21:4-7 (The control computer 38 will “provide[] for ... the correct sequence of the data bits for a relevant slave, related to the sequence in which the I/O modules are arranged.”). The [control computer 38](#) “provides for and monitors correct sequence of the data bits for a relevant slave, related to the sequence in which the I/O modules are arranged.” Ex. 1005, 21:4-7.

180. Second, the switches (i.e., the [unit 36](#) and [transmitting/receiving unit 6](#)) need not be reconfigured. For example, the [control unit 36](#) simply transmits the information based on the newly calculated sequence of the data bits that it “extract[s]” from the [control computer 38](#) and the [transmitting/receiving unit 6](#) simply “monitor[s]” the transmission. Ex. 1005, 21:4-9; *see also* Ex. 1005, 20:33-34 (“a control unit 36 for controlling the data flow via the transmission system 7, 8”).

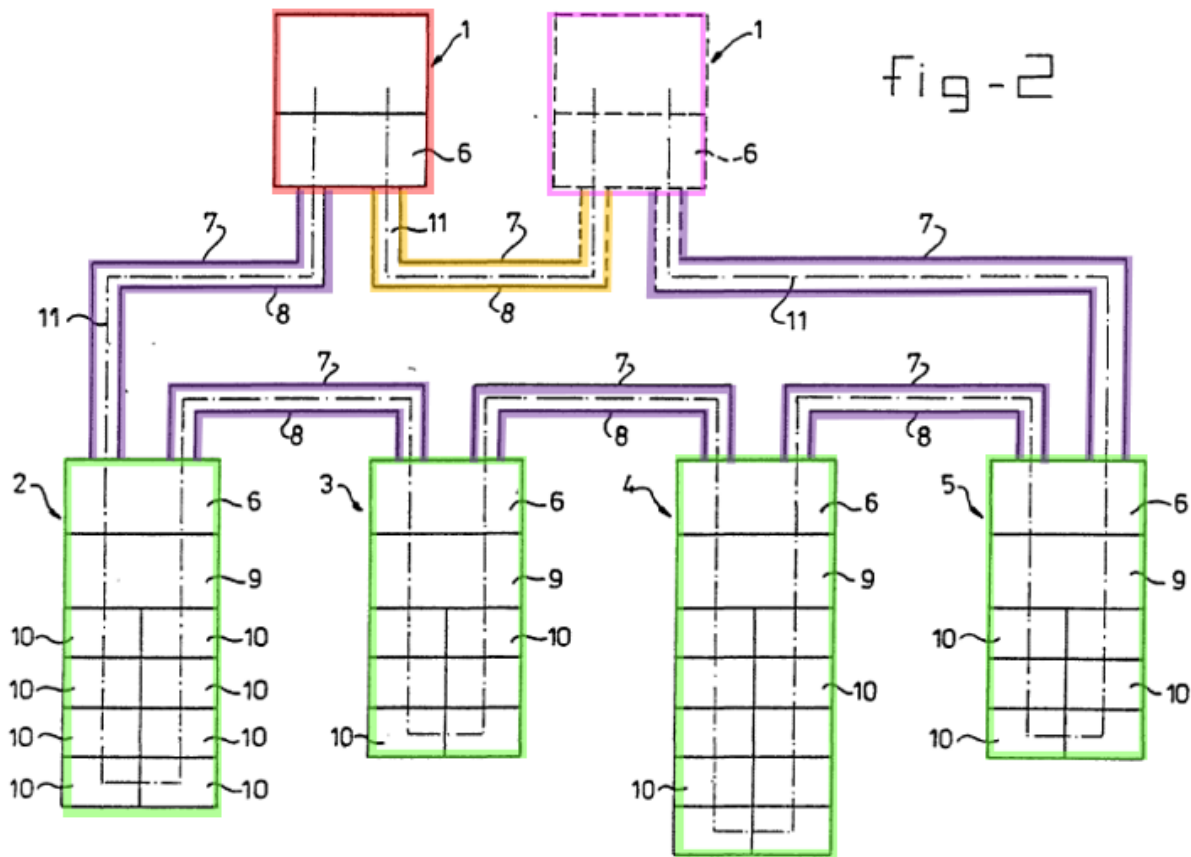
9. Dependent Claim 12

i. [12pre] Apparatus according to claim 11,

181. Vink in combination with Patrick (for Ground 1) and further with AAPA (for Ground 2) renders obvious claim 11.

- ii. [12a] wherein each of the **slave units** is coupled to receive packets transferred thereto from the **first [master unit]** and **second master unit[]** over **first and second ones of the physical interface lines**, respectively, and

182. This limitation merely requires that the slave units are “*coupled to*” receive packets sent from the master units over the physical interface lines. Vink teaches this limitation because it teaches that a “very flexible system is obtained ... in that the at least one master and slaves are designed to transmit or receive packets of data bits via a transmission system ring in one and/or the other direction.” Ex. 1005, 14:28-34. In other words, each of the **slave units 2, 3, 4, and 5** is *coupled to* receive packets sent from one or both of the **active master 1** and **passive master 1** over the **transmission lines 7, 8**.



Ex. 1005, Figure 2.

- iii. [12b] wherein the **pre-switch** passes the packets received through the **first and second physical interface line** and addressed to any of the **ports** on the **slave unit** to respective first and second addresses in the switch fabric.

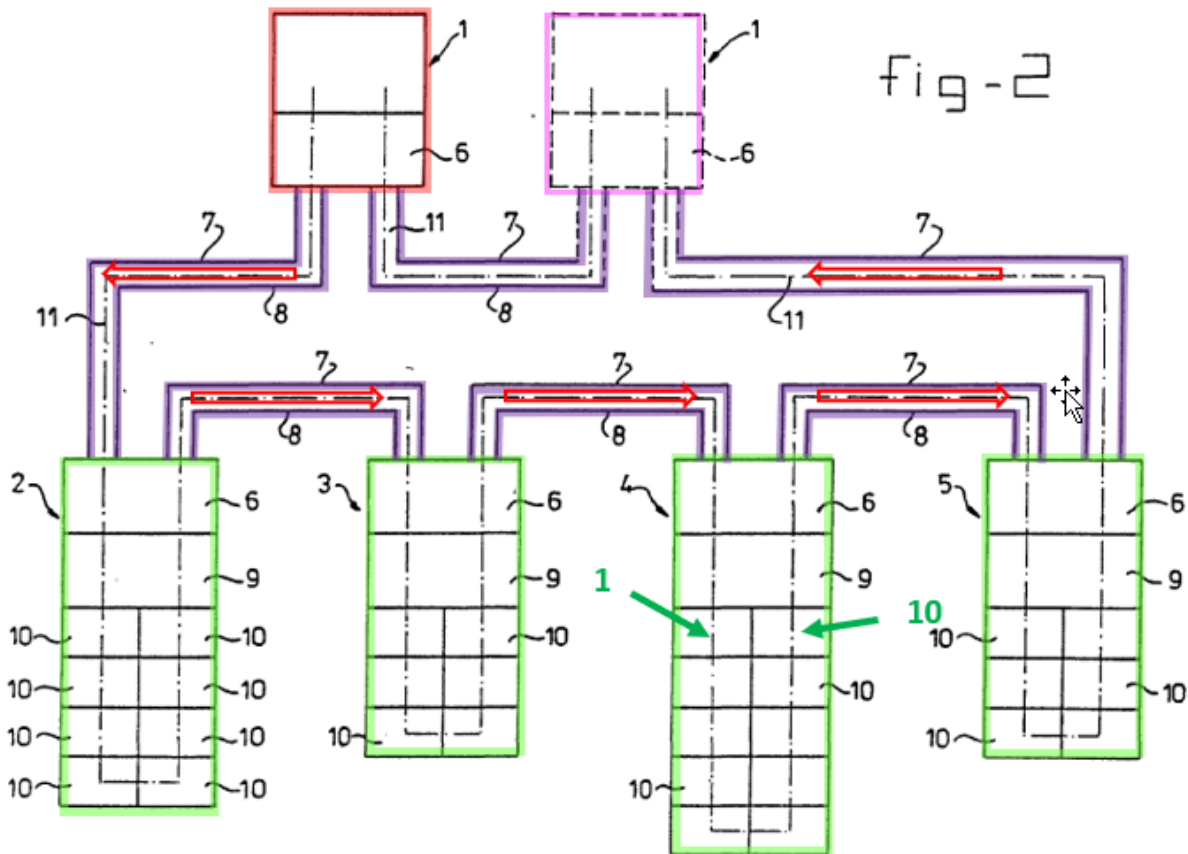
183. I am addressing this limitation based on my understanding the pre-switch can pass the packets received through the first and the second physical interface line at different times, according to the disclosed embodiment in the '904 Patent.

184. For example, I have previously explained in Sections VIII.A.4.ii [5a], VIII.A.3.xi [11e], VIII.A.3.xii [11f] and VIII.A.9.ii [12a], Vink discloses that the pre-switch passes the packets received through the first and second physical interface line, according to the disclosed embodiment in the '904 Patent. Specifically, as I explained in Sections VIII.A.3.xi [11e], VIII.A.3.xii [11f] and VIII.A.9.ii [12a], using **slave 4** as an illustrative example, under normal operation Vink discloses that downstream data is received in **slave 4** through the **transmission lines 7, 8** on the left side of **slave 4** (as illustrated in Figure 2 of Vink) and that the **transmitting/receiving unit 6** and **control module 9** of **slave 4** pass the data packets addressed to the respective **ports (e.g., output 33)** on any of the I/O modules 10 within the switch fabric of **slave 4**.

185. I have also explained in Sections VIII.A.4.ii [5a] and VIII.A.9.ii [12a], using again **slave 4** as an illustrative example, that when a fault has occurred on the **transmission lines 7, 8**, between slaves 3 and 4, downstream data is received in **slave 4** through the **transmission lines 7, 8** on the right side of **slave 4** (as illustrated in Figure 2 of Vink) and that the **transmitting/receiving unit 6** and **control module 9** of **slave 4** pass the data packets addressed to the respective **ports (e.g., output 33)** on any of the I/O modules 10 within the switch fabric of **slave 4**.

186. Vink further discloses that the packets are “addressed to respective first and second addresses in the switch fabric.” For example, Vink discloses that the I/O modules 10 can be addressed based on their in-series arrangement within a slave unit. Ex. 1005, 18:1-3 (“[T]he addressing of the separate I/O modules 10 can take place on the bases of their sequence in the cascade arrangement.”) Specifically, Vink’s addressing is carried out based on “the sequence of the data bits [that] correspond[] to the sequence of the I/O modules.” Ex. 1005, 6:4-5. For example, data packets arriving into the switch fabric of slave 4 under normal operation would arrive through the transmission lines 7, 8 on the left side of slave 4. In slave 4 the I/O modules would be addressed sequentially from, for example, 1 to 10 because slave 4 is illustrated in Figure 2 as having ten I/O modules 10. And if a first data packet has as destination the top-left I/O module of slave 4 (as depicted in Figure 2 below), the pre-switch of slave 4 will receive an address of “1” for the first data packet, because the top-left I/O module is the first I/O module in the cascaded arrangement of I/O modules within slave 4, when data packets arrive from the left side of slave 4. If a second data packet has as destination the top-right I/O module of slave 4, the pre-switch of slave 4 will receive an address of “10” for the first data packet, because as illustrated, the top-right I/O module of slave 4 is the tenth I/O module in the cascaded arrangement of I/O modules within

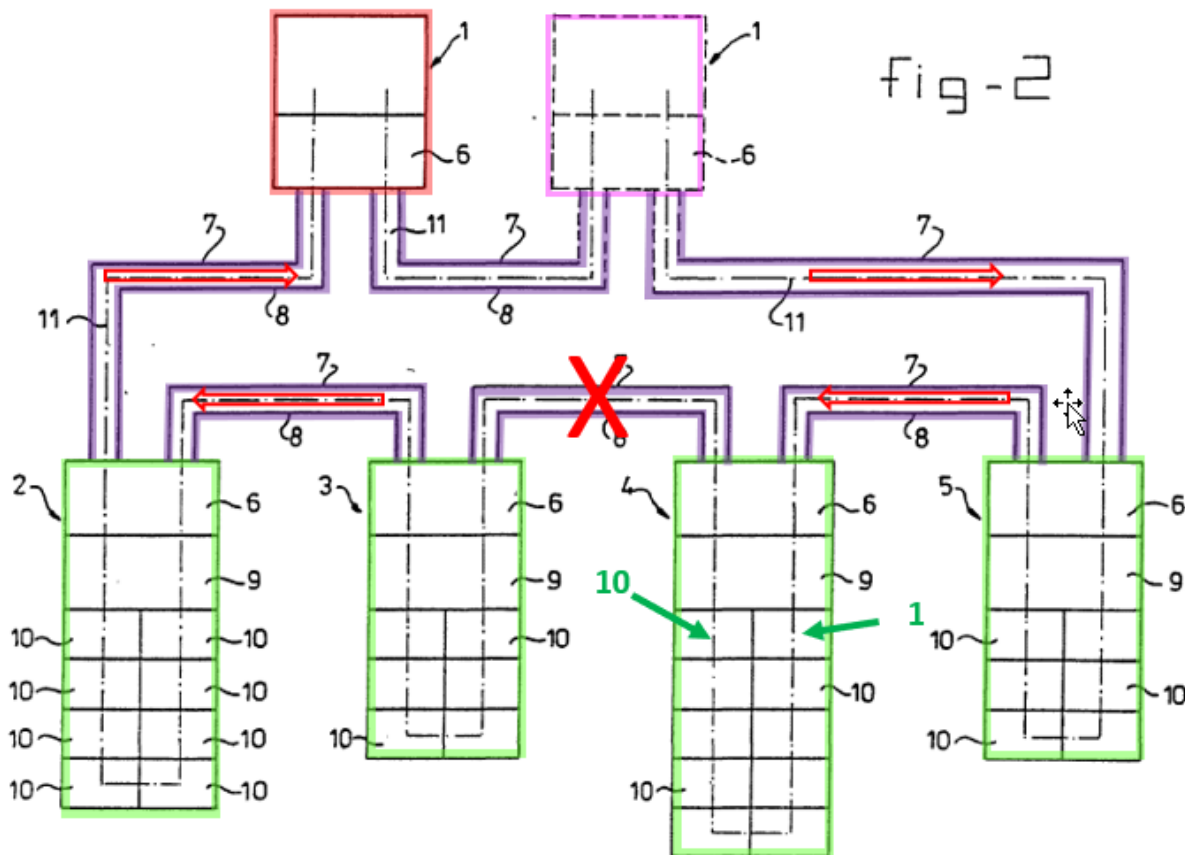
slave 4, when data packets arrive from the left side of slave 4. Based on the destination addresses of the data packets received at slave 4, the pre-switch will pass the data packets to the slave 4 switch fabric.



Ex. 1005, Figure 2.

187. In contrast, if a fault has occurred, data packets arriving into the switch fabric of slave 4 would arrive through the transmission lines 7, 8 on the right side of slave 4. Under this scenario, the I/O modules would be addressed sequentially in the opposite order from, for example, 1 to 10, as shown in Figure 2

below. *See, e.g.,* Ex. 1005, 8:19-20. Specifically, in the event of a fault, the direction of data flow is reversed for data packets intended for slave 4 (as shown below). Therefore, the address of the first data packet (with destination for the top-left I/O module of slave 4) that will be received at the pre-switch of slave 4 will be “10,” because Vink determines the addresses sequentially within a slave. Similarly, the address of the second data packet (with destination the top-right I/O module of slave 4) that will be received at the pre-switch of slave 4 will be “1.”



Ex. 1005, Figure 2.

188. In other words, the destination address for the first data packet intended for the top-left I/O module of slave 4 will be swapped at the pre-switch from 1 to 10 and the destination address for the second data packet intended for the top-right I/O module of slave 4 will be swapped at the pre-switch from 10 to 1. Accordingly, the pre-switch will pass the data packets to the slave 4 switch fabric based on the swapped destination addresses.

10. Dependent Claim 13

i. [13pre] Apparatus according to claim 12,

189. Vink in combination with Patrick (for Ground 1) and further with AAPA (for Ground 2) renders obvious claim 12.

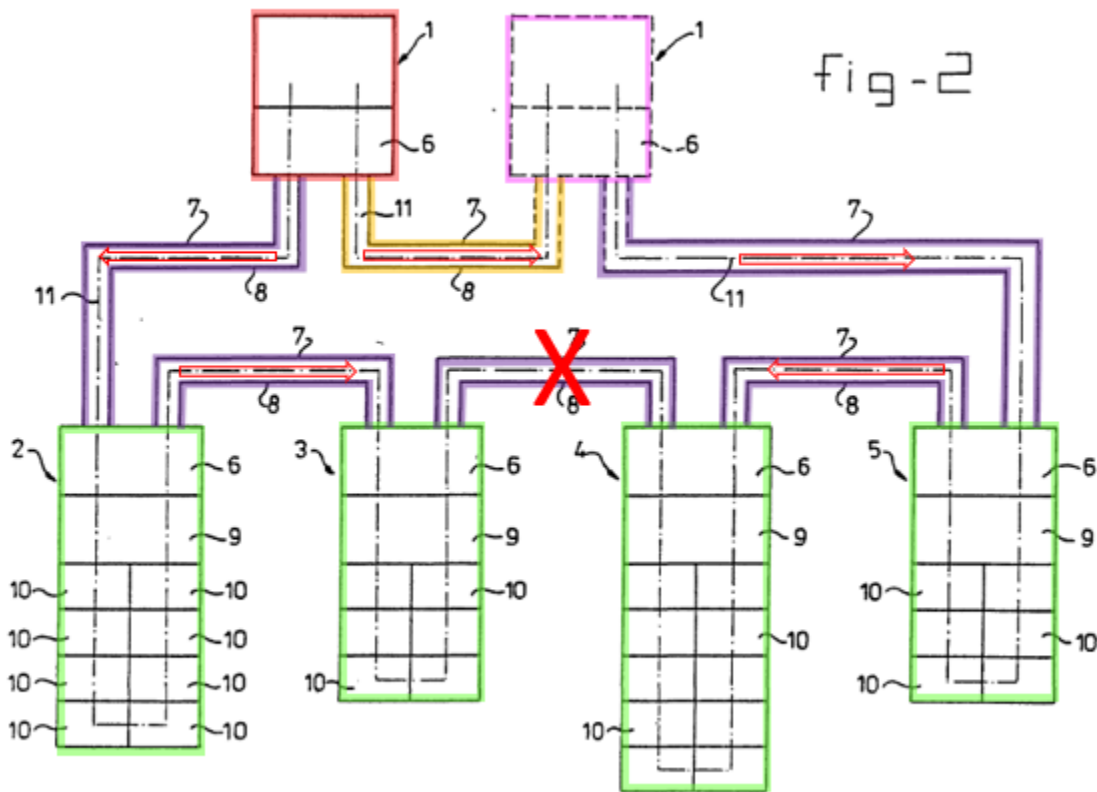
ii. [13a] wherein in response to a reversal of a direction of data flow in the daisy chain, the first and second addresses are swapped in the pre-switch, so that substantially no reconfiguration of the switch fabric is required.

190. Vink discloses limitation [13a].

191. The discussions I provided above in Sections VIII.A.3.xi [11e] and VIII.A.9 [claim 12] apply equally to how Vink teaches that the **control module 9** and **transmitting/receiving unit 6** within each slave unit control the data packets that are delivered to the I/O modules 10 of each slave, where the I/O modules 10 are serially connected and each I/O module includes **switches** that together form

the claimed switch fabric. Ex. 1005, 25:1-7 (“the I/O modules (10) being provided with control means (35) and the control module (9) being provided with means (16), coupled to the control means (35), for controlling in a synchronised manner, in response to control information received from the at least one master (1), the inputting and/or outputting of data bits by the connected I/O modules (10).”).

192. I also explained that the addresses of the I/O modules are based on the sequence of the I/O modules within the sequence of the substations (slaves). Accordingly, reversing the direction of the data flow (e.g., from a counter clockwise direction to a clockwise direction) would reverse the sequence of the slaves containing the I/O modules, as well as the sequence of the I/O modules within each slave. And since the destination addresses of the data packets are swapped at the pre-switch of the slave unit, no reconfiguration of the switch fabric is required to allow the data packets to reach their intended destination. That is, none of the **shift registers 25/26**, **buffers 29/30**, and **control means 35** located in the I/O modules 10 of **slave 4** requires reconfiguration to identify a data packet addressed for a particular I/O module's outputs 33. Thus, when the direction of data flow is reversed, Vink discloses swapping the addresses in the pre-switch and no substantial reconfiguration of the switch fabric will be required to route the data packets to the appropriate I/O module.



Ex. 1005, Figure 2.

11. Independent Claim 14

- i. [14pre] In a network access multiplexing system, in which a master unit is connected by a physical interface to a packet-switched network, a **slave unit** configured to be coupled to the **master unit** in a daisy chain of such **slave units**, the **slave unit** comprising:

193. As I noted in connection with claim 1, I understand that the preamble may not be limiting. Nevertheless, Vink in combination with Patrick (for Ground 1) and further with AAPA (for Ground 2) suggests the preamble, as I explained in

Sections VIII.A.3.i [1pre, 4pre, 9pre, 11pre], VIII.A.3.ii [1a, 4a, 9a, 11a],
VIII.A.3.iii [1b, 4b, 9b, 11b], and VIII.A.3.iv [1c, 4c, 9c, 11c].

194. Vink's system is a "multiplexing" system. For example, Vink repeatedly discusses the multiplexer unit within each slave. Ex. 1005, 17:5-8 ("The transmitting/receiving unit 6 comprises a *multiplexer 12* consisting of two modems 13, 14 which are respectively connected to the first transmission ring 7 and to the second transmission ring 8."), 17:13-17 ("After demodulation by one of the modems 13, 14, the data received are fed to the control module 9 connected to the *multiplexer 12* which, in the exemplary embodiment shown, is arranged to exchange information with the master in accordance with the known Synchronous Data Link Control (SDLC) protocol."), 17:22-25 ("With the aid of time control means 17 connected to the *multiplexer 12* and unit 16, the time control information required for the control module 9 is derived from the transmission of the data bits via the transmission system 7, 8.").

195. Furthermore a POSITA would have understood that users connected to each I/O unit are able to access the network in the combined system, and therefore the system multiplexes the network access among all the I/O units.

- ii. [14a] a plurality of **ports**, for coupling the **slave unit** to respective **subscriber lines**;

196. The discussions I provided above in Section VIII.A.3.iii [1b, 4b, 9b, 11b] apply equally to how Vink in combination with Patrick (for Ground 1) and further with AAPA (for Ground 2) renders obvious limitation [14a].

- iii. [14b] **first and second physical interfaces**, coupled to exchange packets with **preceding and succeeding units**, respectively, along the daisy chain;

197. The discussions I provided above in Sections VIII.A.3.iv [1c, 4c, 9c, 11c] and VIII.A.3.vi [4d], apply equally to how Vink discloses limitation [14b].

- iv. [14c] a **pre-switch**, coupled to receive packets from the **first physical interface** and responsive to address data carried by the packets, to sort the packets such that packets addressed to the **slave unit** are retained, and packets addressed to the **succeeding units** are passed to the **second physical interface**; and

198. The discussions I provided above in Sections VIII.A.3.x [11d] and VIII.A.3.xii [11f] apply equally to how Vink discloses limitation [14c].

- v. [14d] a fabric of one or more **switches**, which convey the retained packets to the **ports**, responsive to the address data.

199. The discussions I provided above in Sections VIII.A.3.x [11d] and VIII.A.3.xi [11e] apply equally to how Vink discloses limitation [14d].

12. Dependent Claim 15

i. [15pre] The slave unit according to claim 14,

200. Vink in combination with Patrick (for Ground 1) and further with AAPA (for Ground 2) renders obvious claim 14.

ii. [15a] wherein the pre-switch is further coupled to receive packets transferred thereto from the second physical interface and to sort the packets in like manner to the packets received through the first physical interface.

201. The discussions I provided above in Sections VIII.A.3.xii [11f], VIII.A.9.ii [12a], VIII.A.9.iii [12b], and VIII.A.10.ii [13a] apply equally to how Vink in combination with Patrick suggests limitation [15a].

13. Dependent Claim 16

i. [16pre] The slave unit according to claim 15,

202. Vink in combination with Patrick (for Ground 1) and further with AAPA (for Ground 2) renders obvious claim 15.

ii. [16a] wherein the retained packets that were received from the first and second physical interfaces and are passed by the pre-switch to the switch fabric are identified by respective first and second port numbers, and

203. The discussions I provided above in Section VIII.A.9.iii [12b] apply equally to how Vink discloses this limitation. But to the extent Petitioner argues that “port numbers” are different from “addresses,” a POSITA would have readily

recognized that in a digital communication system port numbers can be used for addressing purposes. For example, U.S. Patent No. 6,631,136 to Chaudhury et al. (“Ex. 1007”) explains that the destination address of a node contains a port identifier and that each port is associated with a port address. Ex. 1007, 13:16-18 (“Destination Address: This field contains the destination address of the Region, Node, Port ID.”); Ex. 1007, 20:29-30 (“[A] number of ports contained within each of said nodes, each of said ports being associated with a port address.”). As another example, U.S. Patent No. 5,425,026 to Mori (“Ex. 1008”) explains that ports in a network with multiple nodes can be identified by a port address that contains a node number and a port number. Ex. 1008, Abstract (“In a packet switched network, each network node has line and trunk ports to which LAN user terminals and links are connected and which are *identified by a port address containing a node number plus a port number*”).

- iii. [16b] wherein in response to a reversal of a direction of data flow in the daisy chain, the **first and second port numbers** are swapped in the **pre-switch**, so that **substantially no reconfiguration of the switch fabric is required in response to the reversal.**

204. The discussions I provided above in Section VIII.A.10.ii [13a] apply equally to how Vink discloses limitation [16b].

14. Dependent Claim 17

i. [17pre] The slave unit according to claim 14,

205. Vink in combination with Patrick (for Ground 1) and further with AAPA (for Ground 2) renders obvious claim 14.

ii. [17a] wherein when one of the packets received by the pre-switch comprises a multicast packet addressed to one or more of the ports on the slave unit, the pre-switch sorts the multicast packet such that one copy of the packet is retained and another copy of the packet is passed to the second physical interface.

206. The discussions I provided above in Sections VIII.A.3.x [11d], VIII.A.3.xii [11f], and VIII.A.11.iv [14c] apply equally to how Vink discloses limitation [17a].

15. Dependent Claim 18

i. [18pre] The slave unit according to claim 14,

207. Vink in combination with Patrick (for Ground 1) and further with AAPA (for Ground 2) renders obvious claim 14.

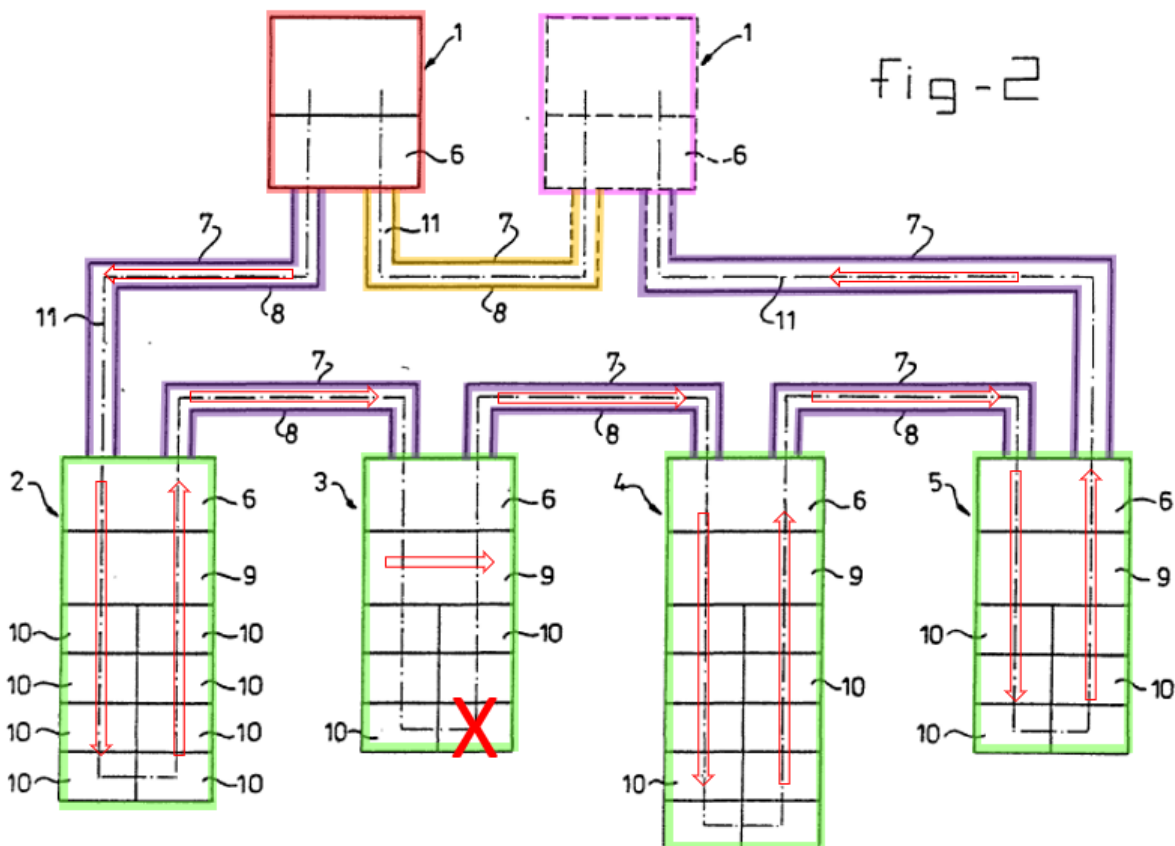
ii. [18a] wherein in the event of a fault in the switch fabric, the pre-switch continues to pass the packets addressed to the succeeding units on to the succeeding units without significant interruption.

208. Vink discloses this limitation.

209. Vink discloses that “[w]hen a transmission error is detected, the control module of a slave will not accept the data received,” and the “data bits

received are then transferred further unchanged” such that the “master then receives back the data bits despatched [sic], possibly with transmission errors.”

Ex. 1005, 14:12-17. Therefore, as illustrated in Figure 2 below, if an error has occurred in one of the I/O modules 10 of slave 3, the data bits received by slave 3 “are [] transferred further unchanged.” Ex. 1005, 14:14-15. So slave 3 will simply pass the data packets received by the transmitting/receiving unit 6 of slave 3 directly onto the next slave 4 as the control module 9 of slave 3 rejects passing the data packets for transmission along the cascade of the I/O modules in slave unit 3.



Ex. 1005, Figure 2.

210. For example, Vink teaches that by including address information bits, data can be transmitted throughout the communication system “without the need to transmit all the data bits to be exchanged via all the connected I/O modules.” Ex. 1005, 11:29-37. In other words, “only the data bits intended for, and originating from[,] the I/O modules connected to a local data bus are transferred on said [local] data bus ... and only exchanging with the connected I/O modules (10) the data bits intended therefor.” Ex. 1005, 8:25-34; *see also* Ex. 1005, 25:20-24 (“Communication system ... wherein the control module (9) is provided with selection means (20-22) for only transmitting data bits intended for, or originating from the I/O modules (10) connected to said control module (9) via the local data bus (19).”).

16. Independent Claim 19

i. [19pre] A method for providing access to a network, comprising:

211. As I noted in connection with claim 1, I understand that the preamble may not be limiting. Nevertheless, Vink in combination with Patrick (for Ground 1) and further with AAPA (for Ground 2) suggests the preamble. Specifically, Vink suggests a “method for providing access to a network,” because Vink describes methods for exchanging data with one or more I/O modules. Ex. 1005,

1:6-10 (“The invention relates to a method and a communication system for exchanging data in discrete or digital form with one or more input (I) and/or output (O) modules, by means of serial transfer of data bits, under the control of at least one master station (master).”); Ex. 1005, Title (“***Method*** and communication system for the bit-serial exchange of data.”); Ex. 1005, 5:9-12 (“The object of the invention is therefore to provide ***a method*** and a communication system for serial data bit transfer, ***suitable for exchanging data with a desired (large) number of information points...***”); Ex. 1005, 5:15-18 (“For this purpose, the invention provides a method of serially exchanging data bits, with a plurality of input (I) and/or output (O) modules, using at least one master station (master) to which the I/O modules are connected in a cascade arrangement...”).

ii. [19a] coupling first and second master units to interface with the network;

212. The discussions I provided above in Section VIII.A.3.ii [1a, 4a, 9a, 11a] apply equally to how Vink in combination with Patrick (for Ground 1) and further with AAPA (for Ground 2) renders obvious limitation [19a].

- iii. **[19b] linking a plurality of slave units, each slave unit comprising one or more ports to respective subscriber lines, in a daisy chain between the first and second master units;**

213. The discussions I provided above in Sections VIII.A.3.iii [1b, 4b, 9b, 11b] and VIII.A.3.iv [1c, 4c, 9c, 11c] apply equally to how Vink in combination with Patrick (for Ground 1) and further with AAPA (for Ground 2) suggests limitations [1b], [4b], [9b], and [11b].

- iv. **[19c] conveying initial downstream data packets, received from the network by one of the master units, along the daisy chain in a first direction, so as to deliver the packets to the ports of the slave units; and**

214. The discussions I provided above in Sections VIII.A.3.vi [4d], VIII.A.3.viii [9e], VIII.A.3.xi [11e], and/or VIII.A.3.xii [11f] apply equally to how Vink in combination with Patrick (for Ground 1) and further with AAPA (for Ground 2) suggests limitation [19c].

- v. **[19d] in the event of a fault in the daisy chain, conveying further downstream data packets, received from the network by one of the master units, along the daisy chain in a second direction, opposite to the first direction, so as to deliver the further packets to the ports of at least some of the slave units.**

215. The discussions I provided above in Sections VIII.A.4.ii [5a], VIII.A.6.ii [7a], and/or VIII.A.3.ix [9f] apply equally to how Vink suggests limitation [19d].

17. Dependent Claim 20

i. [20pre] A method according to claim 19,

216. Vink in combination with Patrick (for Ground 1) and further with AAPA (for Ground 2) renders obvious claim 19.

ii. [20a] wherein the initial and further downstream packets are received from the network by the first master unit, and

217. The discussions I provided above in Sections VIII.A.3.vi [4d], VIII.A.3.viii [9e], VIII.A.3.xi [11e], and/or VIII.A.3.xi [11f] apply equally to how Vink in combination with Patrick (for Ground 1) and further with AAPA (for Ground 2) suggests limitation [20a].

iii. [20b] wherein conveying the further downstream packets in the second direction comprises conveying the further downstream packets from the first master unit to the second master unit, and then conveying the further downstream packets from the second master unit to the daisy chain.

218. The discussions I provided above in Sections VIII.A.4.ii [5a], VIII.A.6.ii [7a], and/or VIII.A.3.ix [9f] apply equally to how Vink suggests limitation [20b].

18. Dependent Claim 21

i. [21pre] A method according to claim 20,

219. Vink in combination with Patrick (for Ground 1) and further with AAPA (for Ground 2) renders obvious claim 20.

ii. [21a] wherein conveying the further downstream packets from the first master unit to the second master unit comprises linking further slave units in an additional daisy chain between the first and second master units, and conveying the further downstream packets from the first master unit to the second master unit over the additional daisy chain.

220. The discussions I provided above in Sections VIII.A.3.ix [9f] and/or VIII.A.6.ii [7a] apply equally to how Vink in combination with Patrick (for Ground 1) and further with AAPA (for Ground 2) suggests limitation [21a].

19. Dependent Claim 22

i. [22pre] A method according to claim 19, and comprising

221. Vink in combination with Patrick (for Ground 1) and further with AAPA (for Ground 2) renders obvious claim 20.

- ii. **[22a] conveying initial upstream data packets, received by the slave units from the subscriber lines, along the daisy chain in the second direction so as to transmit the upstream data packets via the first master unit over the network, and in the event of the fault, conveying further upstream data packets received by one or more of the slave units along the daisy chain in the first direction via the second master unit.**

222. The discussions I provided above in Sections VIII.A.3.vi [4d], VIII.A.5.ii [6a], and VIII.A.6.ii [7a] apply equally to how Vink in combination with Patrick (for Ground 1) and further with AAPA (for Ground 2) suggests limitations [22a].

20. Dependent Claim 23

- i. **[23pre] A method according to claim 22,**

223. Vink in combination with Patrick (for Ground 1) and further with AAPA (for Ground 2) renders obvious claim 22.

- ii. **[23a] and comprising bicasting the upstream data packets from the first master unit to the network and to the second master unit, which transmits the bicast upstream data packets over the network.**

224. The discussions I provided above in Section VIII.A.5.ii [6a] apply equally to how Vink in combination with Patrick (for Ground 1) and further with AAPA (for Ground 2) suggests limitation [23a].

21. Dependent Claim 24

i. [24pre] A method according to claim 19,

225. Vink in combination with Patrick (for Ground 1) and further with AAPA (for Ground 2) renders obvious claim 19.

ii. [24a] wherein conveying the initial downstream data packets along the daisy chain comprises pre-switching the packets at each of the slave units, so that packets not addressed to any of the ports on the slave unit are passed to the next slave unit in the daisy chain, while packets that are addressed to one or more of the ports on the slave unit are passed to a switch fabric that directs the packets to the ports to which they are addressed.

226. The discussions I provided above in Section VIII.A.3.xii [11f] apply equally to how Vink discloses limitation [24a].

22. Dependent Claims 2 and 25

i. [2pre] Apparatus according to claim 1,

227. Vink in combination with Patrick (for Ground 1) and further with AAPA (for Ground 2) renders obvious claim 1.

ii. [25pre] A method according to claim 19,

228. Vink in combination with Patrick (for Ground 1) and further with AAPA (for Ground 2) renders obvious claim 19.

iii. [2a, 25a] wherein the network comprises an asynchronous transfer mode (ATM) network.

229. Vink in combination with Patrick (for Ground 1) and further with AAPA (for Ground 2) suggests limitations [2a] and [25a]. Vink discloses a communication system, such as “Local Area Networks” (LAN’s). *See* Ex. 1005, 1:11-15 (“Communication systems of this type are in practice known per se. Examples are the so-called ‘Local Area Networks’ (LAN’s)...;” *see also*, Ex. 1005, 1:19-21 (“LAN communication systems are, in principle, designed for communicatively coupling two or more connected stations together as required”). Further, Vink discloses that “public networks ... are available” for “long-distance connections.” Ex. 1005, 1:18-19.

230. Vink does not explicitly disclose that the network comprises an ATM network. But ATM networks, which can be public networks, were well-known. For example, AAPA discloses that an ATM network could be connected to two masters. *See* Ex. 1001, 1:39-45 (“The master unit comprises a core network interface element 24, providing the necessary physical layer (PHY) and data link layer (for example, ATM) functions. A concentrator 26 performs higher-level functions, including VPI/VCI translation for the ATM network, and multiplexes downstream and upstream packets, or cells, among slave units 27.”). Also, as the Examiner noted “figure 2B of the admitted prior art of the instant application is

block diagrams that schematically illustrate topologies *known in the art* for use in multi-shelf access systems, such as that shown in fig. 1, page 2, lines 18-25, *wherein the core network 22 is an ATM network (packet-switched network)*, page 2, line 1-4.” Ex. 1002, 159.

231. Patrick similarly discloses that its communication system may be connected to a network, where the network “may be a broadcast network such as *a local area network (‘LAN’)*, or a non-broadcast circuit-oriented network such as *ATM (asynchronous transfer mode)*, frame relay, or x.25.” Ex. 1006, 5:45-49.

232. Using a specific network protocol like ATM, in lieu of LAN, to allow a communication system to gain access to high-speed network was done routinely in the art and ATM and LAN are recognized as known equivalents (as evidenced by Patrick). A POSITA would have had a reasonable expectation of success in making such a modification to Vink’s communication system’s network connection to provide access to an ATM network.

23. Dependent Claims 3 and 26

i. [3pre] Apparatus according to claim 1,

233. Vink in combination with Patrick (for Ground 1) and further with AAPA (for Ground 2) renders obvious claim 1.

ii. [26pre] A method according to claim 19,

234. Vink in combination with Patrick (for Ground 1) and further with AAPA (for Ground 2) renders obvious claim 19.

iii. [3a, 26a] wherein the network comprises an Internet protocol (IP) network.

235. Vink in combination with Patrick (for Ground 1) and further with AAPA (for Ground 2) suggests limitations [3a] and [26a]. Vink discloses a communication system, such as “Local Area Networks” (LAN’s). *See* Ex. 1005, 1:11-15 (“Communication systems of this type are in practice known per se. Examples are the so-called ‘Local Area Networks’ (LAN’s)...”). Although Vink does not explicitly teach that the network comprises an Internet Protocol (IP) network, IP networks were well-known. For example, Patrick discloses that the primary station can be connected to “networks such as the Internet.” Ex. 1006, 3:20-24. Internet is a network that uses the Internet Protocol (IP) suite (TCP/IP) to communicate between devices.

236. Using a specific protocol like the Internet Protocol, in lieu of LAN, to allow a communication system to gain access to high-speed network was done routinely in the art and are recognized as known equivalents (as evidence by Patrick). A POSITA would have had a reasonable expectation of success in

making such a modification to Vink's communication system's network connection to provide access to an IP network, such as the Internet.

IX. Conclusion

237. In my opinion, the challenged claims 1-26 of the '904 patent are unpatentable.

X. Availability for Cross-Examination

238. In signing this declaration, I recognize that the declaration will be filed as evidence in a case before the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I also recognize that I may be subject to cross examination in the case and that cross examination will take place within the United States. If cross examination is required of me, I will appear for cross examination within the United States during the time allotted for cross examination.

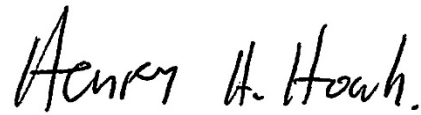
XI. Right to Supplement

239. I reserve the right to supplement my opinions in the future to respond to any arguments that the Patent Owner may raise and to take into account new information as it becomes available to me.

XII. Jurat

240. I declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1101 of Title 18 of the United States Code.

March 13, 2023

A handwritten signature in black ink that reads "Henry H. Houh". The signature is written in a cursive style with a horizontal line underneath it.

Dr. Henry Houh