hop channels) which are about equally distributed ahead-of and behind the estimated phase. For example, assume a hop sequence represented by F(k) where k is a modulo-32 clock value. Assume also that the pager device **300** estimates the clock value of the scanner device **302** as k_est. The pager device **300** may transmit the page message on hop channels F(k_est−8), F(k_est−7), . . . , F(k_est−1), F(k_est), F(k_est+1), . . . , F(k_est+7). In this manner, the page message may be received by the scanner device **302** when the estimated phase is wrong by an offset between −8 and +7 in the sequence of hop channels. If no response is received from the 16 channel paging train, F(k_est−8) to F(k_est+7), the other train may be selected. In some embodiments of the present invention it may be advantageous for an A train and a B train to overlap with one common hop channel because the pager device **300** may change trains at the same phase rate as the scanner device **302** changes its scan frequency.

[**0041**] When the scanner device **302** is scanning hop channels for a paging message, interference on the hop channels from other devices may prevent reception of the paging message and cause delay in the establishment of a connection with the pager device **300**. The number of wireless communication devices has been rapidly increasing and the increase has been particularly rapid in the unlicensed communication bands, such as the ISM band. Such devices include baby monitors, garage door openers, identification (ID) devices, and Wireless Local Area Network (WLAN) devices.

[**0042**] **FIG. 4**(*a*) illustrates a situation where narrowband interference is present on hop channels **2403**, **2406**, and **2478**. **FIG. 5**(*a*) illustrates a situation where wideband interference is present across hop channels **2404** to **2409**. If the occupied hop channels are in the sequence of channels scanned by the scanner device **302**, a paging message may not be received and establishment of a connection may be delayed until at least the next scan. If the next scan also occurs on an occupied hop channel, the delay is cumulative and the overall delay may become unacceptably long.

[**0043**] According to some embodiments of the present invention, the scanner device **302** removes interfered/occupied/reserved channels from the scanned hop sequence and substitutes other hop channels in their place. For example, as shown in **FIG. 4**(*b*), channels **2403**, **2406**, and **2478** are removed. As shown in **FIG. 5**(*b*), channels **2404**-**2409** are removed from hop sequences.

[**0044**] In a conventional Bluetooth system, a communication device in a scanner mode may scan 32 hop channels covering about 64 MHz of bandwidth for page messages. According to some embodiments of the present invention, by monitoring interference levels on the 32 channels, the communication device may determine which channels are interfered/occupied and less likely to be capable of providing a paging message or being used to carry other messages relating to establishing a communication link with another communication device. The communication device may obtain a paging message more quickly by not waiting for page messages on interfered channels. For example, the communication device may designate **17** of the 32 channels as unusable or forbidden, and thereby, reduce the bandwidth scanned for paging messages from 64 MHz to 30 MHz.

[**0045**] In some embodiments of the present invention, the scanner device **302** can maintain a list of allowed channels and forbidden channels in a hop sequence used for scanning. An example list is shown in **FIG. 6**, in which the hop sequence spans from channel G(0) to G(7). Although a sequence of eight channels has been shown for illustration purposes any length hop sequence may be used. As shown, two of the hop channels, G(2) and G(3), are forbidden. The forbidden channels should be avoided while scanning for paging message for any of a number of reasons. For example, the forbidden channels may correspond to where a substantial amount of interference has been detected. It may also be the case that one or more hop channels are known to be "reserved" for use by another system, so that the scanner device **302** can avoid experiencing interference by avoiding those channels. Similarly, a nearby system may be required to provide a high priority/high quality service via one or more hop channels. In this case, a communication device may skip those channels to avoid causing interference and possibly disturbing the nearby system.

[**0046**] It will also be recognized that the designation of a hop channel as alternatively "forbidden" or "allowed" need not be static, but can instead be determined and changed dynamically. According to some embodiments of the present invention, the scanner device **302** may sense the amount of interference on individual hop channels in the hop sequence and, when the interference exceeds a threshold value, it may label the channel forbidden. The sensing may include measuring an indication of the received signal strength when a paging message is not being directed to the scanner device **302**. Similarly, when the amount of interference is below a threshold value, the scanner device **302** may change a previously labeled forbidden channel to an allowed channel. Interference may be sensed periodically, such as with a scan process and/or independent from the scan process, or performed non-periodically.

[**0047**] According to some embodiments of the present invention, the scanner device **302** may measure the amount of interference on a hop channel, to determine whether it is allowable, while it is scanning for a paging message on the hop channel. The page message may comprise a binary sequence that is derived from the address of the scanner device **302**. Upon receiving a page message, the scanner device **302** may compare (i.e., correlate) its address with the address represented by the page message. When a threshold number of bits match between the two addresses, the page message may be determined to be intended for the scanner device **302**. In this manner, an exact match may not be necessary to make the determination. The closeness of the comparison may also indicate the amount of interference on the scanned hop channel. When the closeness of the comparison is outside a threshold range, such as when less than a lower threshold number of bits match, the scanned hop channel may be determined to have an unacceptable amount of interference and the scanned channel may be labeled a forbidden channel. Other channel interference detection (quality detection) techniques may be applied as will be apparent to those who are skilled in the art. For example, techniques based on soft information derived from, for example, maximum likelihood sequence estimation (MLSE) or forward-error-correction coding, may be used to determine the quality of a channel.

[**0048**] When a hop channel has been determined to be a forbidden channel, it is possible, and perhaps likely, that the adjacent channels contain an unacceptable amount of inter-