EXHIBIT 1105

U.S. PATENT NO. 4,970,653, ISSUED TO KENUE ON NOV. 13, 1990

("KENUE")

TRW Automotive U.S. LLC: EXHIBIT 1105
PETITION FOR *INTER PARTES* REVIEW
OF U.S. PATENT NUMBER 8,599,001

[54] **VISION METHOD OF DETECTING LANE BOUNDARIES AND OBSTACLES**

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[73] Assignee: **General Motors Corporation,** Detroit, Mich.

[21] Appl. No.: **334,033**

[22] Filed: **Apr. 6, 1989**

[51] Int. Cl.⁵ **G06F 15/50**

[52] U.S. Cl. **364/461;** 364/424.02; 358/103

[58] Field of Search 364/424.02, 461, 424.02; 180/167, 168, 169; 318/587, 103

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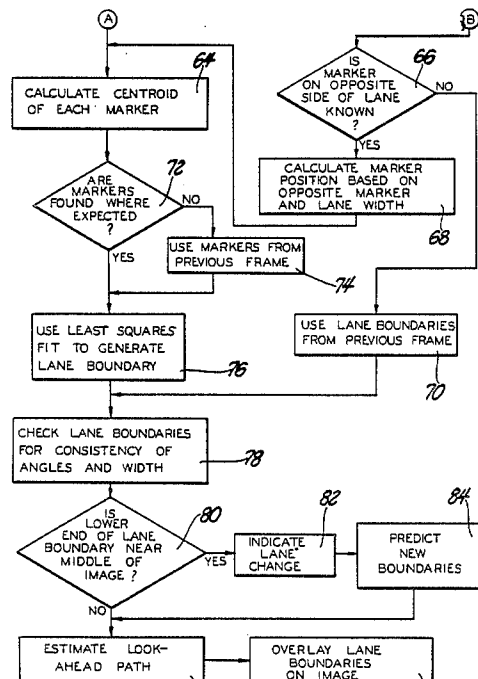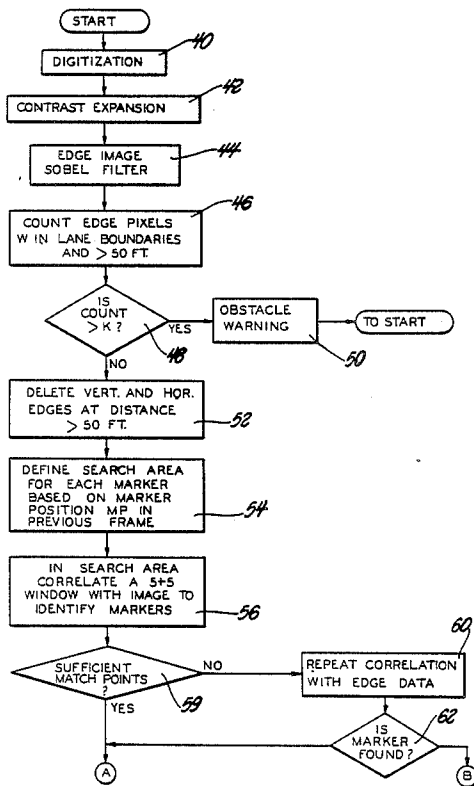|			
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[57] **ABSTRACT**

An image processing method operates on an image from a ccd camera viewing a roadway scene in front of a vehicle to detect lane markers and determine the relationship of the vehicle to the lane. Obstacles in the lane near the vehicle are detected and a warning is given to the driver. The method uses template matching techniques or a Hough algorithm to detect the lane markers or road edges.
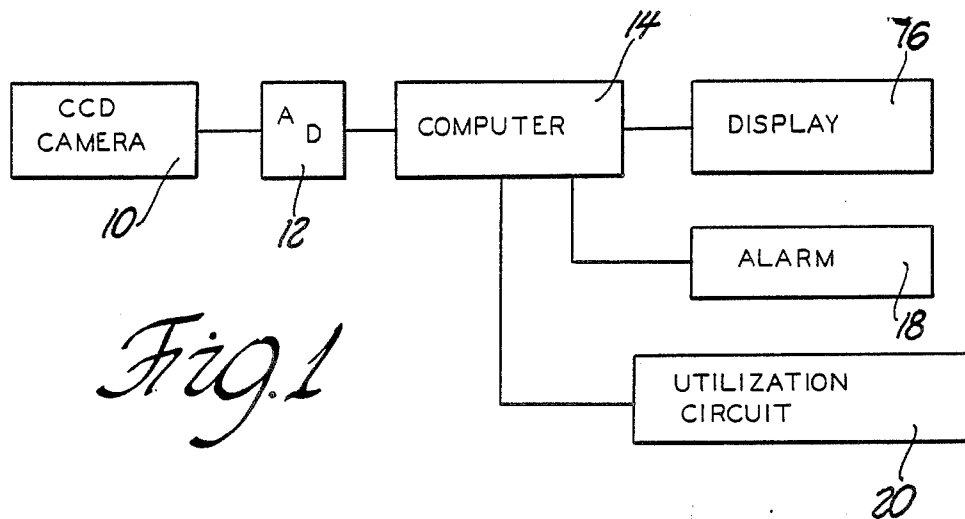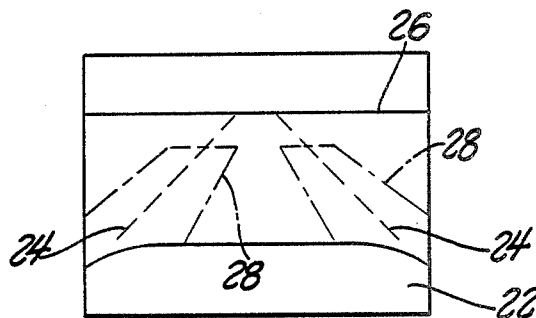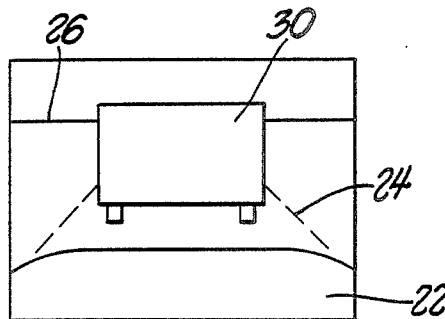
10 Claims, 7 Drawing Sheets

Fig.1

Fig. 2

Fig 3

START

DIGITIZATION *40*

CONTRAST EXPANSION *42*

EDGE IMAGE SOBEL FILTER *44*

COUNT EDGE PIXELS W IN LANE BOUNDARIES AND > 50 FT. *46*

Fig.4a

IS COUNT > K ? *48*

— YES → OBSTACLE WARNING → TO START *50*

NO

DELETE VERT. AND HOR. EDGES AT DISTANCE > 50 FT. *52*

DEFINE SEARCH AREA FOR EACH MARKER BASED ON MARKER POSITION MP IN PREVIOUS FRAME *54*

IN SEARCH AREA CORRELATE A 5+5 WINDOW WITH IMAGE TO IDENTIFY MARKERS *56*

SUFFICIENT MATCH POINTS ? *59*

— NO → REPEAT CORRELATION WITH EDGE DATA *60*

YES

IS MARKER FOUND ? *62*

(A)   (B)

Fig. 4b

DOCKET ALARM
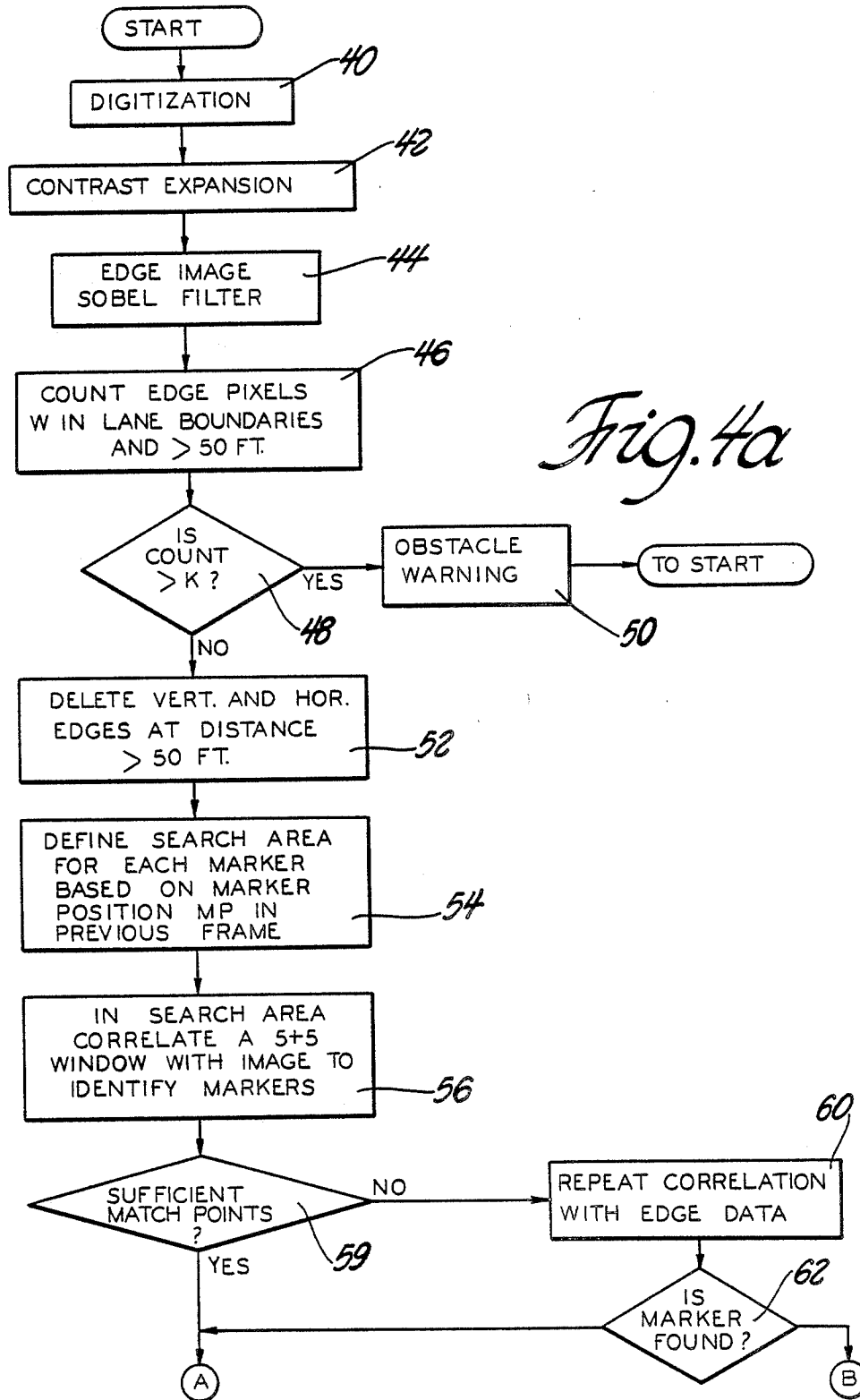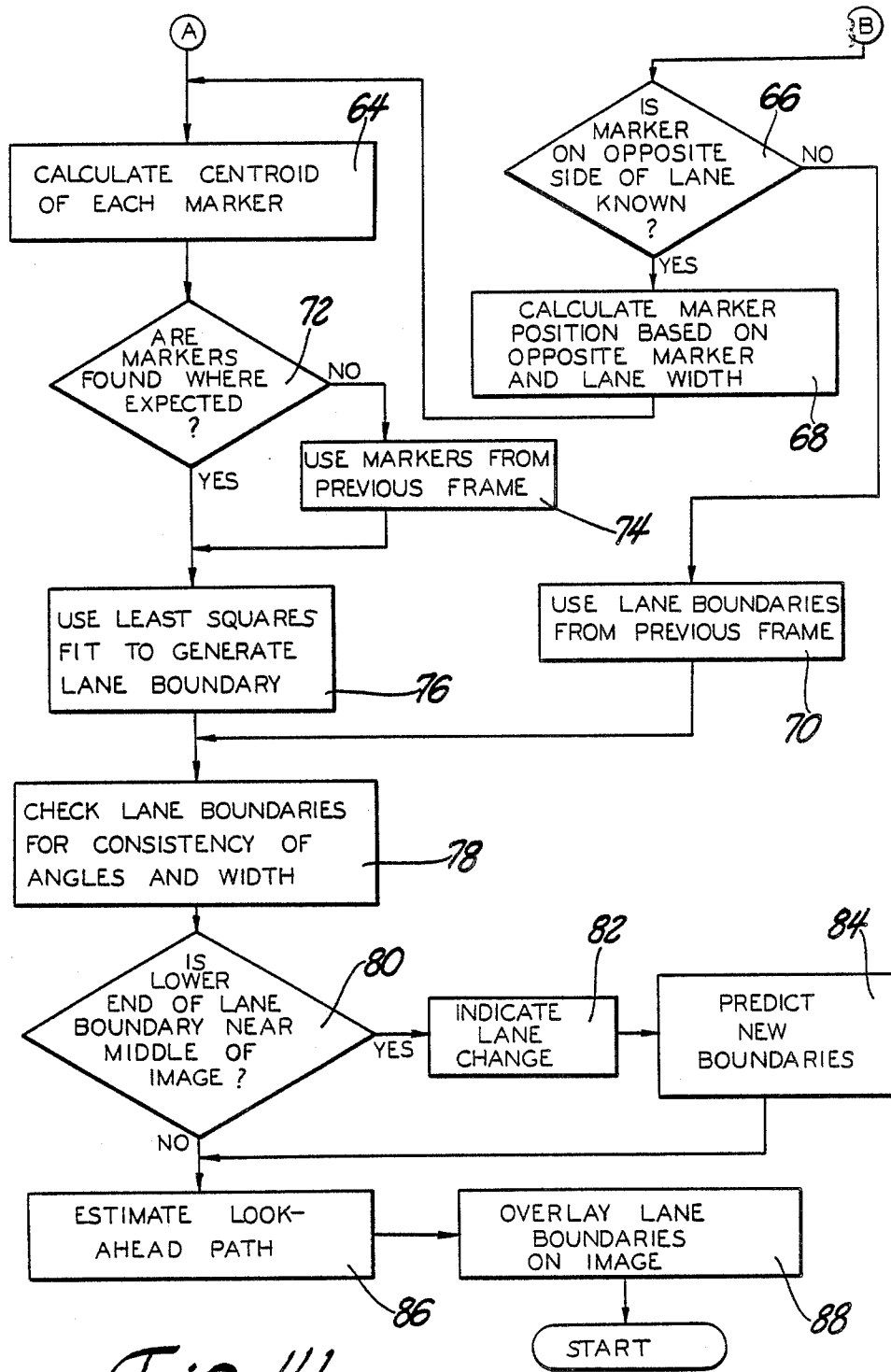
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