

- [54] **METHOD AND APPARATUS FOR MEASURING DIRECTION**
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- [73] Assignee: **Eaton-Leonard Corporation, Santa Ana, Calif.**
- [22] Filed: **Apr. 18, 1974**
- [21] Appl. No.: **461,881**
- [52] U.S. Cl..... **235/151.3; 235/61.6 R; 33/174 PC; 33/1 M; 33/1 N**
- [51] Int. Cl.²..... **G01B 3/56; G01B 7/28**
- [58] Field of Search..... **33/1 M, 1 N, 1 PT, 1 CC, 33/1 MP, 174 PC; 235/151.3, 61.6 A, 61.6 B, 61.6 R, 151.11, 92 DN, 151.32; 250/237**

Primary Examiner—Edward J. Wise

[57] **ABSTRACT**

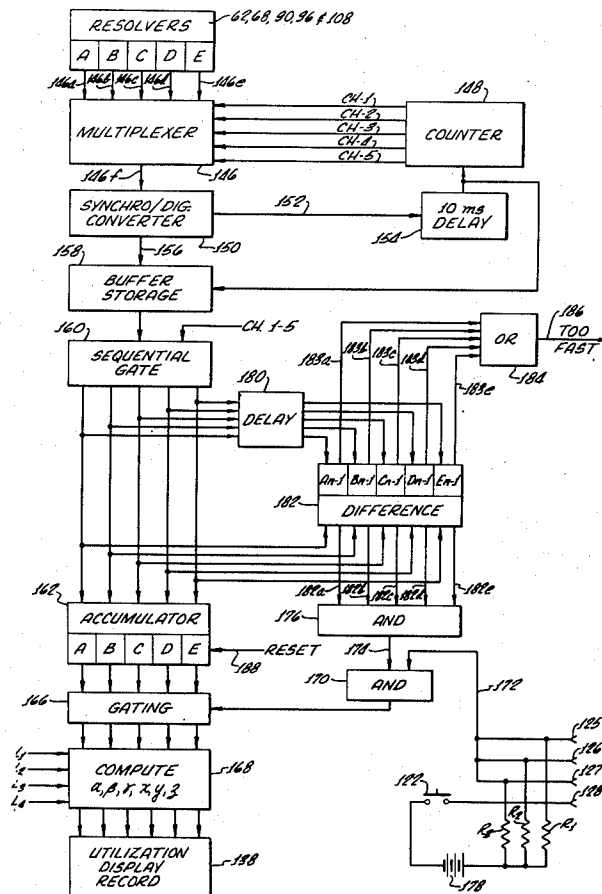
Measurement of a vector inn space is accomplished by an articulated five axis probe carrying a working head that can be moved into a measuring position that has a known angular relation to an object to be measured. A plurality of pivotally interconnected links include a first link pivotally mounted to a work table and an end link that fixedly carries a working head having a V-groove defined by four mutually spaced electrically conductive contact elements. For measurements made upon a tube having a number of bends, the working head is successively positioned in contact with the several straight portions of the bent tube and the angles of the several links relative to adjacent links and relative to the work table are read out for each contact. When the working head is properly oriented with respect to the tube, the electrical contacts enable read out of the several angles. These collectively define both the direction of the working head and its coordinate position with respect to a reference coordinate system. The measured angles, together with lengths of the several links, are employed to calculate direction angles and coordinate position of vectors coaxial with each tube straight portion.

[56] **References Cited**

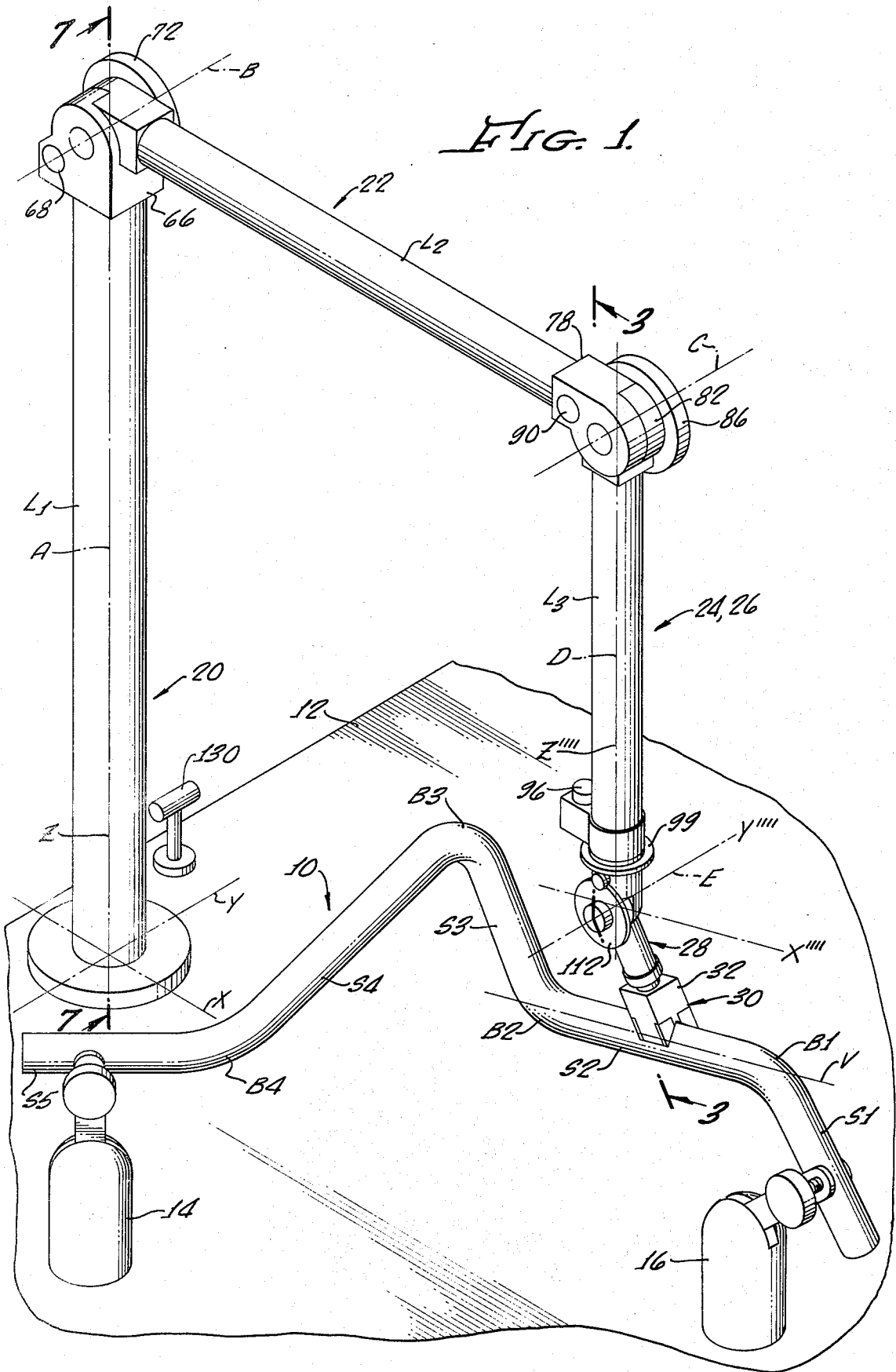
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47 Claims, 17 Drawing Figures



EX1074



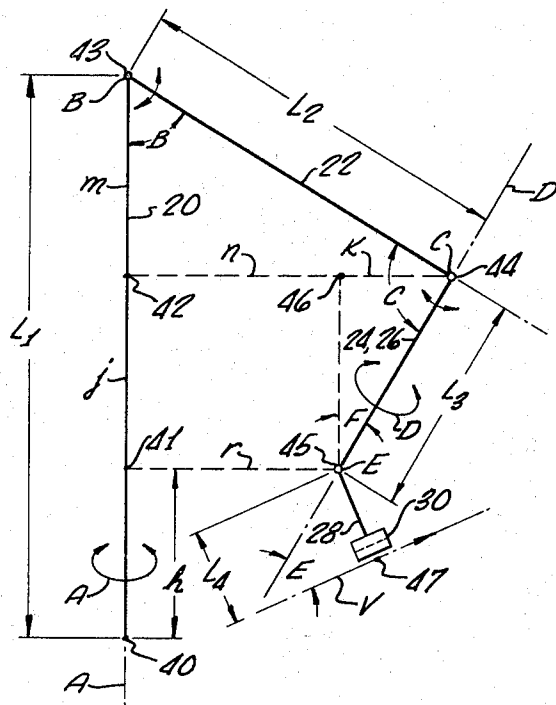


FIG. 2.

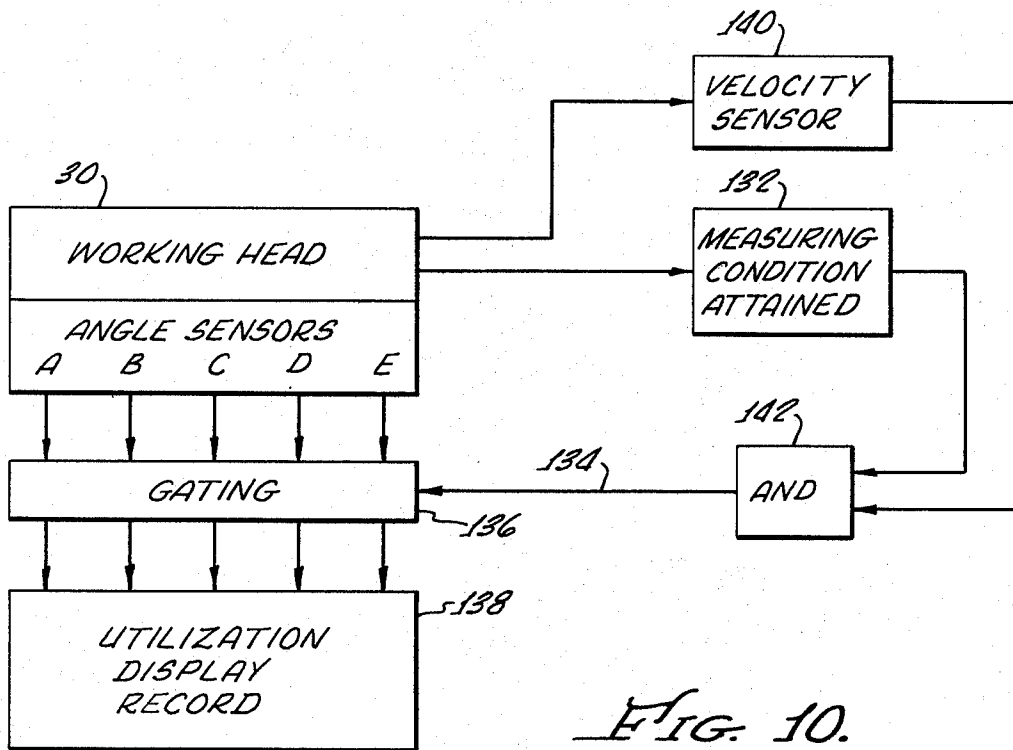


FIG. 10.

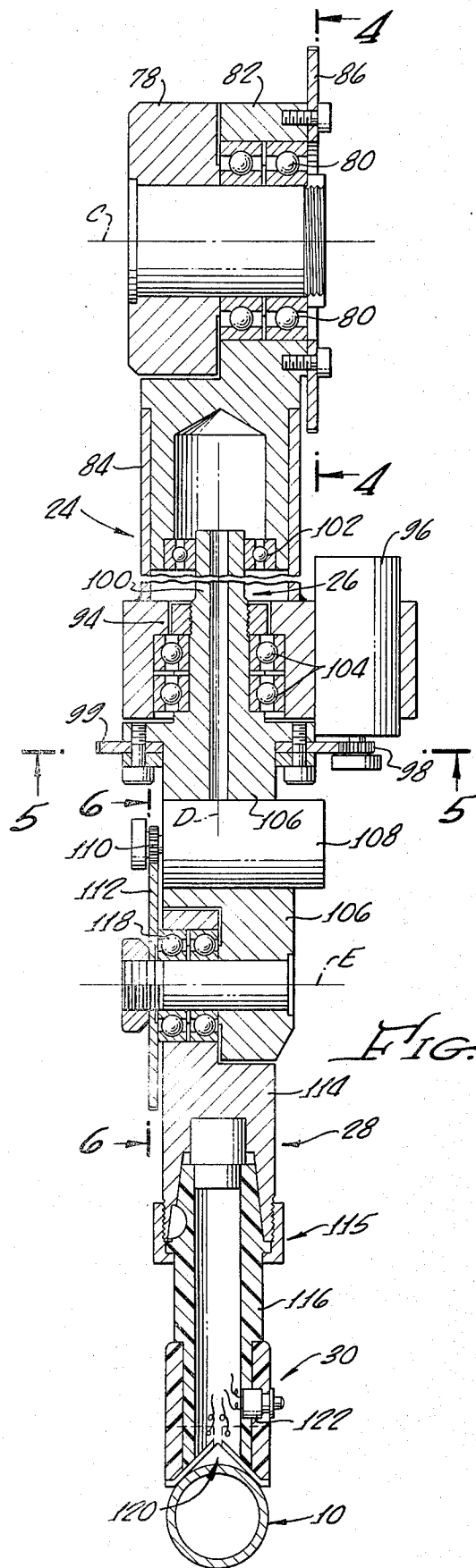


FIG. 3.

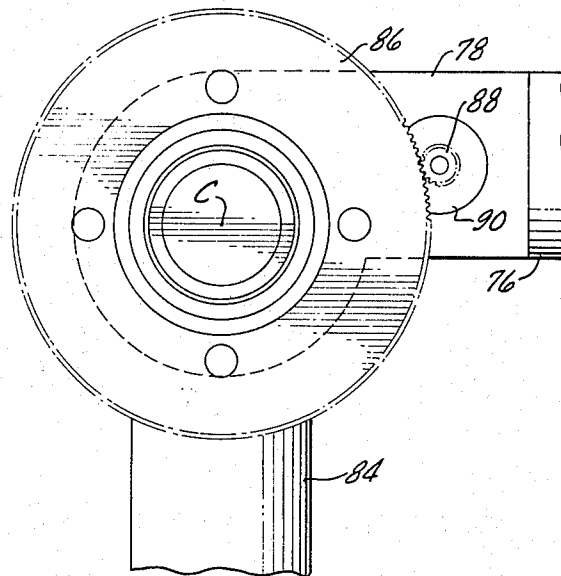


FIG. 4.

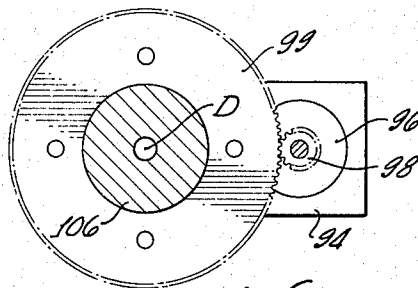


FIG. 5.

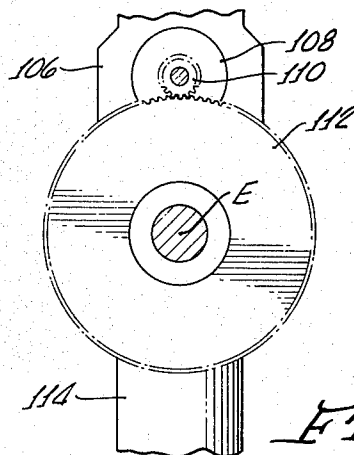
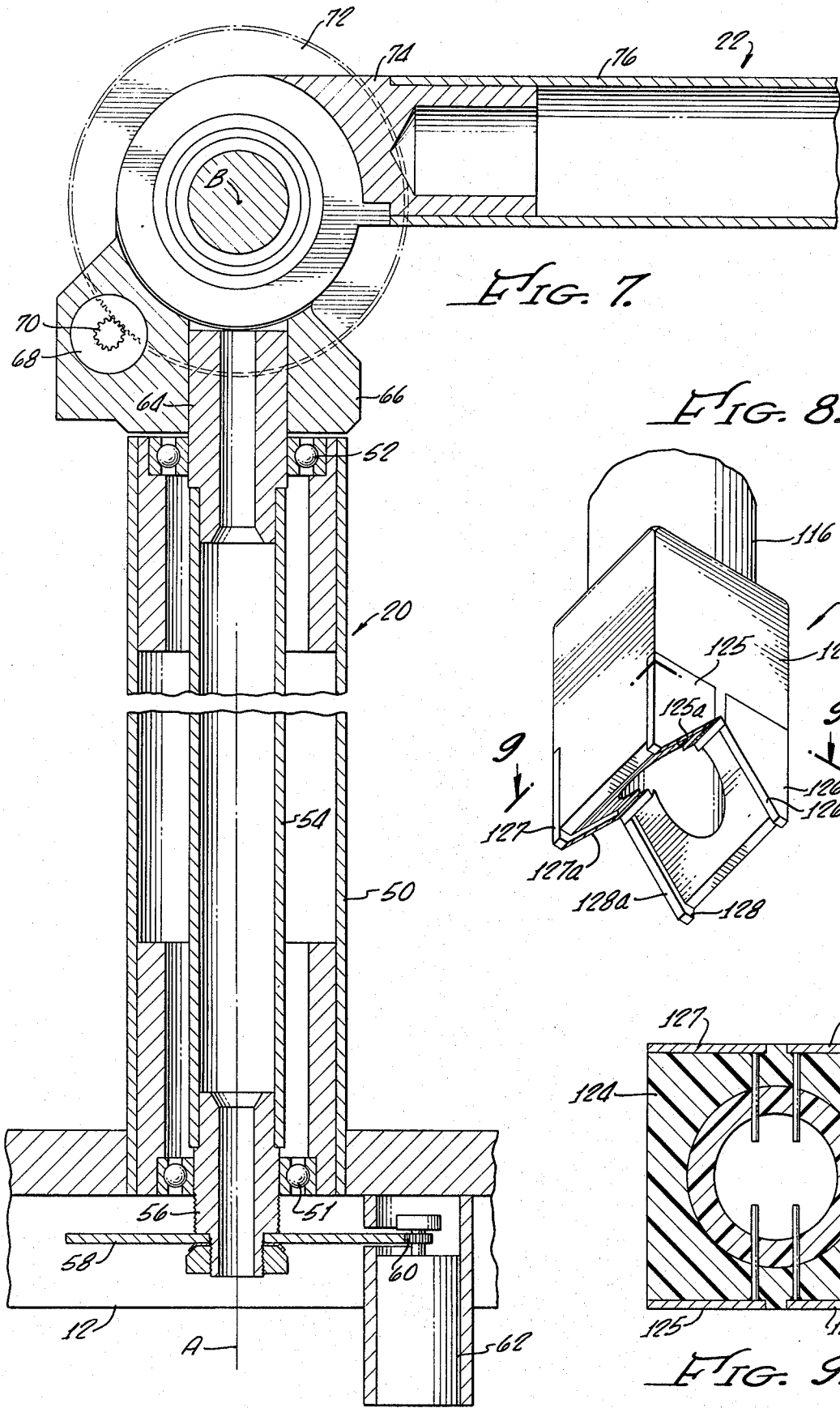


FIG. 6.



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