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(19) **United States**(12) **Patent Application Publication****Sheppard et al.**(10) **Pub. No.: US 2023/0232057 A1**(43) **Pub. Date:****Jul. 20, 2023**(54) **METHODS AND APPARATUS TO ESTIMATE POPULATION REACH FROM MARGINAL RATINGS WITH MISSING INFORMATION**(52) **U.S. Cl.**CPC ... *H04N 21/25883* (2013.01); *G06Q 30/0201* (2013.01); *G06F 17/18* (2013.01)(71) Applicant: **The Nielsen Company (US), LLC**,
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ABSTRACT(72) Inventors: **Michael Sheppard**, Holland, MI (US);
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Methods, apparatus, and articles of manufacture are disclosed to estimate population reach from marginal ratings with missing information. An example apparatus includes a pseudo universe calculator to (i) determine a first pseudo universe estimate for a first audience of media corresponding to a first union of first margins, the first margins corresponding to known audience totals, and (ii) determine a second pseudo universe estimate for a second audience of the media corresponding to a second union of second margins, the determination based on an audience constant, the second margins including a margin corresponding to an unknown audience total. The example apparatus also includes a reach calculator to (i) determine an estimate of the unknown audience total of the second audience based on the second pseudo universe estimate for the second audience, and (ii) determine a reach estimate for the second union based on the first and second pseudo universe estimates.

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