

(12) **United States Patent**  
**Brill et al.**

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(45) **Date of Patent:** **Sep. 30, 2003**

(54) **METHOD AND SYSTEM FOR DEFINING AND RECOGNIZING COMPLEX EVENTS IN A VIDEO SEQUENCE**

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(57) **ABSTRACT**

Given a system which detects simple events, one can define a complex event by constructing a list of sub-events. In order to recognize a complex event, the system keeps a record of the sub-events that have occurred thus far and the objects involved in these sub-events. Whenever the first sub-event in a complex event's sequence is recognized, an activation for that complex event is created. The activation contains an indication of the identity of the object involved in the event. The activation also includes an index initialized to one. If a newly detected event matches the next sub-event in any of the currently open complex events, the index for that complex event is incremented. If the index reaches the total number of sub-events in that complex event, the complete complex event is recognized. Thus any desired alarm is generated. Since the complex event that was just recognized may also be a sub-event of another complex event, the activation lists are consulted again to see if the indices of any other complex event activations can be advanced.

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**Related U.S. Application Data**

(60) Provisional application No. 60/098,475, filed on Aug. 31, 1998.

(51) **Int. Cl.**<sup>7</sup> ..... **G06K 9/68**; G06K 9/00; H04N 7/18

(52) **U.S. Cl.** ..... **382/226**; 382/103; 348/155

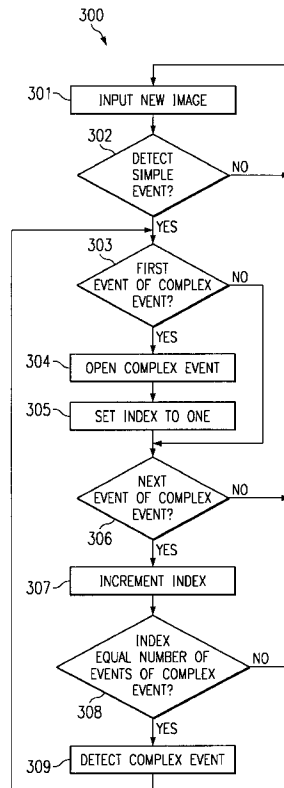
(58) **Field of Search** ..... 382/218, 219, 382/224, 225, 226, 103; 348/142, 143, 152, 153, 154, 155; 386/69; 340/511

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**6 Claims, 4 Drawing Sheets**



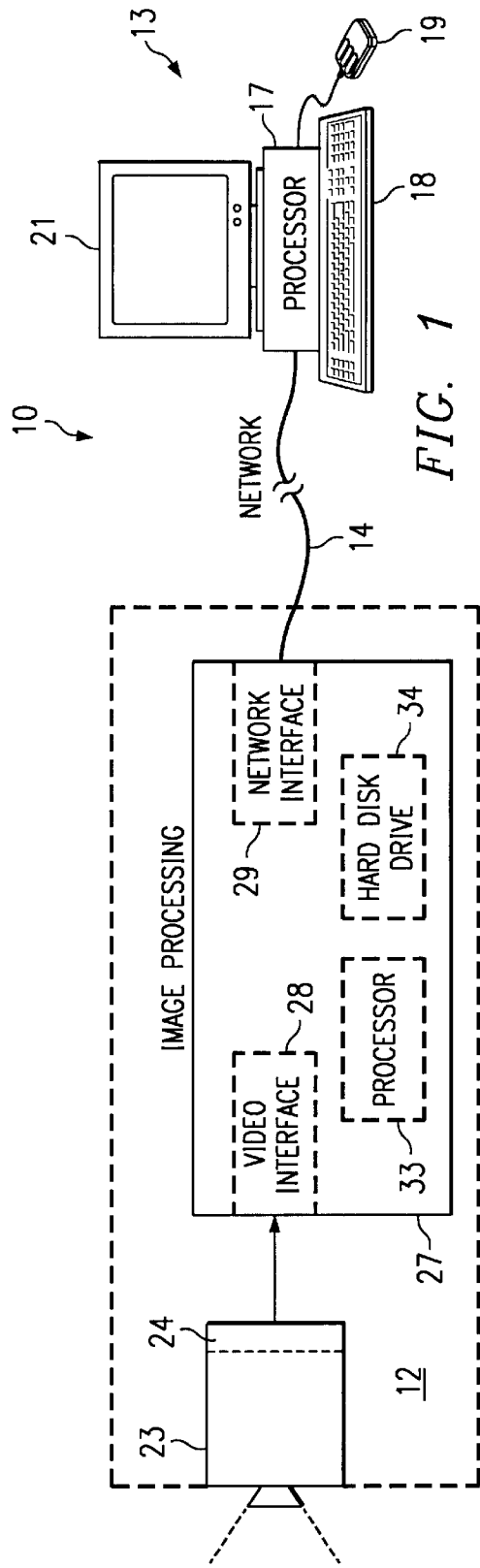


FIG. 1

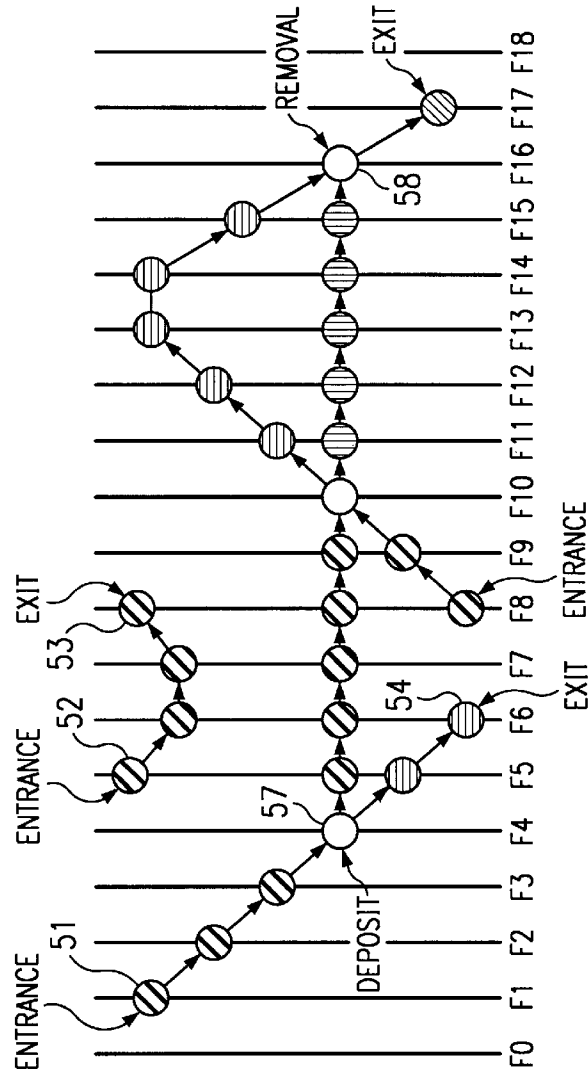


FIG. 2

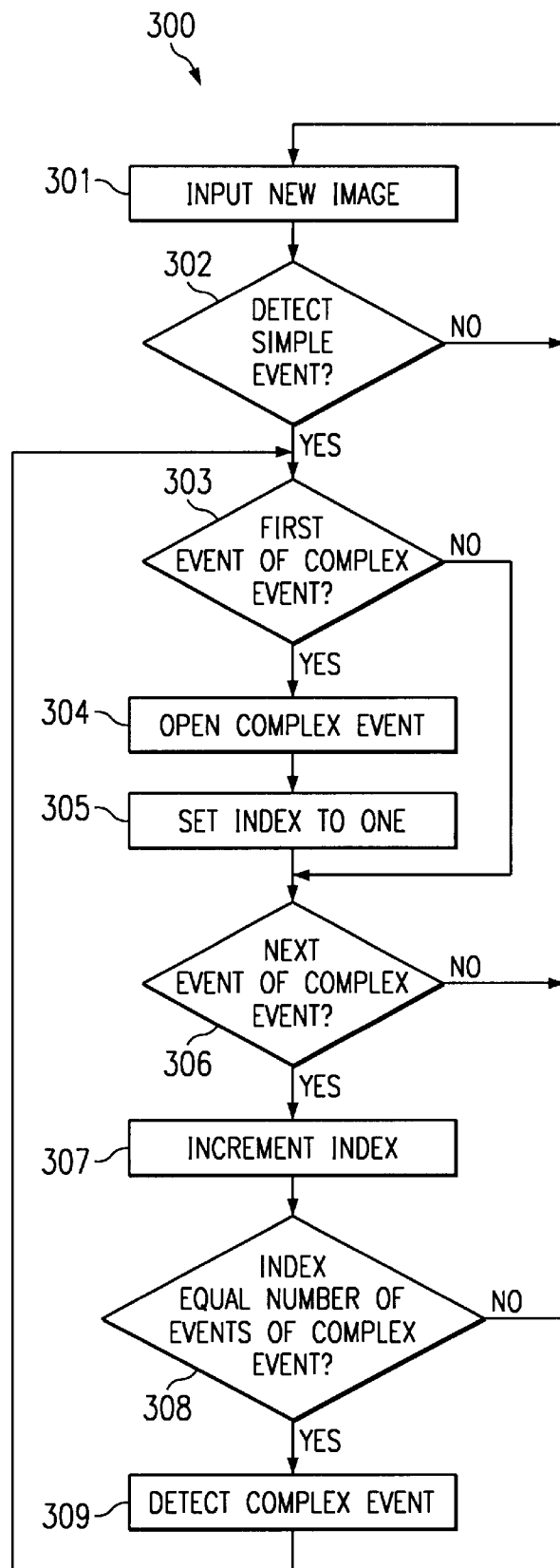


FIG. 3

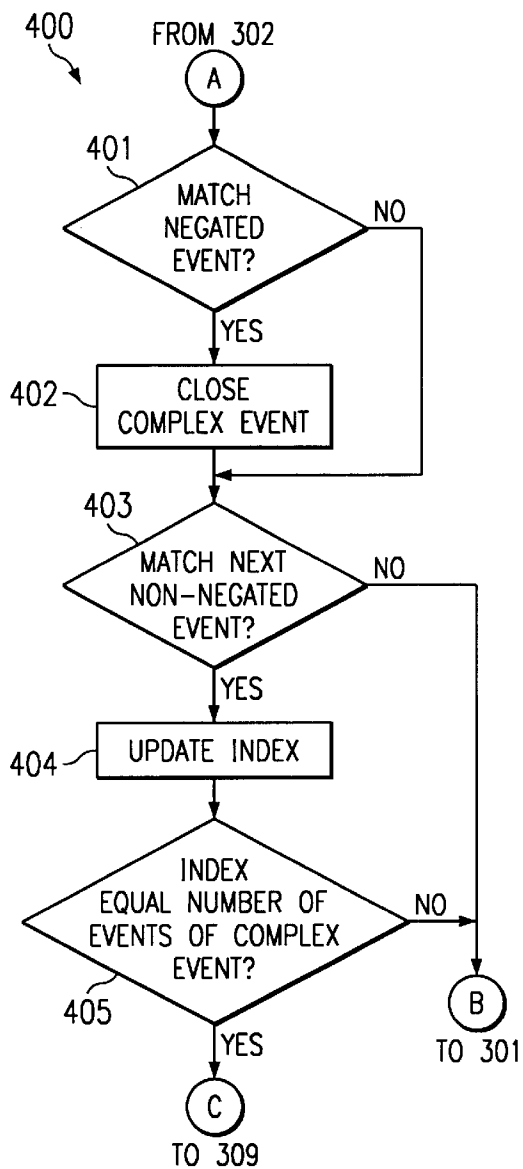


FIG. 4

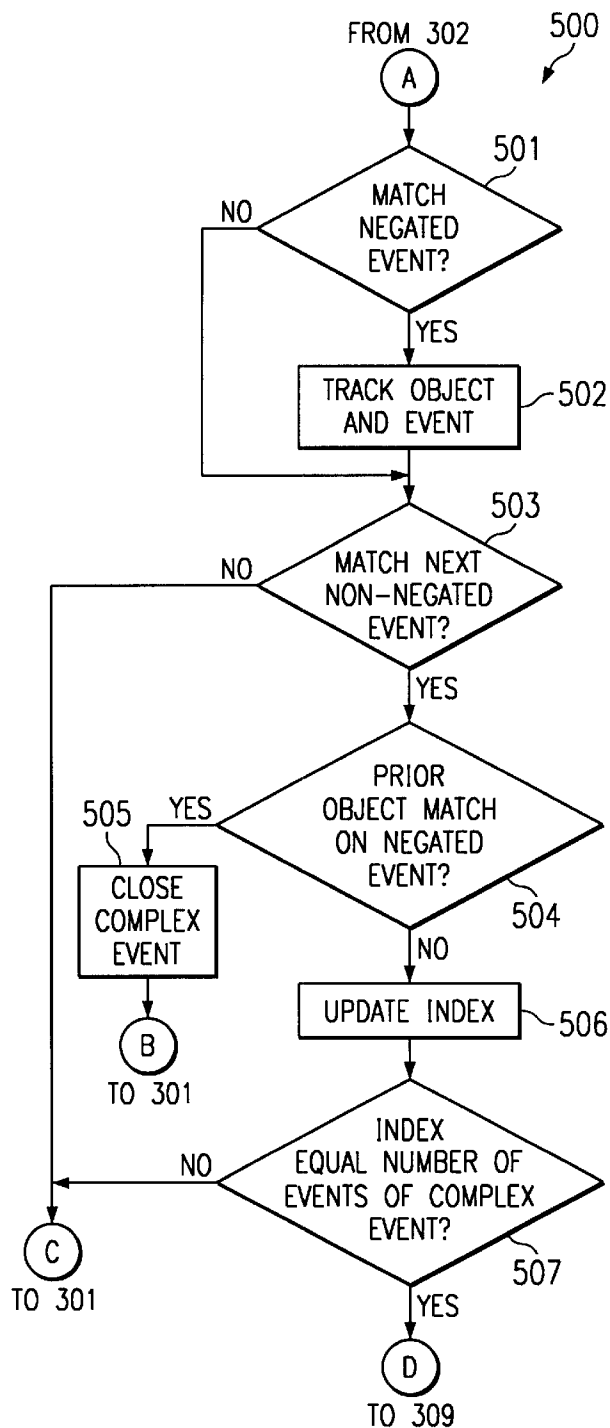


FIG. 5

Name :	<input type="text" value="Loiter by the door"/>
Events:	<input type="checkbox"/> enter <input type="checkbox"/> exit <input checked="" type="checkbox"/> loiter <input type="checkbox"/> alone <input type="checkbox"/> leave <input type="checkbox"/> deposit <input type="checkbox"/> remove <input type="checkbox"/> move <input type="checkbox"/> rest <input type="checkbox"/> incar <input type="checkbox"/> outcar <input type="checkbox"/> lightsout <input type="checkbox"/> lightson
Objects:	<input checked="" type="checkbox"/> person <input type="checkbox"/> box <input type="checkbox"/> briefcase <input type="checkbox"/> notebook <input type="checkbox"/> car <input type="checkbox"/> object <input type="checkbox"/> unknown
Days of week:	<input type="checkbox"/> Monday <input type="checkbox"/> Tuesday <input type="checkbox"/> Wednesday <input type="checkbox"/> Thursday <input type="checkbox"/> Friday <input type="checkbox"/> Saturday <input type="checkbox"/> Sunday
Time of day:	from 12:00 am <input type="text"/> until 12:00 am <input type="text"/>
Regions:	<input type="checkbox"/> PC_area <input checked="" type="checkbox"/> outside_the_door <input type="checkbox"/> phone_area
Duration:	<input type="text" value="5.0"/>
Actions:	<input type="checkbox"/> beep <input checked="" type="checkbox"/> log <input type="checkbox"/> flash <input type="checkbox"/> plot <input checked="" type="checkbox"/> voice <input type="checkbox"/> popup
<input type="button" value="OK"/> <input type="button" value="Cancel"/>	

FIG. 6

Name :	<input type="text" value="Theft"/>	<input type="button" value="ordered"/>
<div style="border: 1px solid black; padding: 5px;"><p>Loiter by the door Deposit/Remove Leave the computer Deposit Exit Loiter by the phone Enter Lights On/Off cmonitor1 Remove</p></div>	<div style="border: 1px solid black; padding: 5px;"><p>Enter Remove ~Deposit Exit</p></div>	
Actions:	<input type="checkbox"/> beep <input type="checkbox"/> log <input type="checkbox"/> flash <input type="checkbox"/> plot <input checked="" type="checkbox"/> voice <input type="checkbox"/> popup	
<input type="button" value="OK"/> <input type="button" value="Cancel"/>		

FIG. 7

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