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(54) **MOTION VECTOR DETECTION DEVICE AND MOTION VECTOR DETECTION METHOD**

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(52) **U.S. Cl.** **375/240.16**; 382/236; 348/699; 348/416.1
(58) **Field of Search** 375/240.16, 240.01, 375/240.24, 240.12, 240.23; 348/402.1, 416.1, 169, 699, 700; 382/236, 238, 239

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,502,492	A	*	3/1996	Jung	375/240.14
5,757,422	A	*	5/1998	Matsumura	348/169
6,002,428	A	*	12/1999	Matsumura et al.	348/169
6,169,766	B1	*	1/2001	Aoki et al.	375/240.16
6,611,559	B1	*	8/2003	Shingo et al.	375/240.16

FOREIGN PATENT DOCUMENTS

JP	04-049788	2/1992
JP	08-084345	3/1996
JP	9-224249	8/1997
JP	11-075192	3/1999

OTHER PUBLICATIONS

Copy of Office Action issued in corresponding Japanese application dated Dec. 3, 2002.
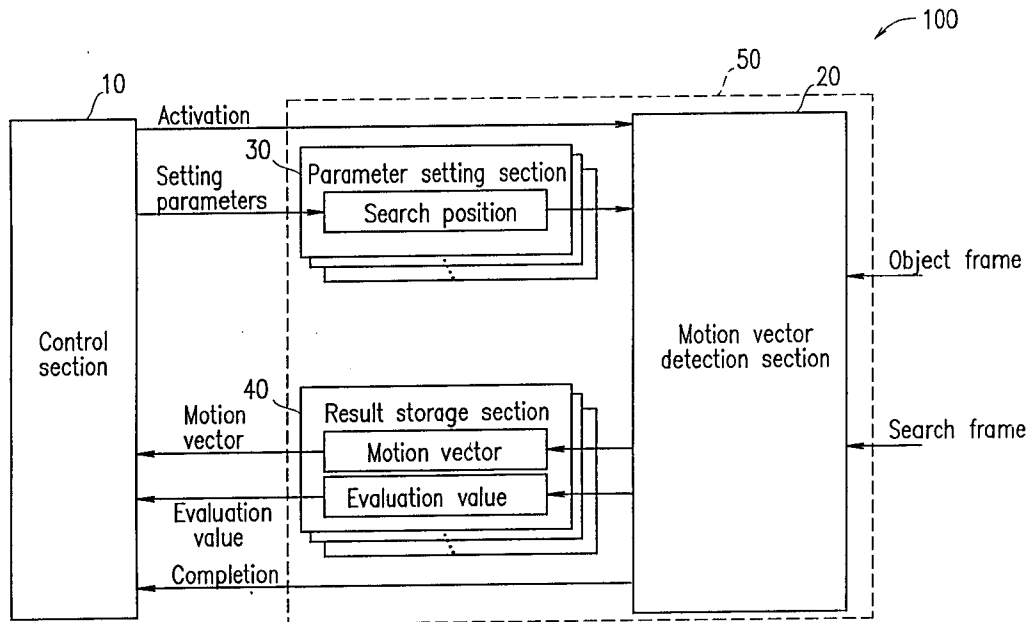
* cited by examiner

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(57) **ABSTRACT**

A motion vector detection device of the present invention includes: a parameter setting section having parameters relating to N (N is a natural number equal to or greater than 2) search regions obtained by dividing at least a portion of an entire search region in a search frame; a motion vector detection section for calculating an evaluation value which indicates a degree of correlation between an encoded object block in an object frame and a candidate block in one of the N search regions and for calculating a motion vector based on the evaluation value; a result storage section for storing the motion vector and the evaluation value calculated by the motion vector detection section; and a control section for controlling the motion vector detection section to calculate motion vectors and evaluation values for M ($1 \leq M \leq N$) different ones of the N search regions until a predetermined condition is satisfied, for receiving the motion vectors and the evaluation values from the result storage section, and for determining the motion vector for the encoded object block.
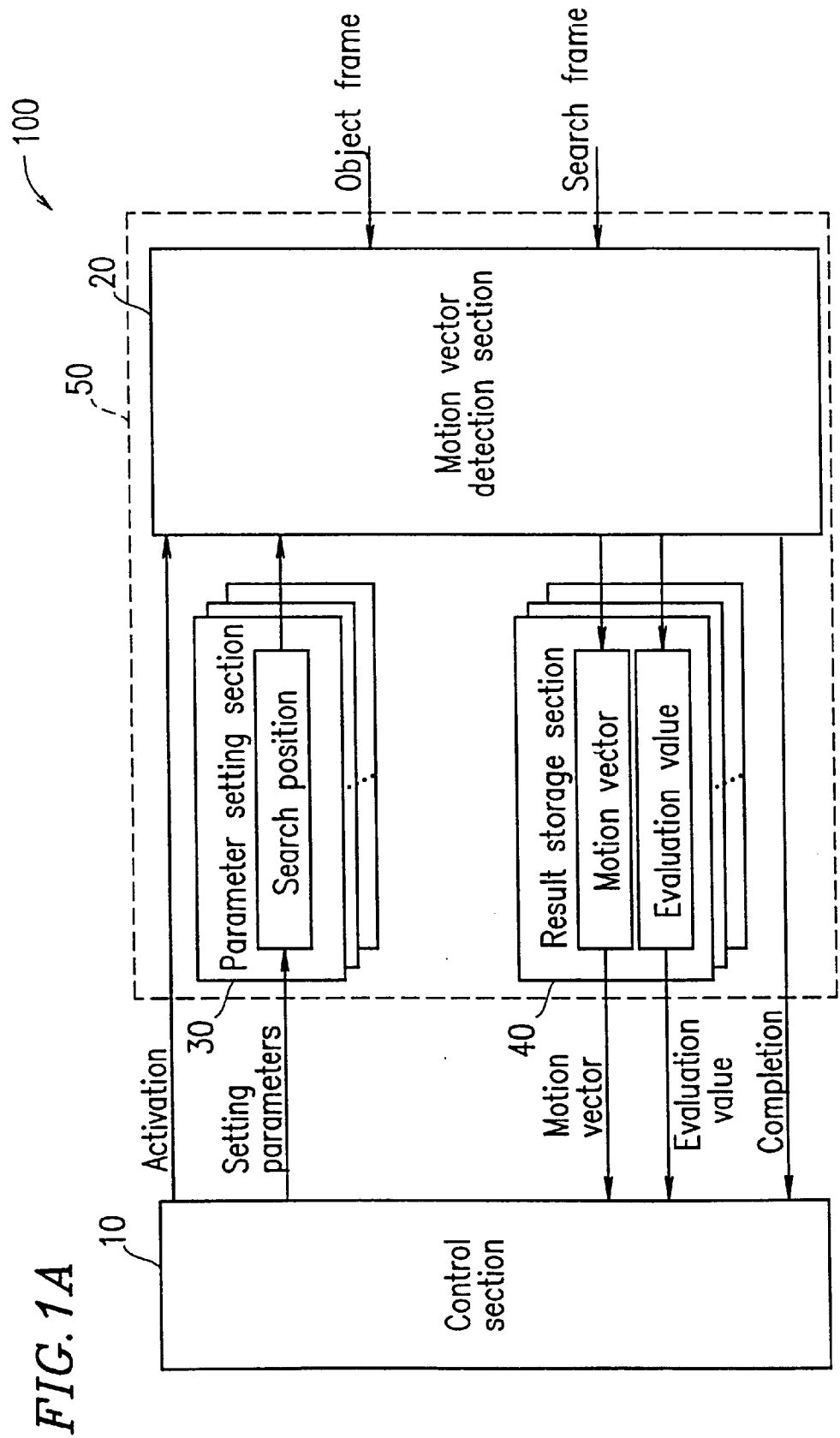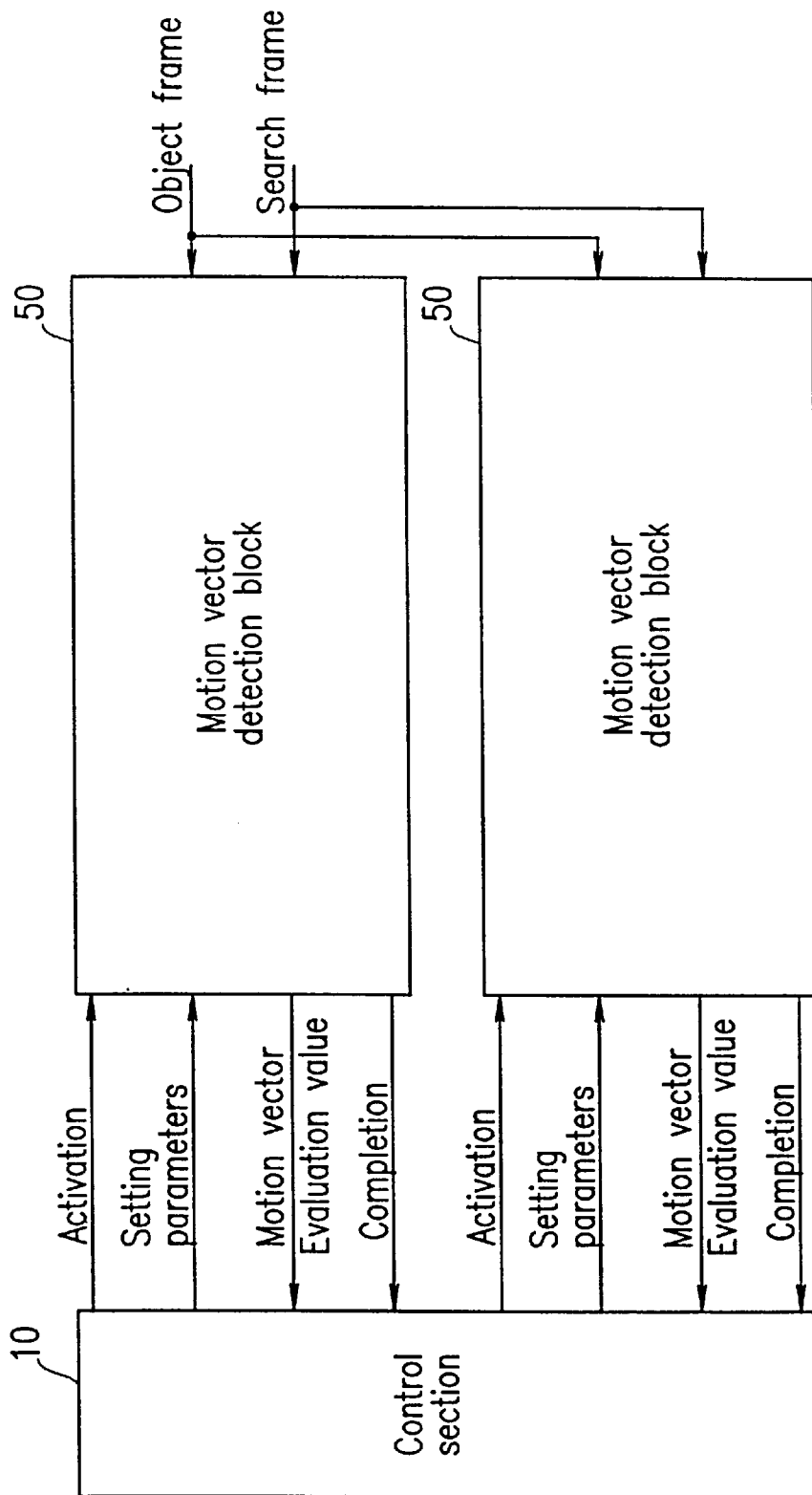
39 Claims, 13 Drawing Sheets

FIG.1A

FIG.1B

FIG.2A

```
                    ┌───────────┐
                    │   Start   │
                    └─────┬─────┘
                          │
                          ▼
              ┌───────────────────────┐
              │    Set  parameters    │──── Step 1
              └───────────┬───────────┘
         ┌─────────────►  │
         │    ┌───────────────────────┐
         │    │      Activation       │──── Step 2
         │    └───────────┬───────────┘
         │                │
         │                ▼
         │    ┌───────────────────────┐
         │    │    Output  results    │──── Step 3
         │    └───────────┬───────────┘
         │                │
         │                ▼            Step 4
         │              ◇───────────◇
         │  No        ◇   Calculation  ◇
         └───────────◇ has been performed ◇
                       ◇   N times ?   ◇
                         ◇───────────◇
                              │ Yes
                              ▼
              ┌───────────────────────┐
              │   Transfer  results   │──── Step 5
              └───────────┬───────────┘
                          │
                          ▼
              ┌───────────────────────┐
              │ Select  optimal vector│──── Step 6
              └───────────┬───────────┘
                          │
                          ▼
                    ┌───────────┐
                    │    End    │
                    └───────────┘
```
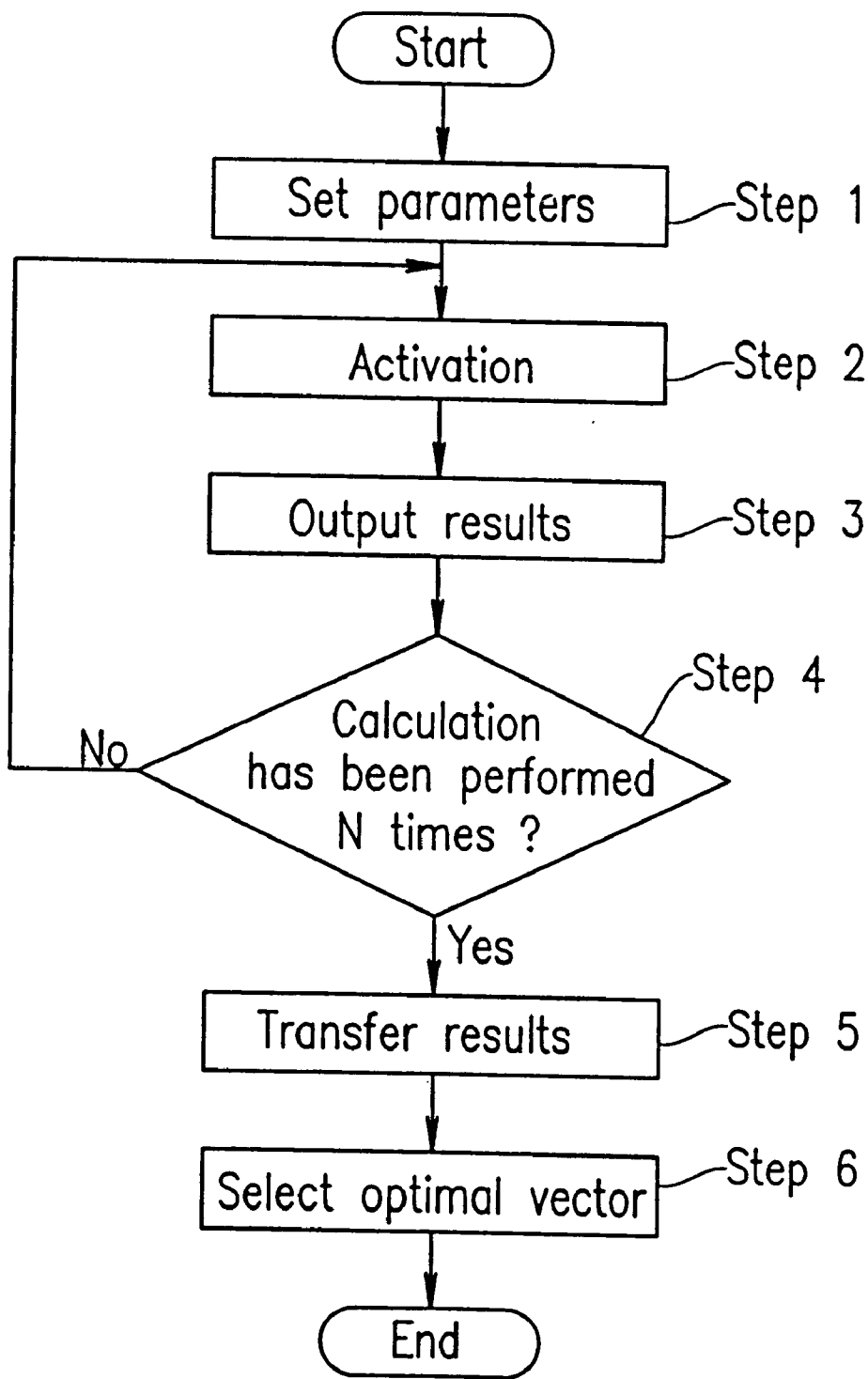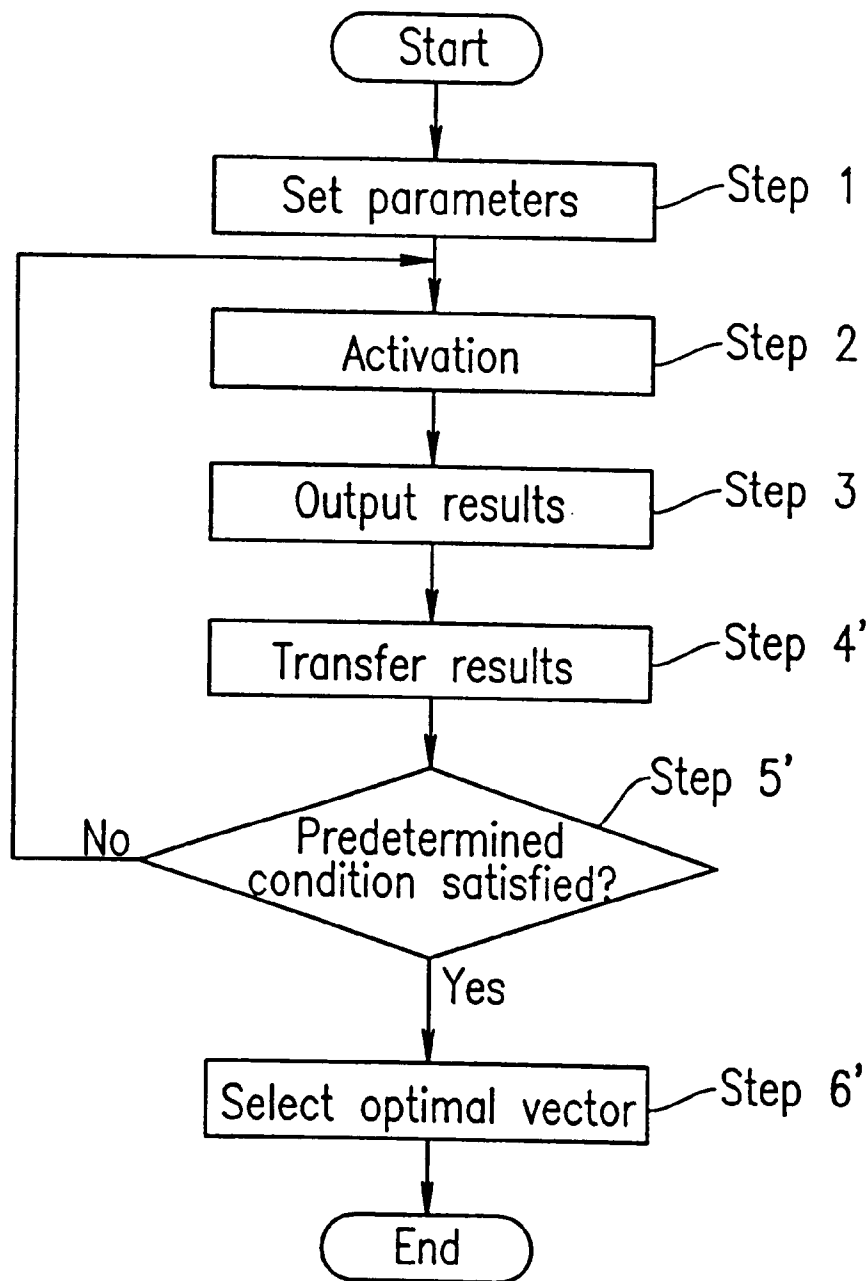
FIG.2B

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