

(12) **United States Patent**  
Azadegan

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(54) **METHOD AND APPARATUS FOR DIFFERENTIAL MACROBLOCK CODING FOR INTRA-FRAME DATA IN VIDEO CONFERENCING SYSTEMS**

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(73) Assignee: **Verizon Laboratories Inc.**, Waltham, MA (US)

(\*) Notice: This patent issued on a continued prosecution application filed under 37 CFR 1.53(d), and is subject to the twenty year patent term provisions of 35 U.S.C. 154(a)(2).

Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 635 days.

(21) Appl. No.: **08/941,785**

(22) Filed: **Sep. 30, 1997**

**Related U.S. Application Data**

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(51) **Int. Cl.<sup>7</sup>** ..... **H04N 7/12**

(52) **U.S. Cl.** ..... **375/240.13**

(58) **Field of Search** ..... 348/384, 390, 348/400, 401, 402, 409, 415, 416, 420, 421; 382/232, 233, 236, 238; 375/240.01, 240.12, 240.13, 240.24; H04N 7/12

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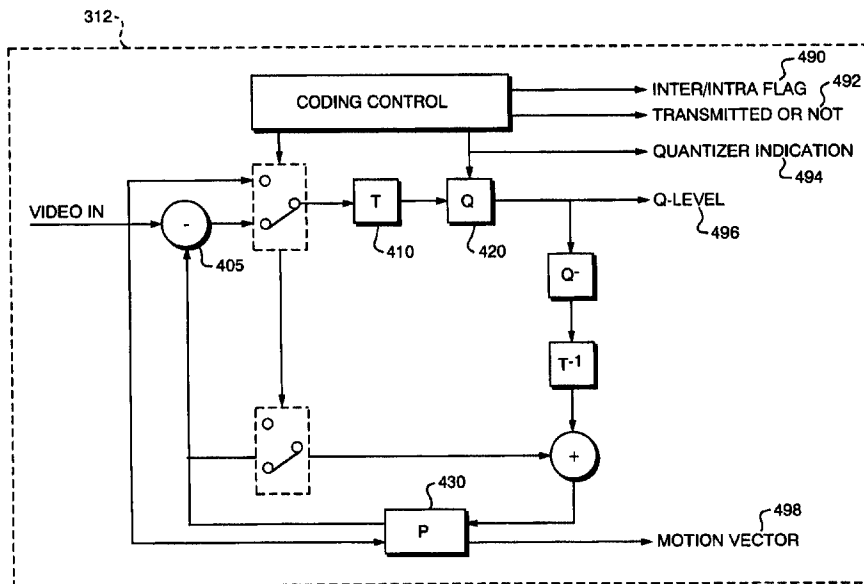
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(57) **ABSTRACT**

A process for reducing spatial redundancy and thereby increasing the efficiency of video compression techniques for video conferencing. A process for improving video coding by differential macroblock coding. One video coding process involves differential formation for the coding of each macroblock in comparison to at least one other macroblock within each video picture. Another video coding process involves differential formation for macroblock coding by comparison to two macroblocks, including the macroblock immediately to the left of the coding macroblock and the macroblock immediately above the coding macroblock. These processes involve improvements to the H.263 video coding standard as well as improvements to the H.324 video conferencing standard. These processes also involve improvements to the MPEG-2 and MPEG-4 video standards.

**66 Claims, 15 Drawing Sheets**



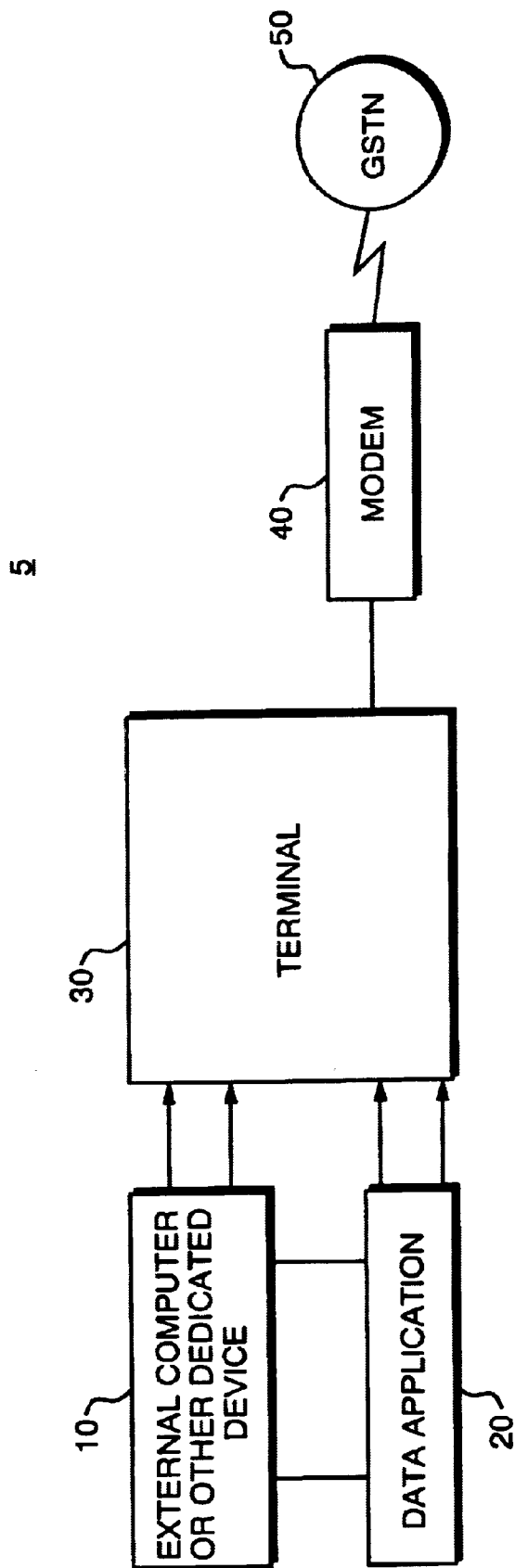


FIG. 1

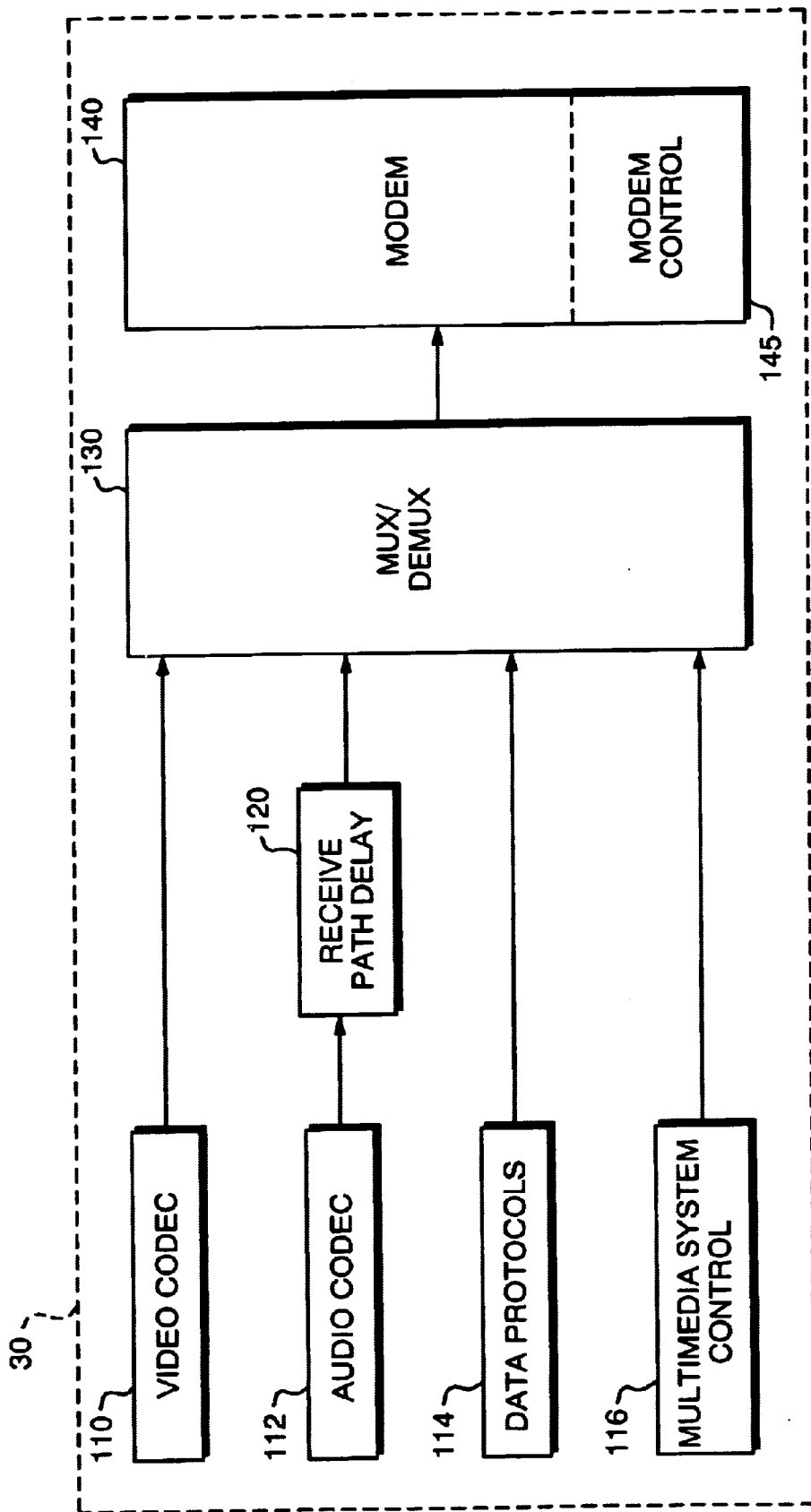


FIG. 2

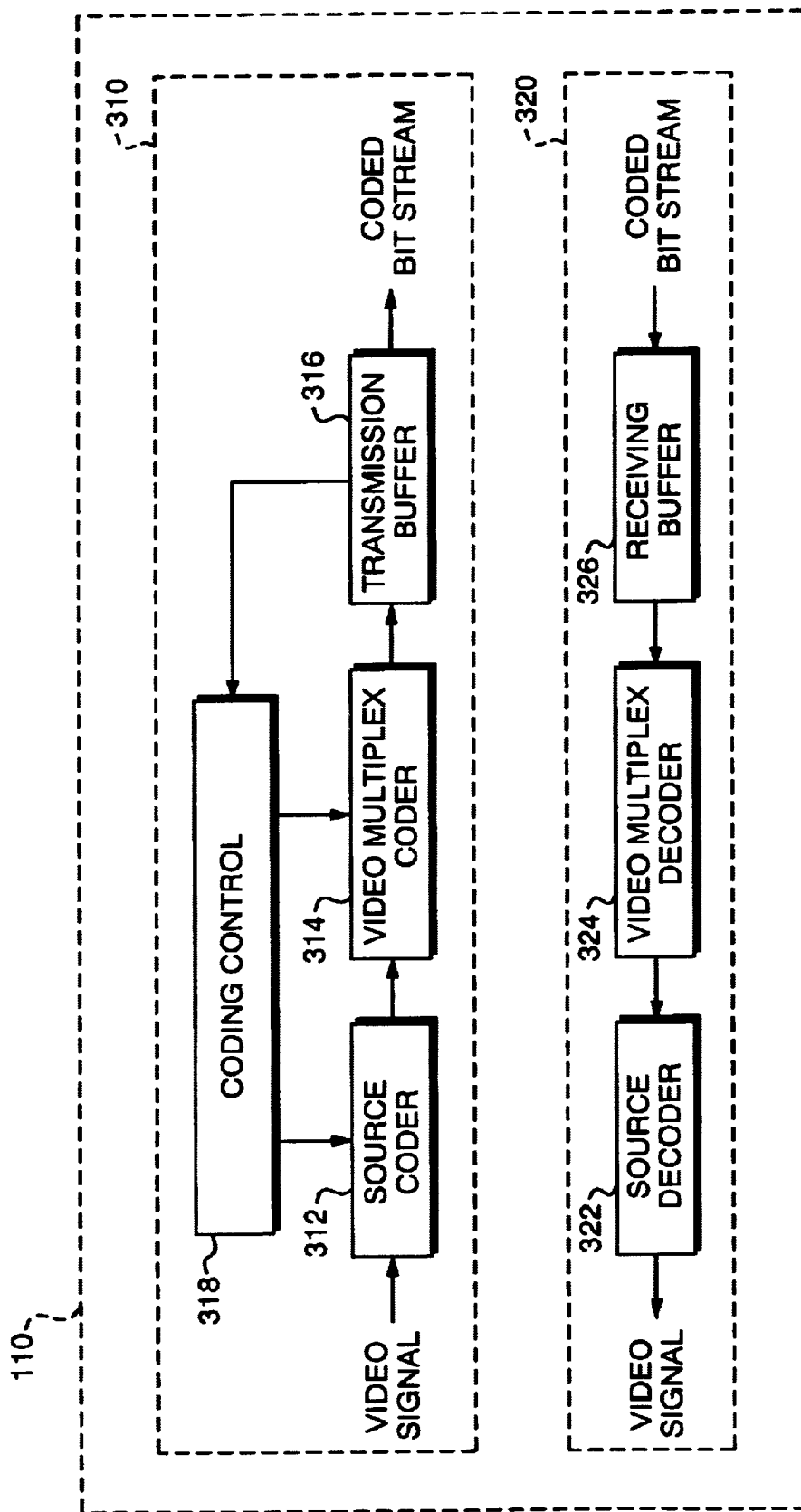


FIG. 3

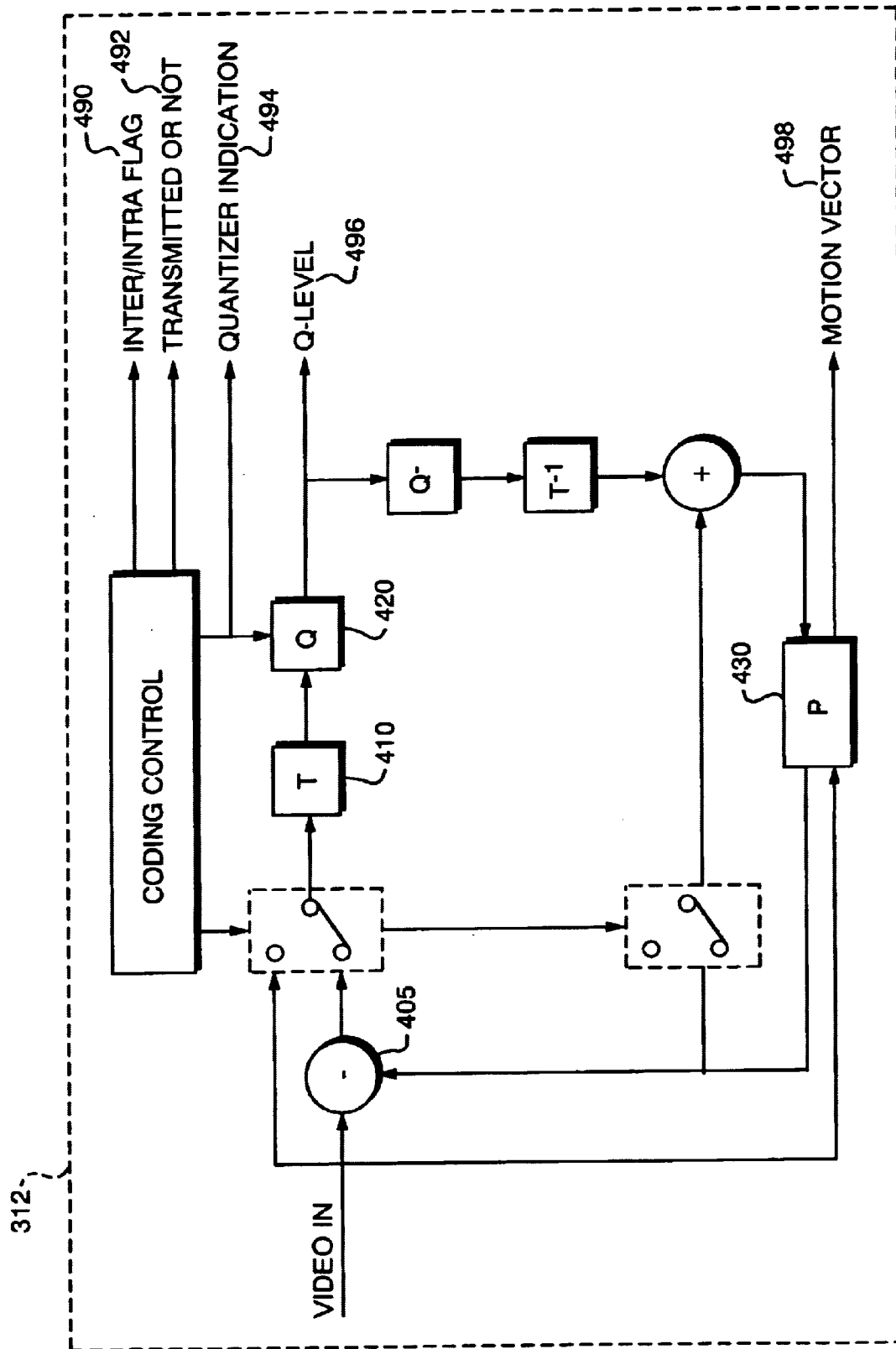


FIG. 4

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