United States Patent [19]

Mizuguchi et al.

[11] **Patent Number: 4,801,771**

[45] **Date of Patent: Jan. 31, 1989**

[54] **FORCE SENSITIVE DEVICE**

[75] Inventors: **Masaaki Mizuguchi; Hirohisa Kuroyanagi,** both of Shizuoka, Japan

[73] Assignee: **Yamaha Corporation,** Hamamatsu, Japan

[21] Appl. No.: **107,583**

[22] Filed: **Oct. 13, 1987**

[30] **Foreign Application Priority Data**

Oct. 13, 1986 [JP] Japan 61-243538
Oct. 13, 1986 [JP] Japan 61-243537

[51] **Int. Cl.**[4] **H01H 3/02;** H01H 13/00; G10H 1/34

[52] **U.S. Cl.** ..... **200/86 R;** 178/18; 200/5 A; 200/512

[58] **Field of Search** ..... 200/5 A, 86 R, 159 B; 178/18

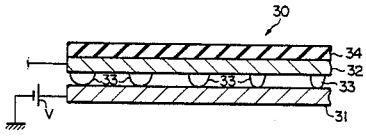
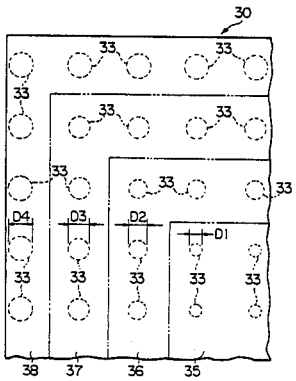
[56] **References Cited**

U.S. PATENT DOCUMENTS

2,790,873	4/1957	Fleming	200/86 R
2,843,695	7/1958	Osuch et al.	200/86 R
3,323,197	6/1967	Millard	200/86 R
3,668,337	6/1972	Sinclair	200/86 R X
3,699,294	10/1972	Sudduth	200/5 A X
3,722,086	3/1973	Wikkerink et al.	200/86 R
3,793,469	2/1974	Tarnopolsky et al.	200/5 A X
3,821,500	6/1974	Newman	200/86 R
3,911,215	10/1975	Hurst et al.	200/86 R X
4,220,815	9/1980	Gibson et al.	200/86 R X
4,317,013	2/1982	Larson	200/5 A
4,324,962	4/1982	Dulen	200/5 A X
4,360,716	11/1982	Fiorella	200/5 A
4,382,165	5/1983	Balash et al.	200/5 A
4,525,606	6/1985	Sado et al.	200/86 R X
4,602,135	7/1986	Phalen	200/86 R X
4,677,417	6/1987	Amagishi	200/86 R X
4,694,126	9/1987	Aiken, Jr. et al.	200/86 R X

Primary Examiner—J. R. Scott
Attorney, Agent, or Firm—Burns, Doane, Swecker & Mathis

[57] **ABSTRACT**

There is provided a force sensitive device comprising a first conductive layer, a second conductive layer resiliently deformable to come into contact with the first conductive layer, a certain level of voltage being applied across the first and second conductive layers, a plurality of spacing members intervening between the first conductive layer and the second conductive layer and formed of an insulating material, and a resilient top layer of an insulating material overlaid on the second conductive layer and operative to cause the second conductive layer to come into contact with the first conductive layer under a force acting on a surface portion thereof, wherein the contact portion varies in area depending upon a position of the surface portion where the force acts so that the force sensitive device produces the signal having a voltage level which varies depending upon the position where the force acts.

25 Claims, 8 Drawing Sheets