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van der Wal et al.

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(54) **MODULAR PARALLEL-PIPELINED VISION SYSTEM FOR REAL-TIME VIDEO PROCESSING**

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(*) 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).

Under 35 U.S.C. 154(b), the term of this patent shall be extended for 0 days.

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Related U.S. Application Data

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(51) **Int. Cl.**⁷ **G06K 9/40**; G06F 15/173

(52) **U.S. Cl.** **345/112**; 345/518; 348/721

(58) **Field of Search** 348/721; 315/676; 345/118, 112, 18; 711/151; 712/11

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Primary Examiner—Andrew I. Faile

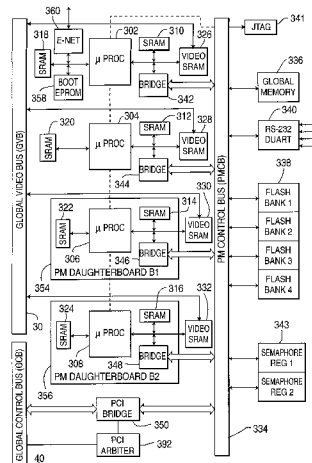
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(57) **ABSTRACT**

A real-time modular video processing system (VPS) which can be scaled smoothly from relatively small systems with modest amounts of hardware to very large, very powerful systems with significantly more hardware. The modular video processing system includes a processing module containing at least one general purpose microprocessor which controls hardware and software operation of the video processing system using control data and which also facilitates communications with external devices. One or more video processing modules are also provided, each containing parallel pipelined video hardware which is programmable by the control data to provide different video processing operations on an input stream of video data. Each video processing module also contains one or more connections for accepting one or more daughterboards which each perform a particular image processing task. A global video bus routes video data between the processing module and each video processing module and between respective processing modules, while a global control bus provides the control data to/from the processing module from/to the video processing modules separate from the video data on the global video bus. A hardware control library loaded on the processing module provides an application programming interface including high level C-callable functions which allow programming of the video hardware as components are added and subtracted from the video processing system for different applications.

30 Claims, 6 Drawing Sheets



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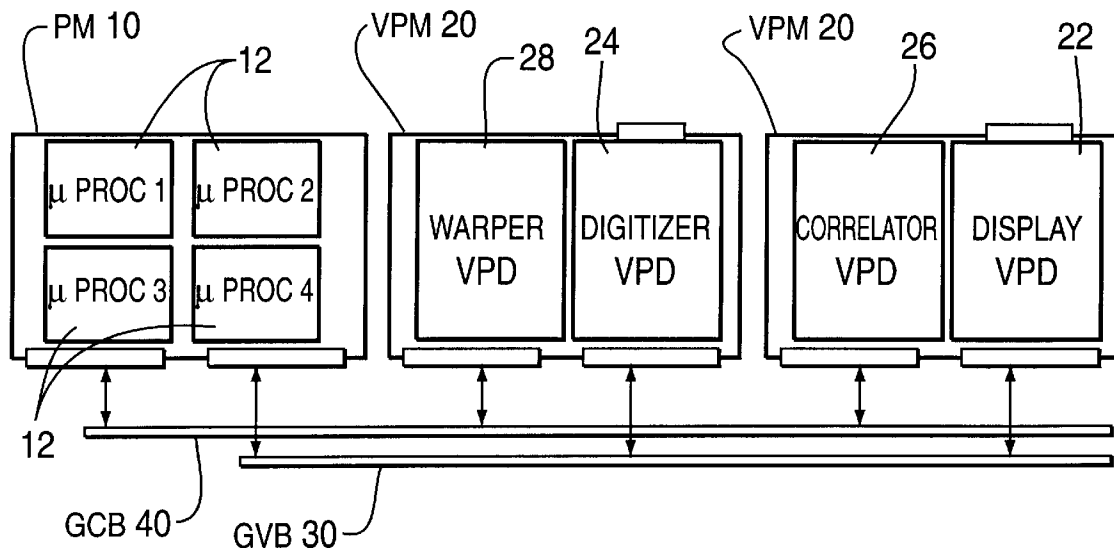


FIG. 1

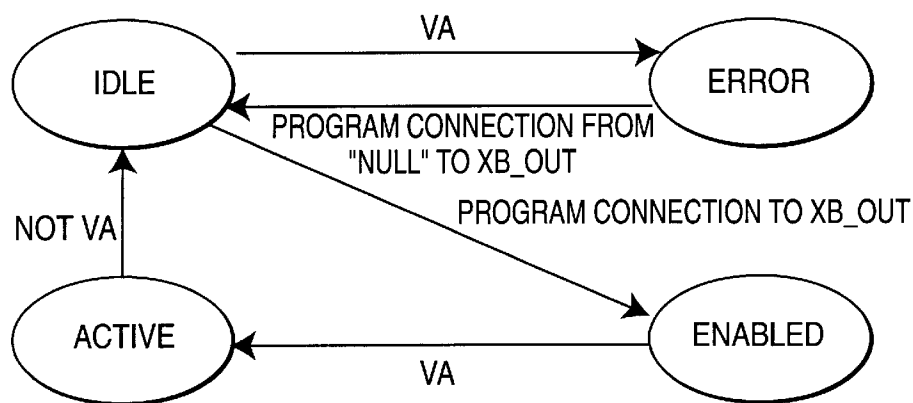


FIG. 2A

STATE DIAGRAM FOR CROSSBAR OUTPUT PORTS XB_OUT

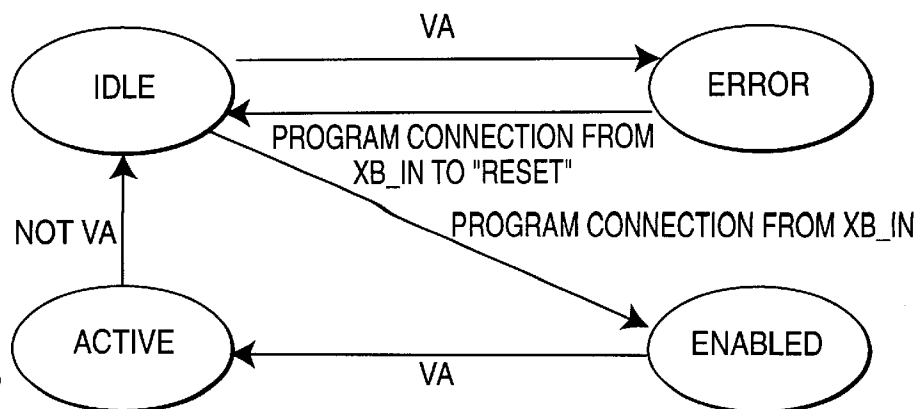
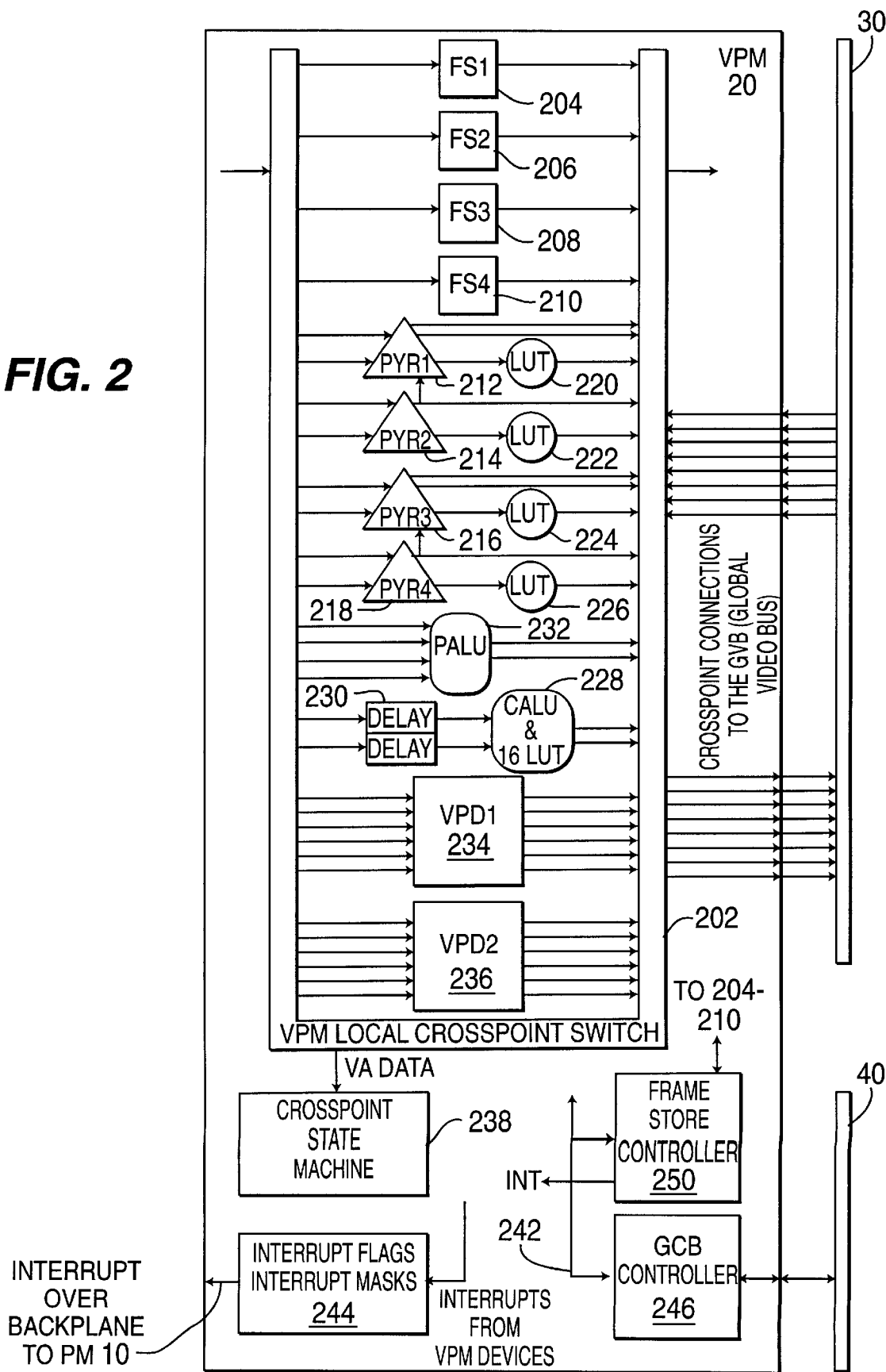


FIG. 2B

STATE DIAGRAM FOR CROSSBAR INPUT PORTS XB_IN

FIG. 2



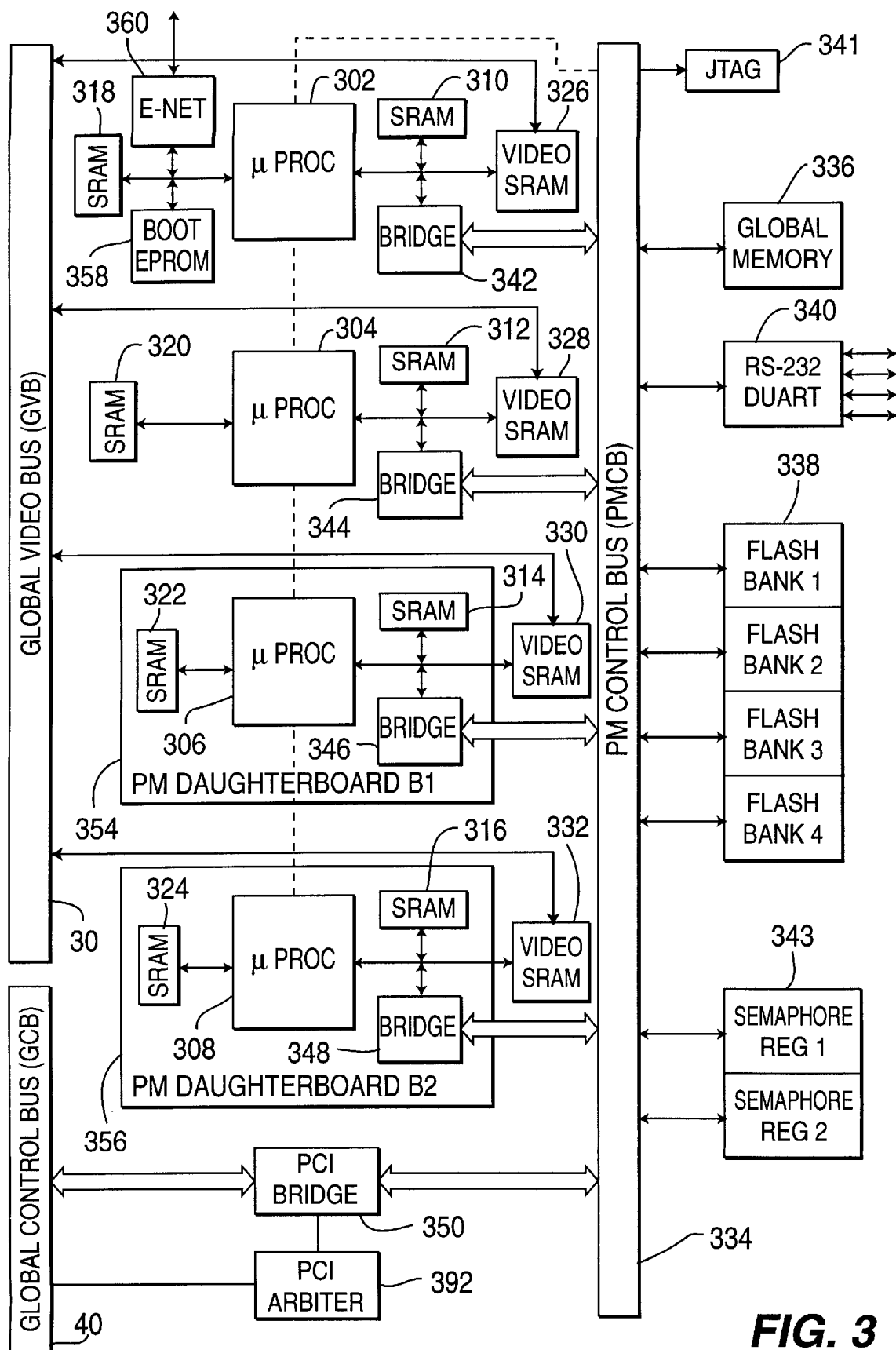


FIG. 3

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