I.O.S.

COMPUTERIZED DISTRIBUTION OF ELEVATION AND CURRENT FOR THE MAJOR IRISH SEA STORM SURGES OF NOVEMBER 1977

by
J.E. JONES

REPORT NO 101
1980

NATURAL ENVIRONMENT RESEARCH COUNCIL
INSTITUTE OF OCEANOGRAPHIC SCIENCES

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COMPUTED DISTRIBUTIONS OF ELEVATION AND CURRENT FOR THE MAJOR IRISH SEA STORM SURGES OF NOVEMBER 1977

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ERRATUM

The correct title of this report is that which appears on the title page. The cover title is incorrect.

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SUMMARY

A two-dimensional numerical model of the Irish Sea has been used to investigate the dynamics of two major storm surges during November 1977. Detailed spatial plots of sea-surface elevation and depth-mean current showing the computed hour-by-hour development of the storm surges, have been prepared and are here presented.

1. INTRODUCTION

In November 1977 two major storm surges were generated in the Irish Sea; the main peaks occurred at 01.00h on 12 November and at 19.00h on 14 November as recorded at Liverpool. The first of these surges, 1.42m in height at Liverpool, in combination with exceptionally high spring tides, caused serious coastal flooding in the Eastern Irish Sea. The second surge peak was even higher at 1.47m but as it occurred near low tide no flooding ensued.

These surges have been investigated dynamically using a two-dimensional numerical model and the results of this study are described in detail in an earlier paper (Heaps and Jones, 1979). However, the paper confined itself to discussing the surge elevations at specific ports, comparing model simulations with observations. Also computed bulk flows across a very limited number of Irish Sea cross sections were studied.

It is of further interest to examine the changing two-dimensional distribution of elevation and current throughout the Irish Sea during these two surge events. Most conveniently this information, derived from the numerical model, may be displayed in the form of elevation contour maps and current vector matrices.

In this report there are 144 maps of both elevation and current in the Irish Sea, arranged in an hourly sequence from 00.00h on 10 November to 23.00h on 15 November, a period which covers both surges.

Thus, this report gives an hour-by-hour time picture of the development of a major storm surge as simulated by a two-dimensional numerical model. It would be practically impossible to obtain such an overall detailed picture from observations.

2. COMMENTS

(1) The elevations and currents were obtained by taking the difference between the results from two numerical model runs. One run simulated the tide plus surge and the other simulated the tide only. This difference therefore not only includes the direct surge but also any surge-tide interaction.

(2) The contours of elevation are drawn at 10 cm. intervals and in certain cases where the contours are crowded together, the numbering of various levels has been omitted. However in these cases the value of the un-numbered contour levels should easily be obtained by inspection.

(3) The current vectors fly with the currents from the small crosses which mark the calculation points. For example in the main channel of the Irish Sea for the plot showing the situation at 00.00h, 10 November, the flow is from south to north.

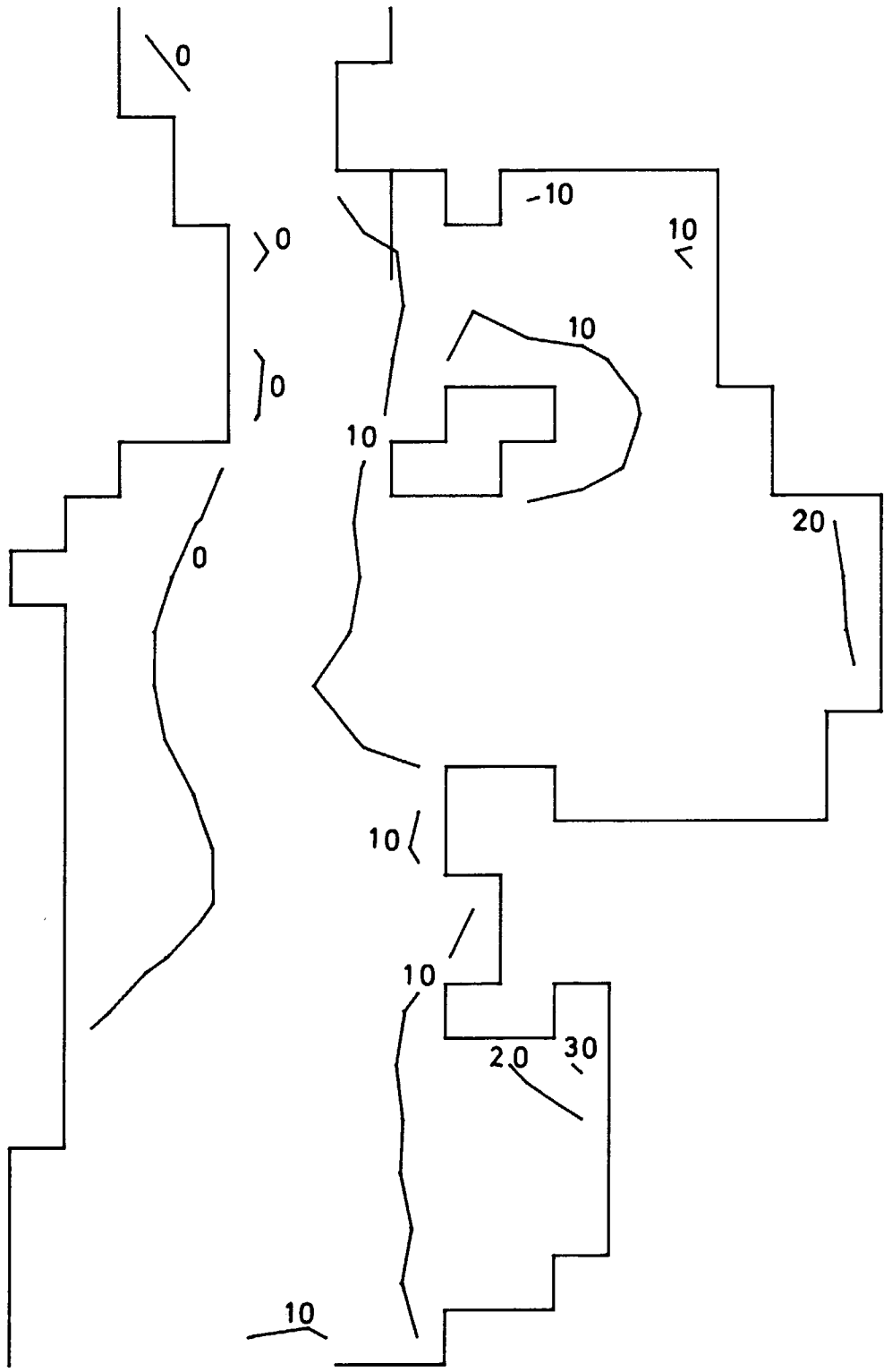
(4) The maps show the Irish Sea model coastline. The fit of this to the actual coast is given in Heaps and Jones, 1979.

3. REFERENCE

Heaps, N.S. and Jones, J.E., 1979, Recent storm surges in the Irish Sea. In Marine Forecasting, ed J.C.J. Nihoul, Elsevier, Amsterdam, pp. 285-319.

0 HRS 10TH

ELEVATIONS



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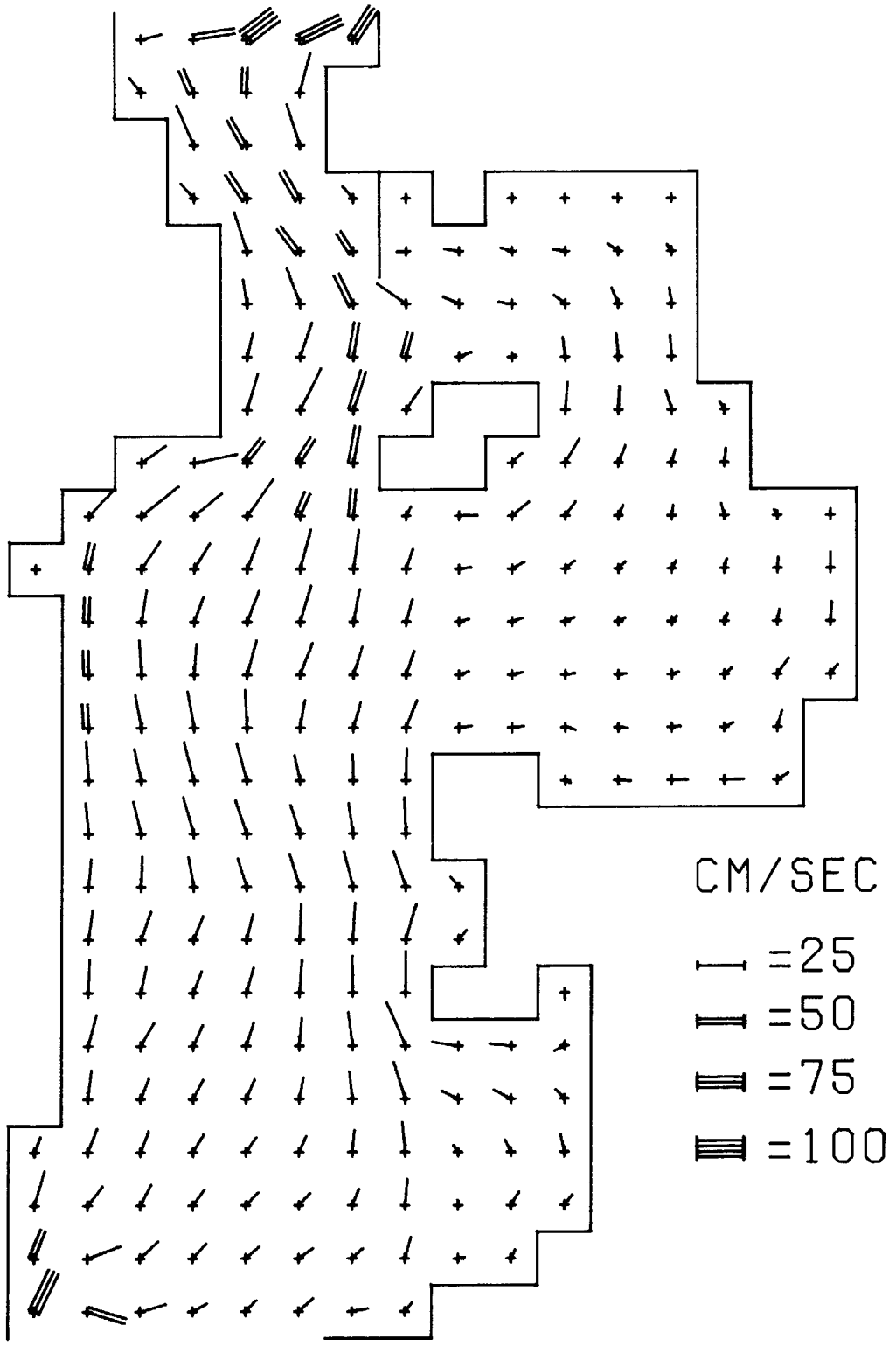

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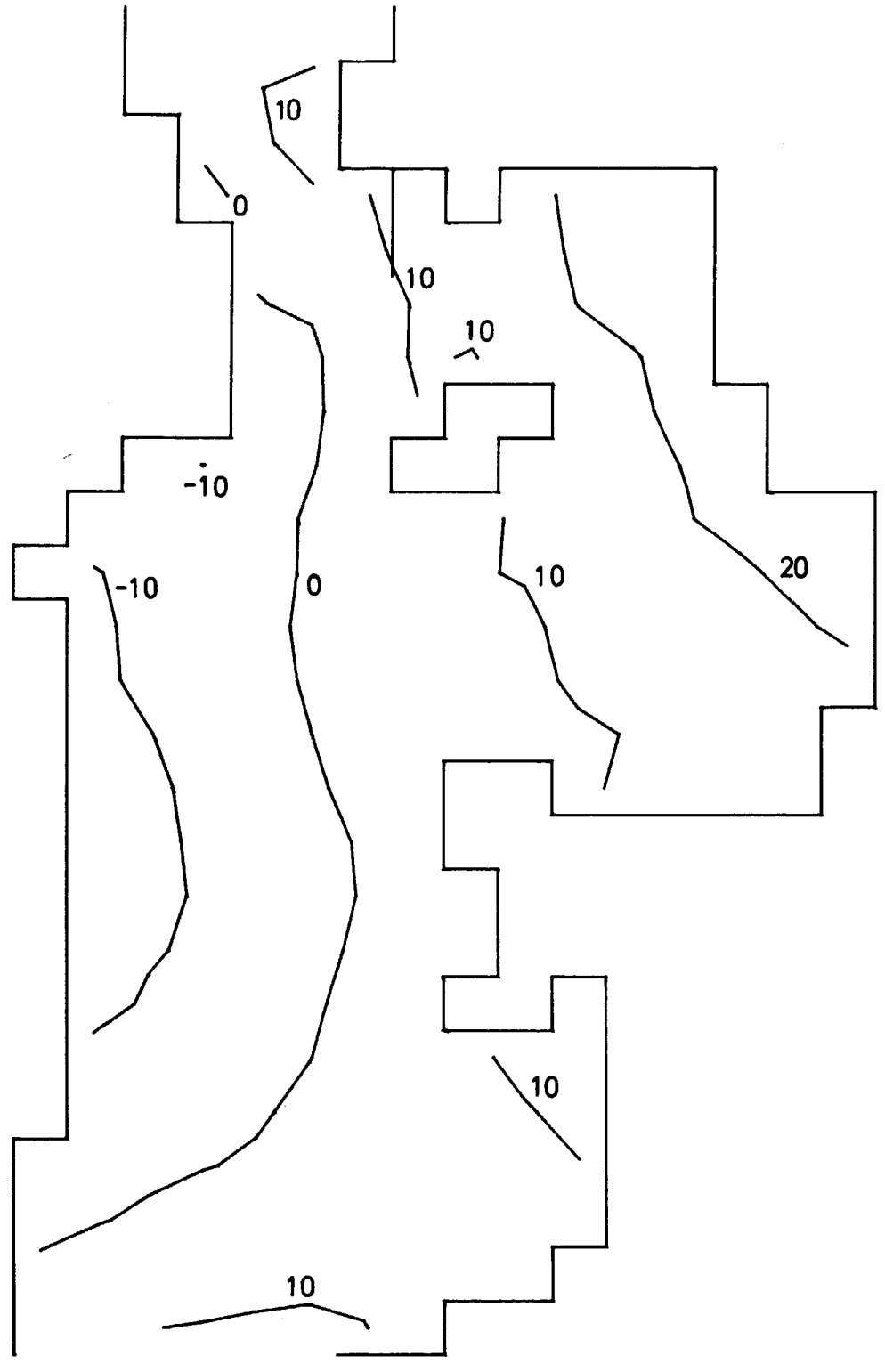

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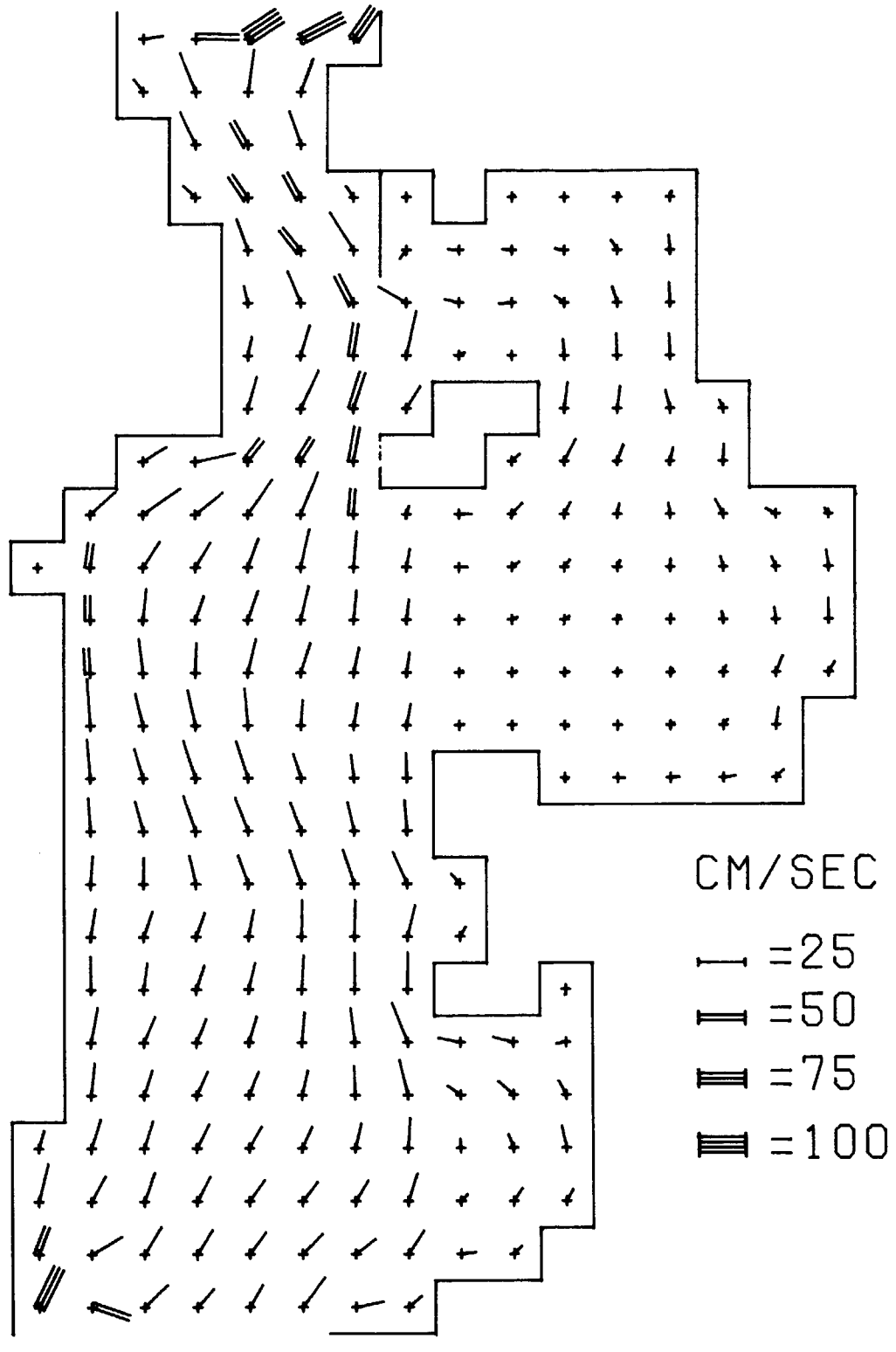

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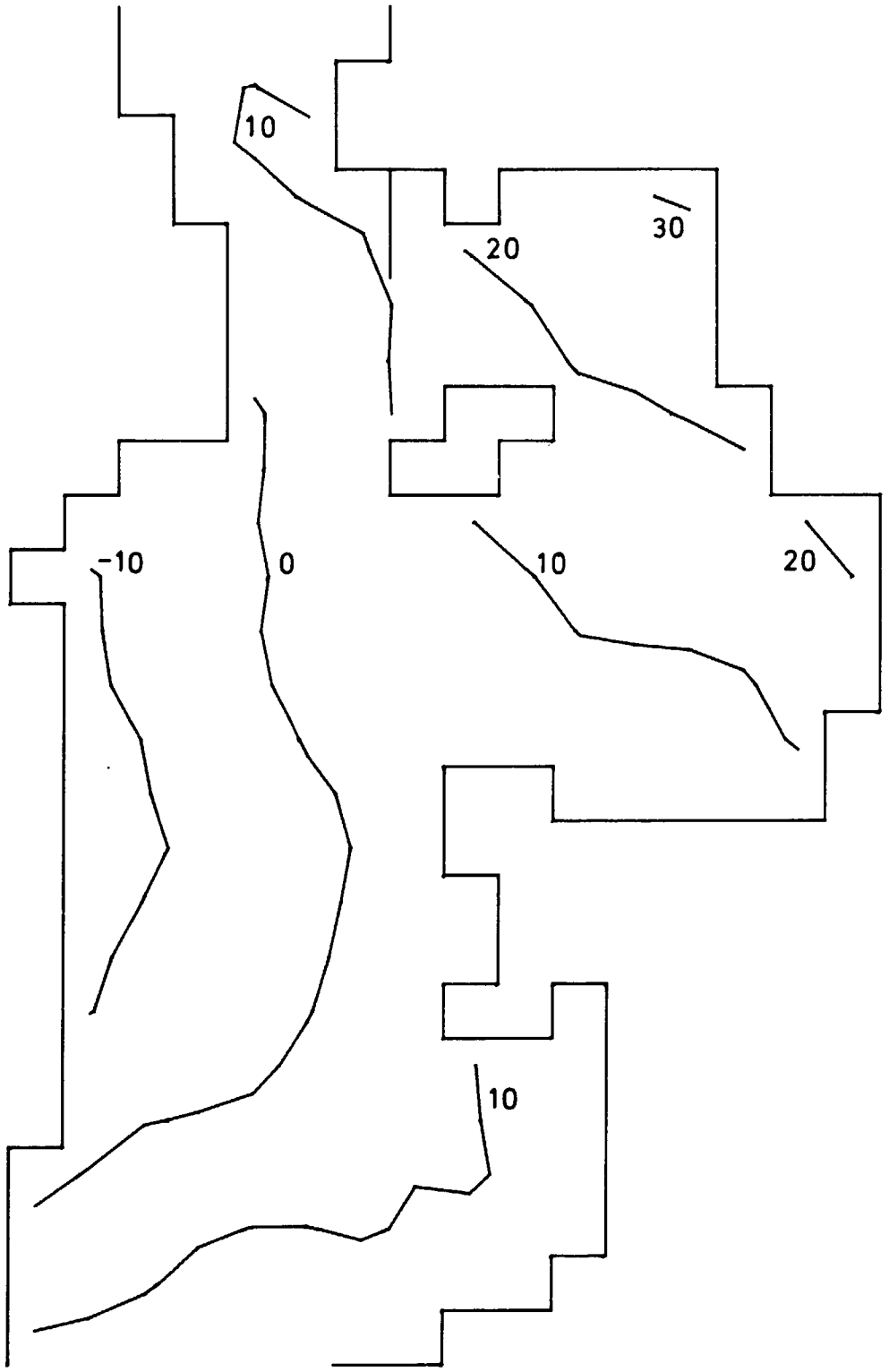

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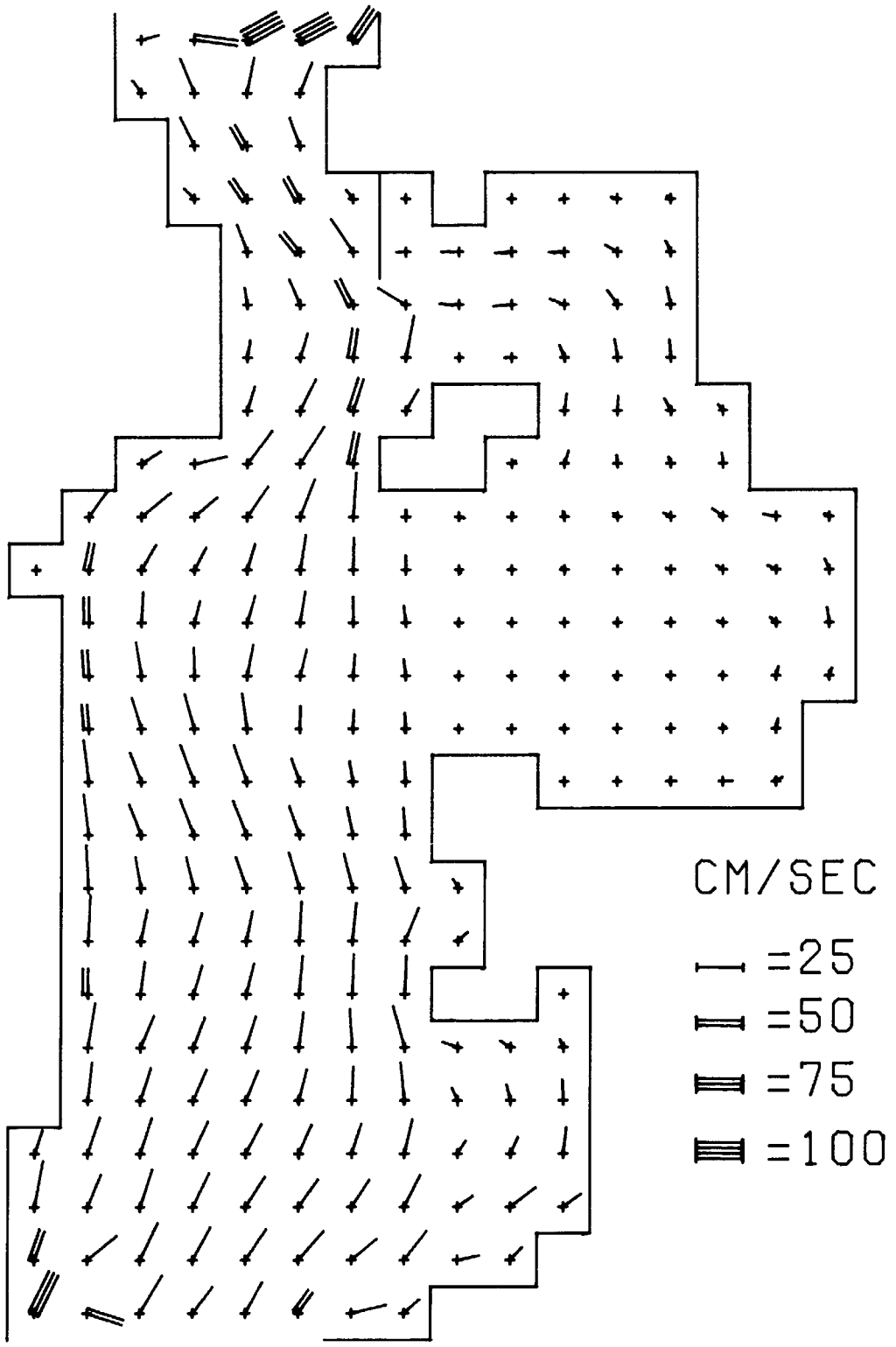

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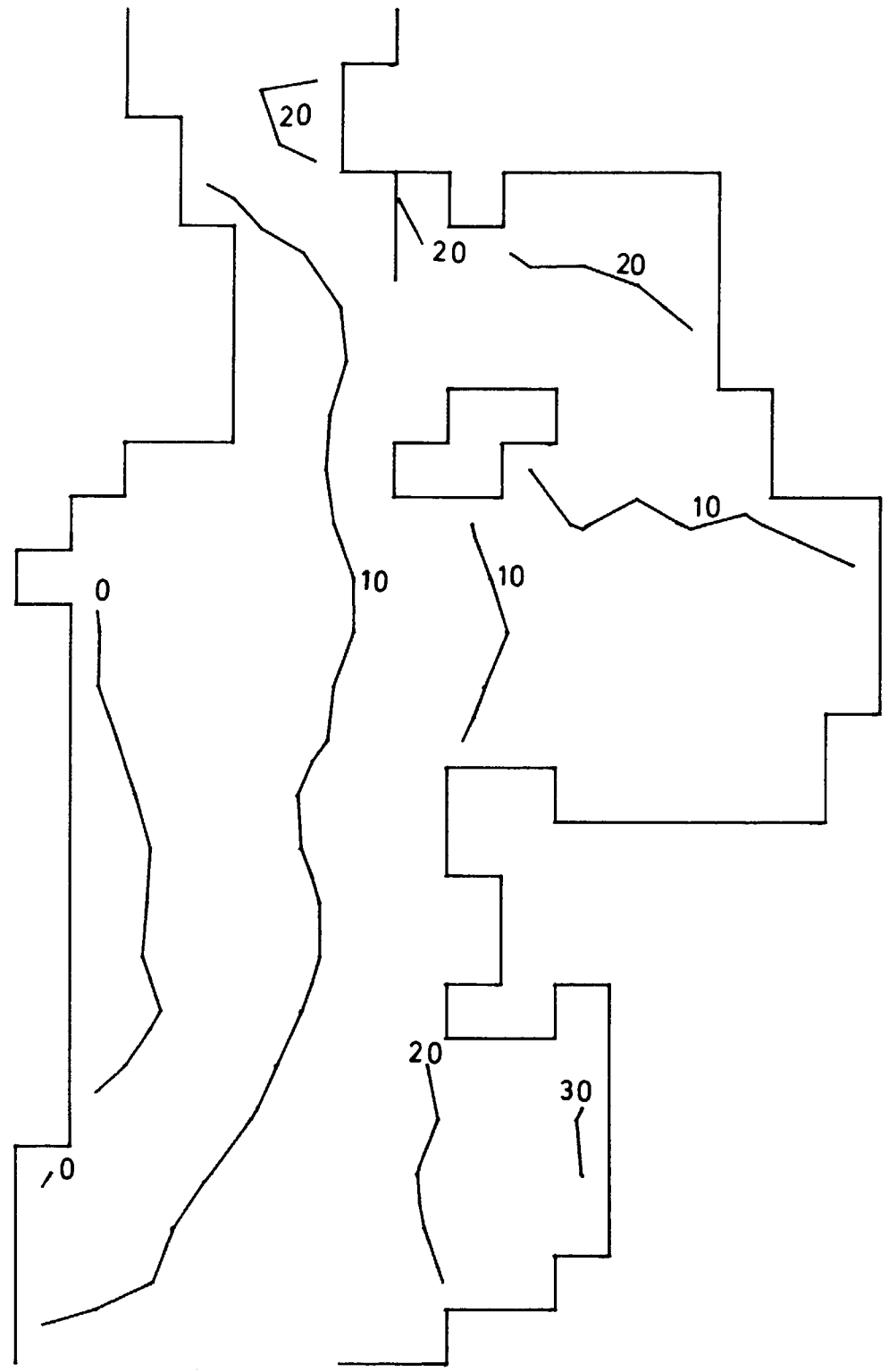

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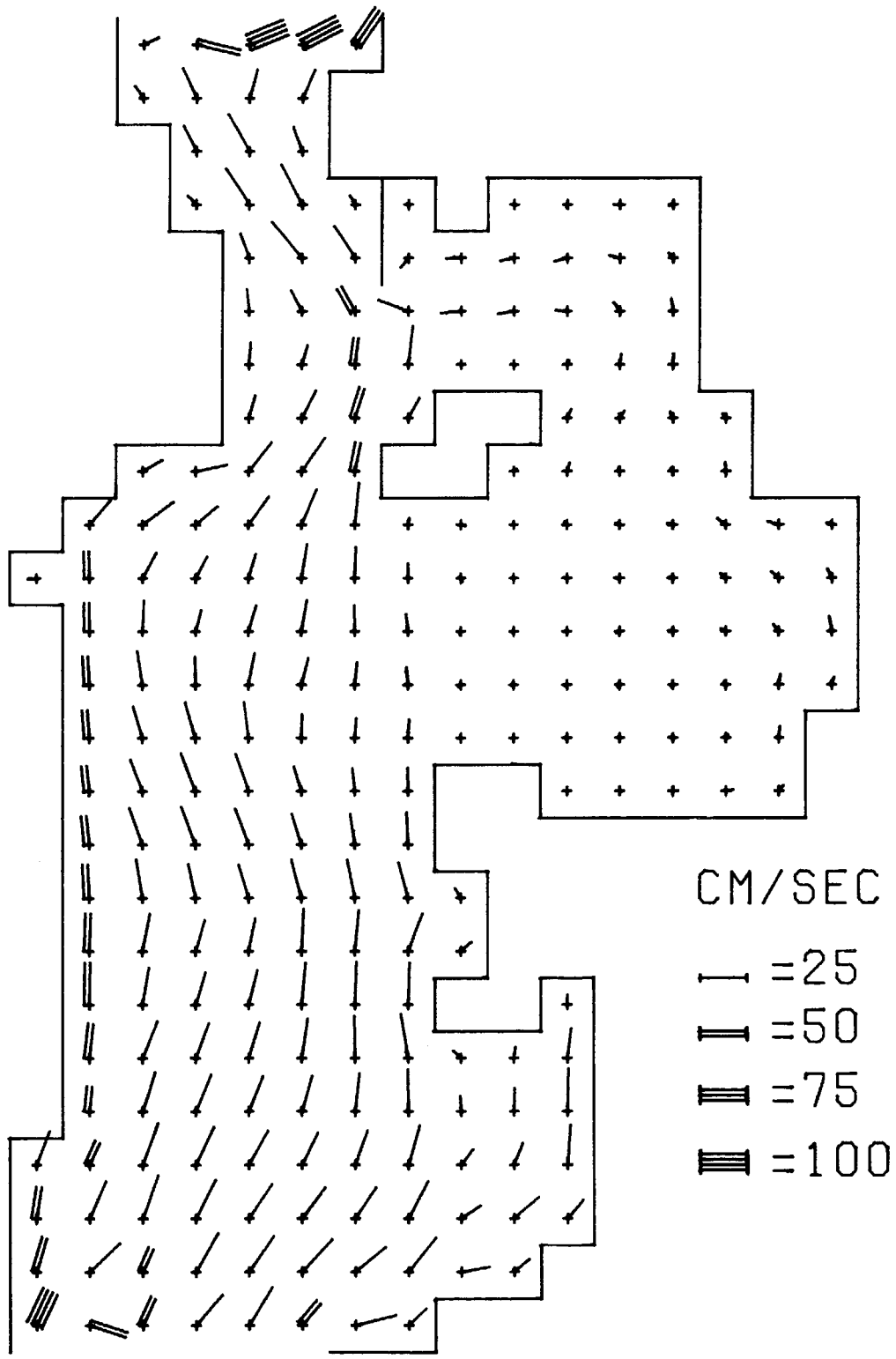

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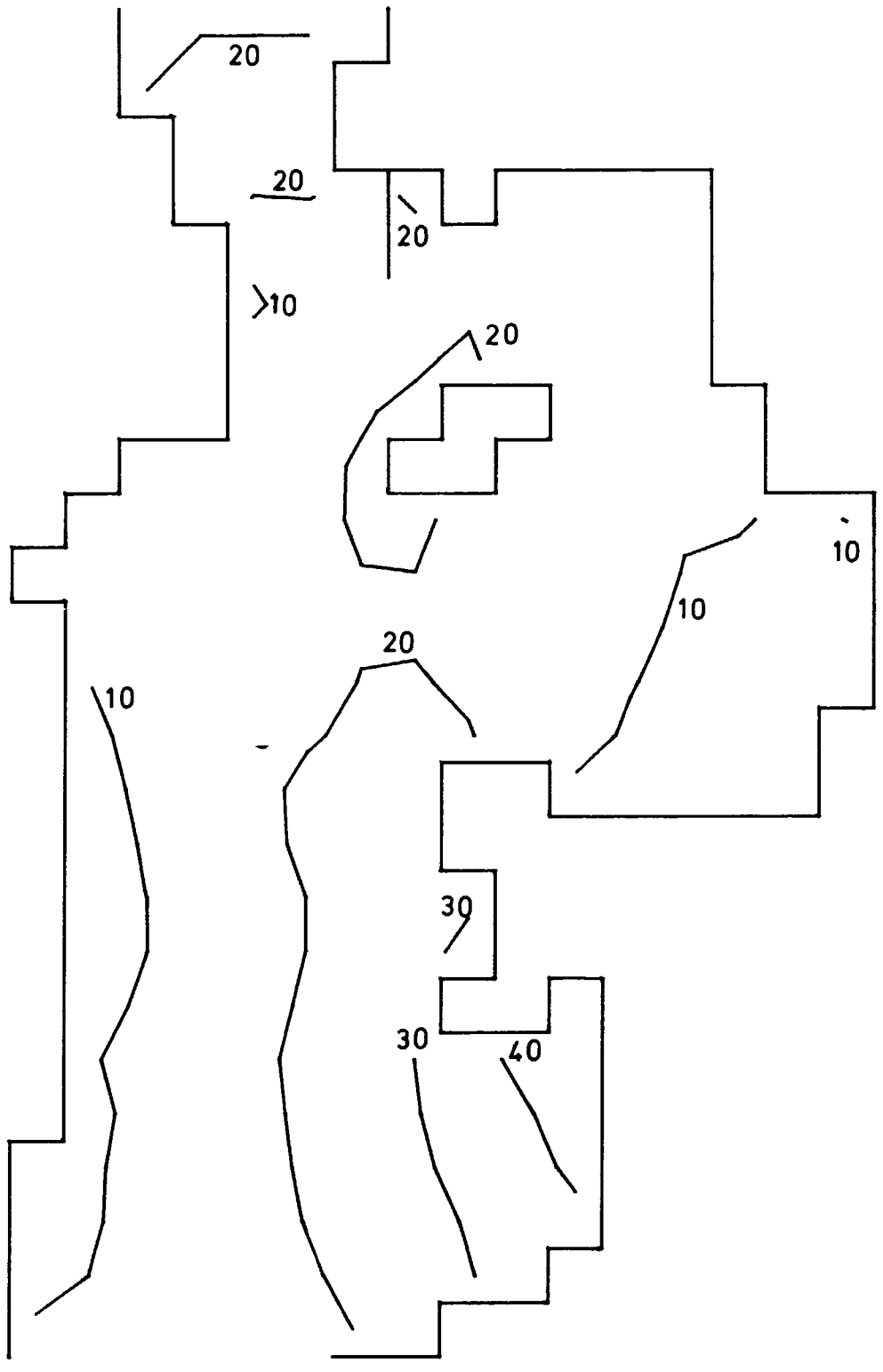

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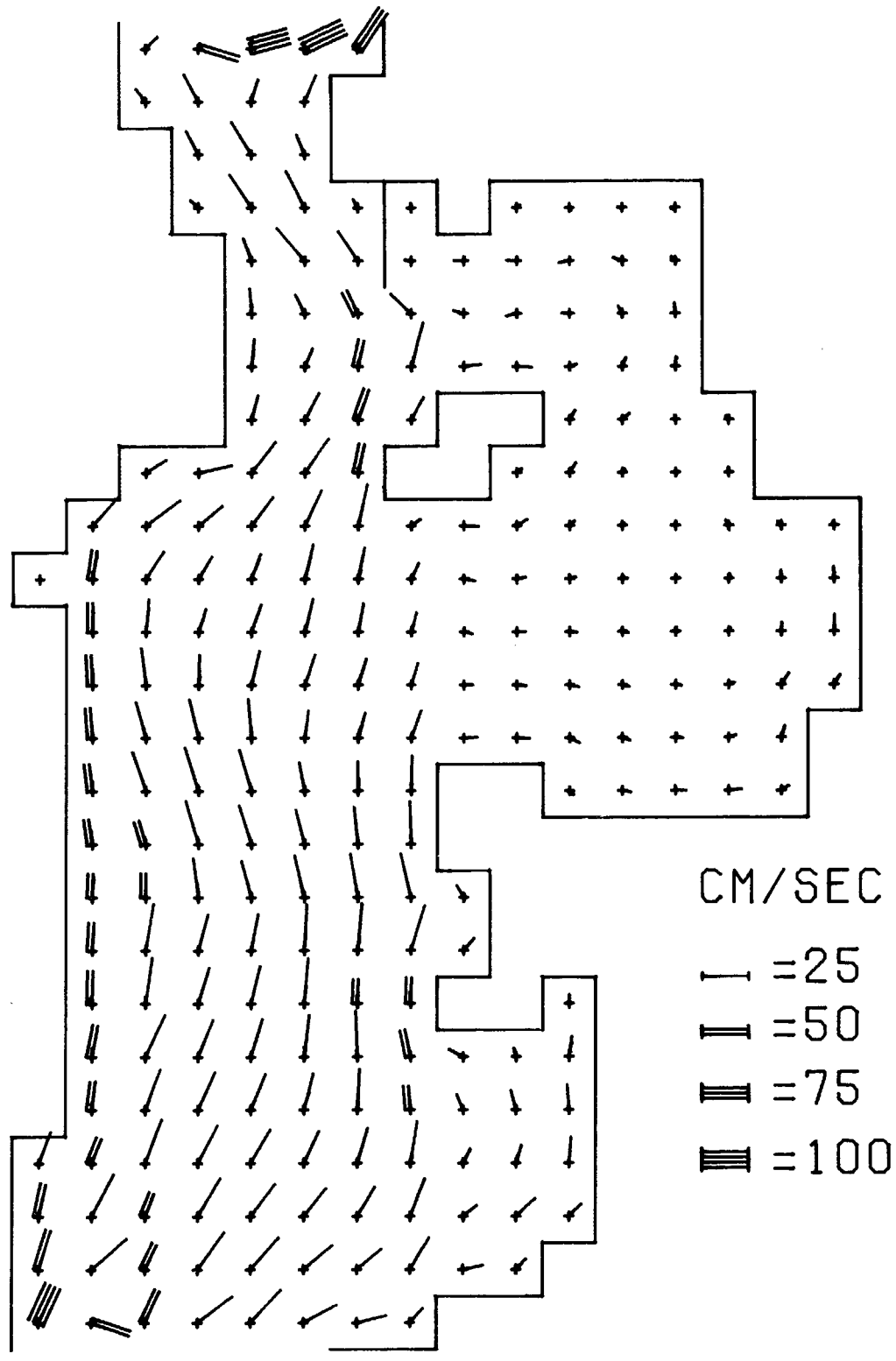

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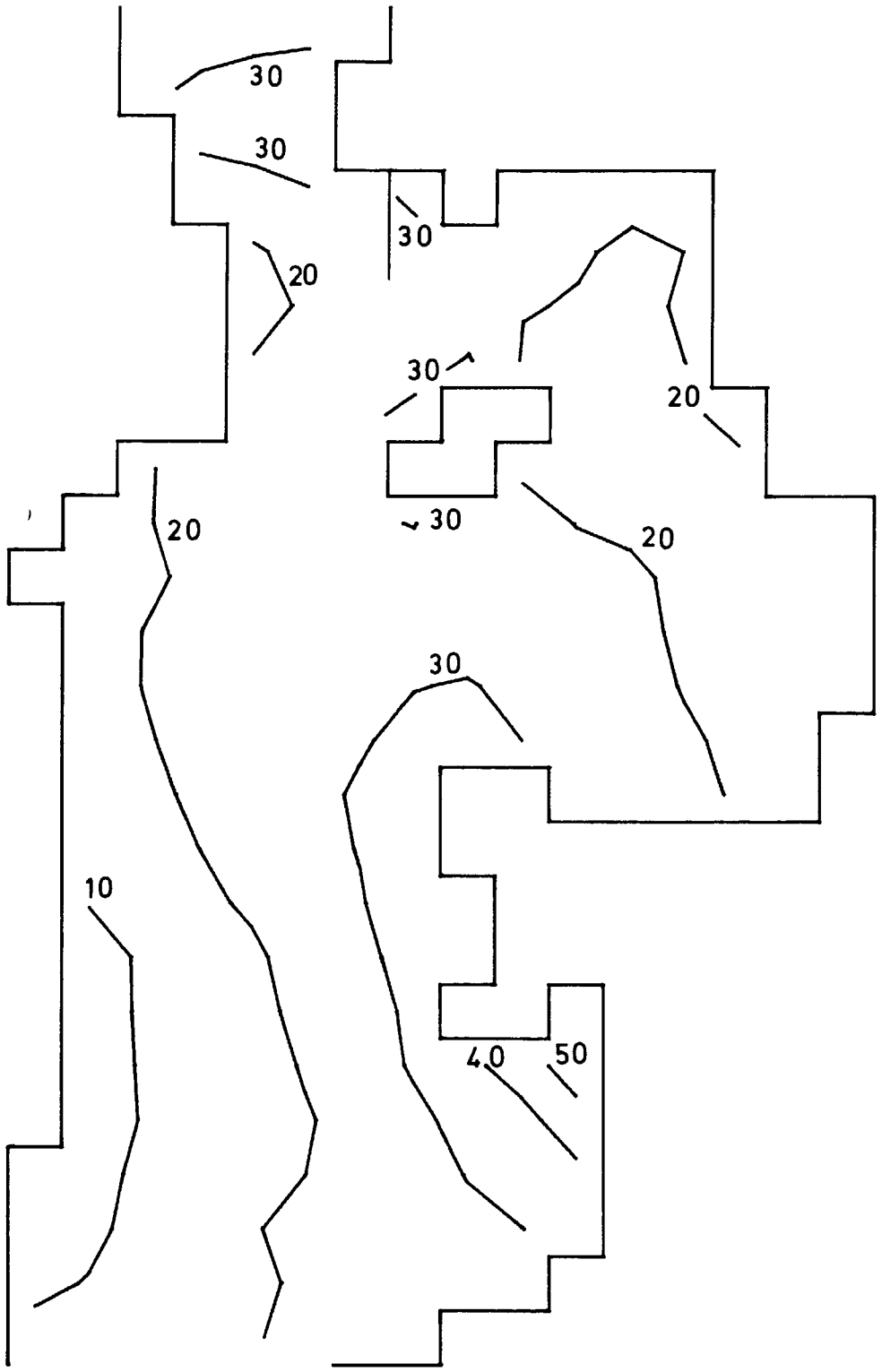

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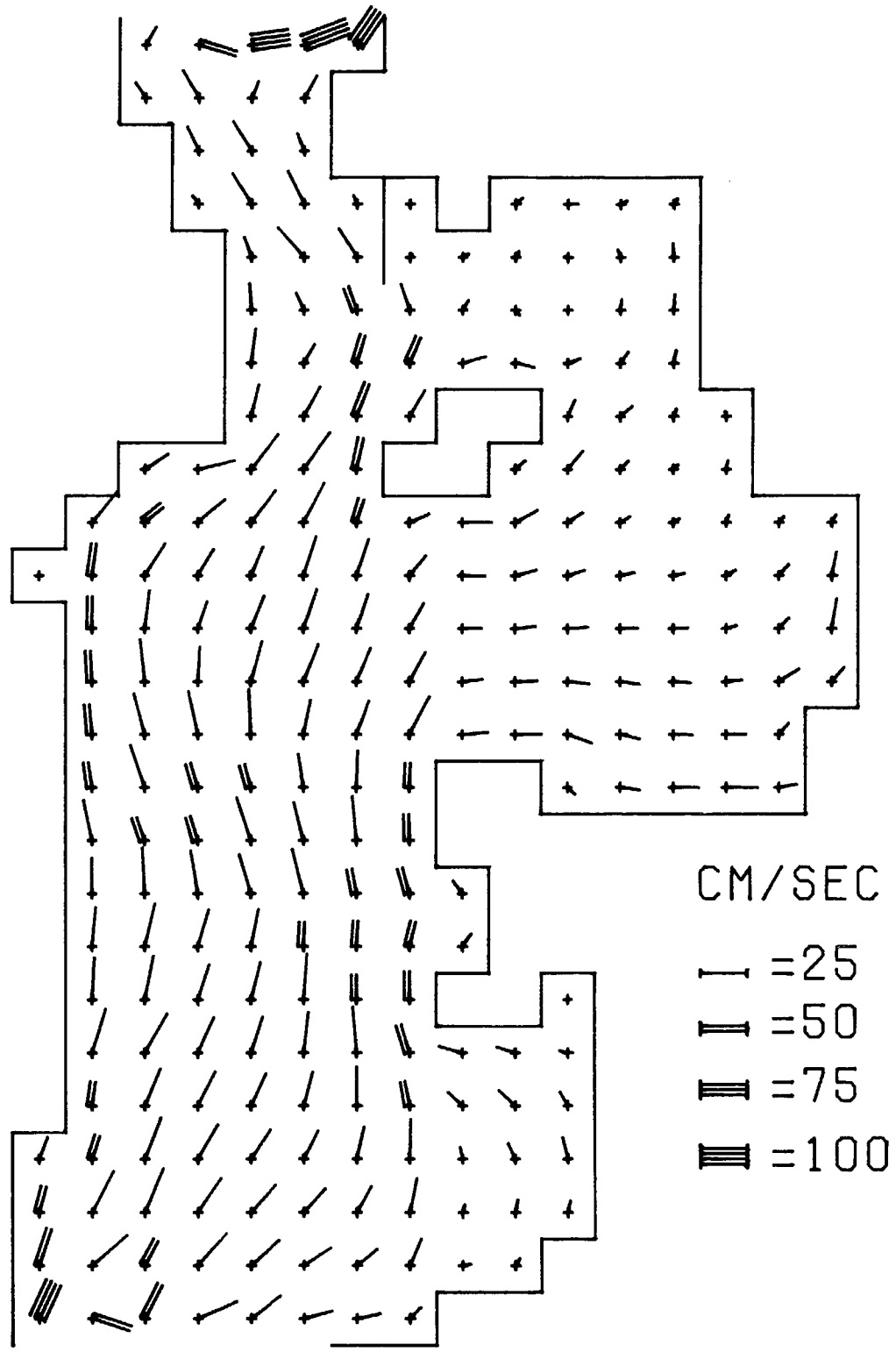

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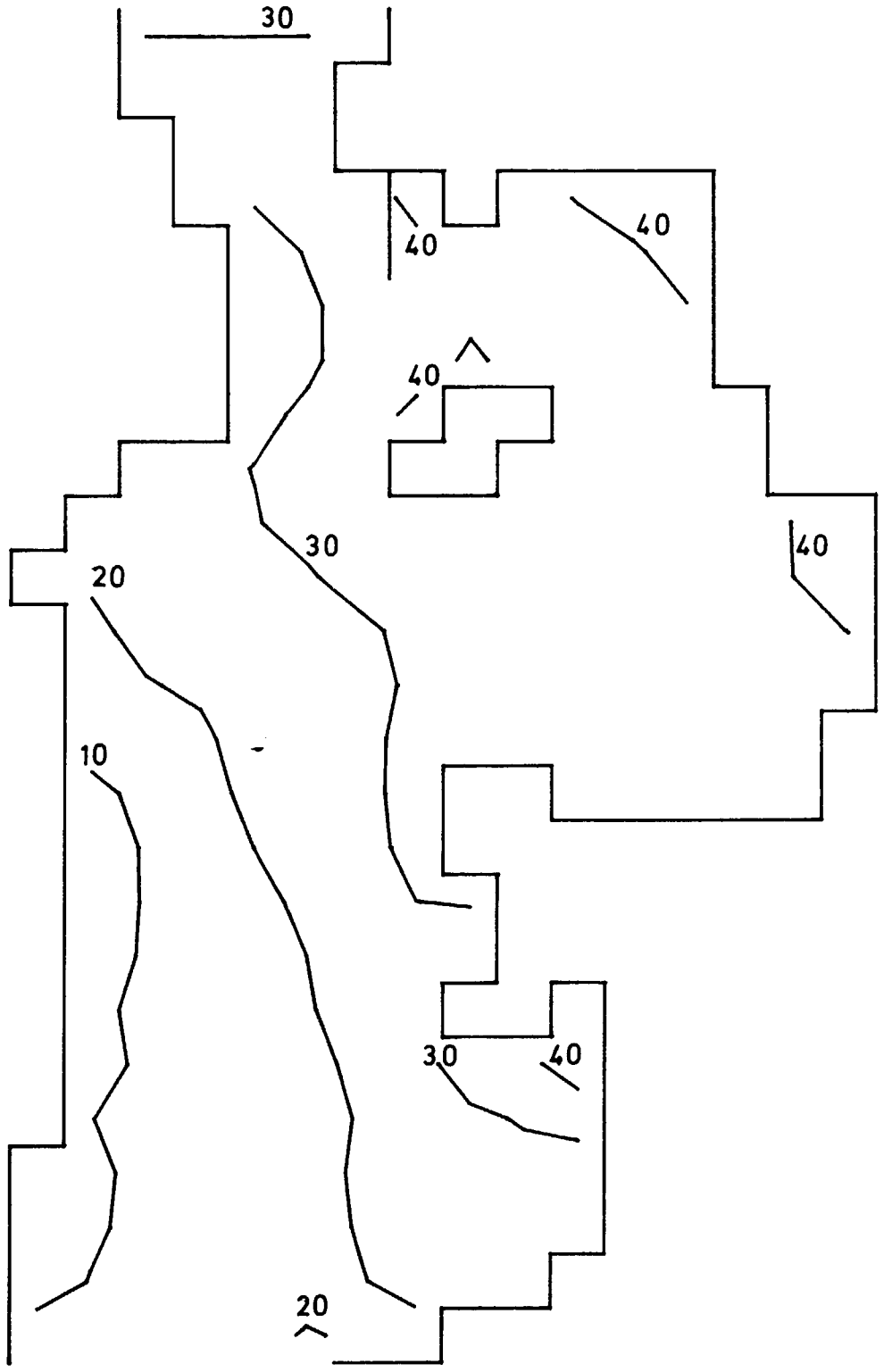

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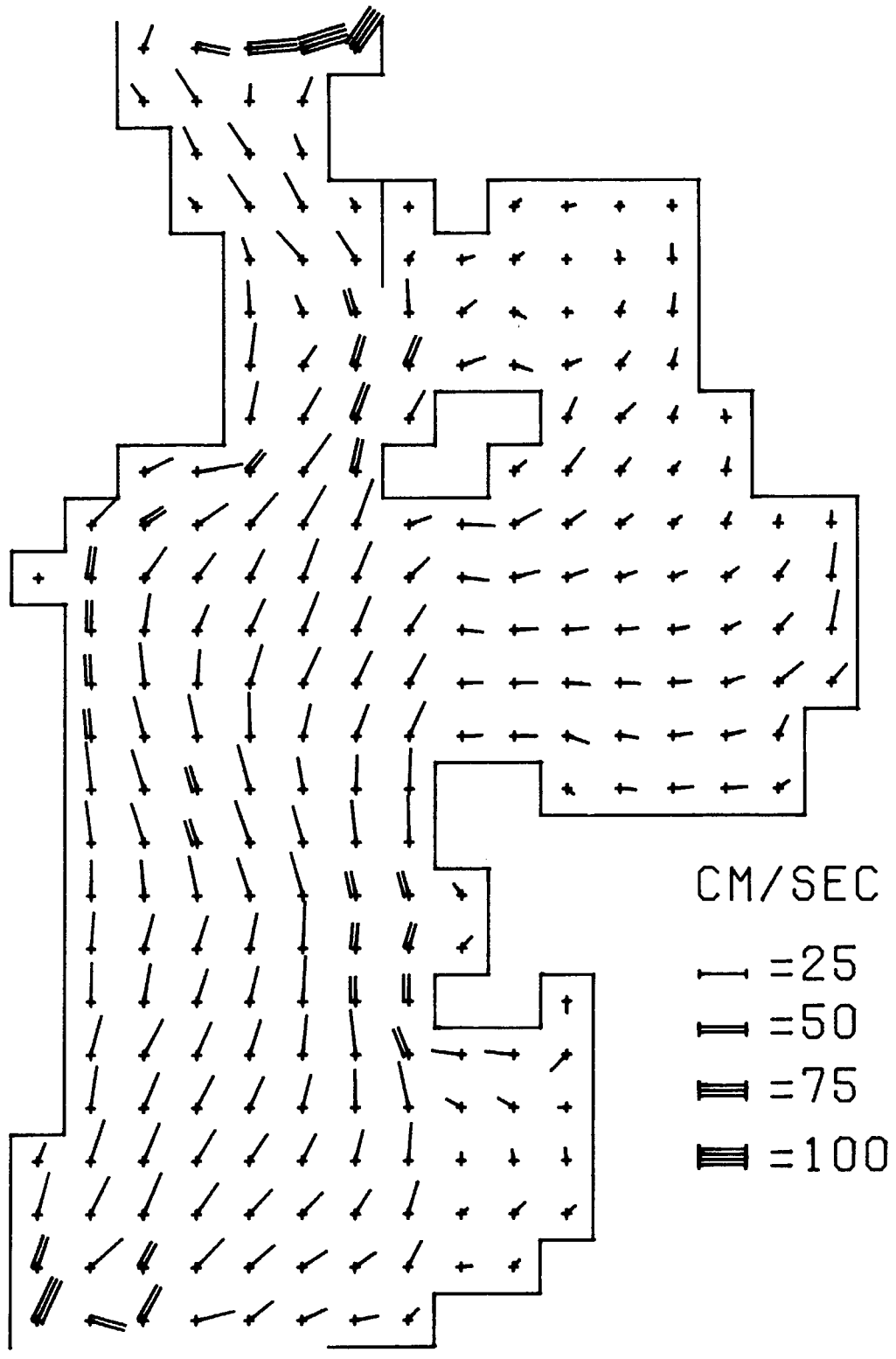

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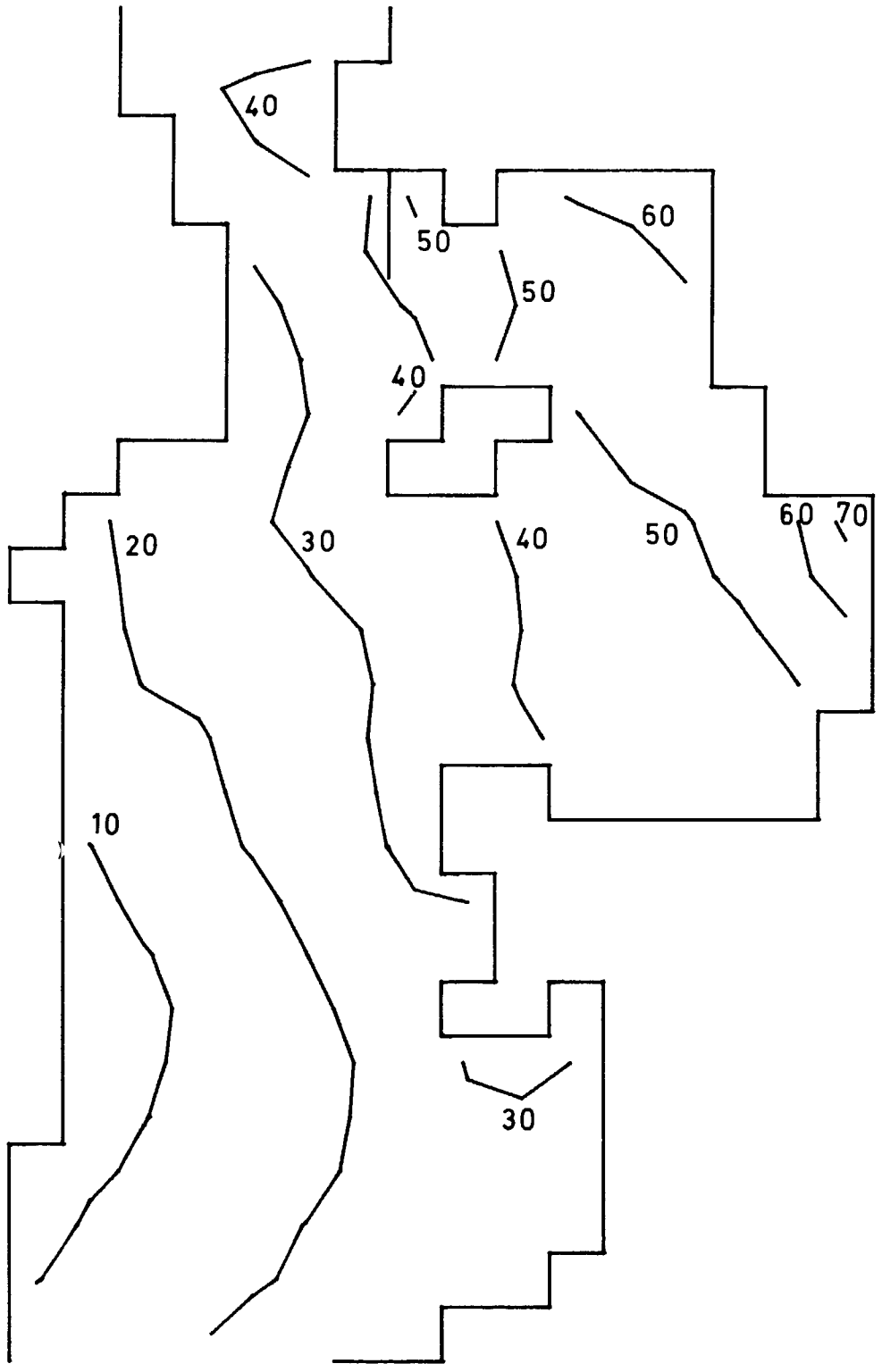

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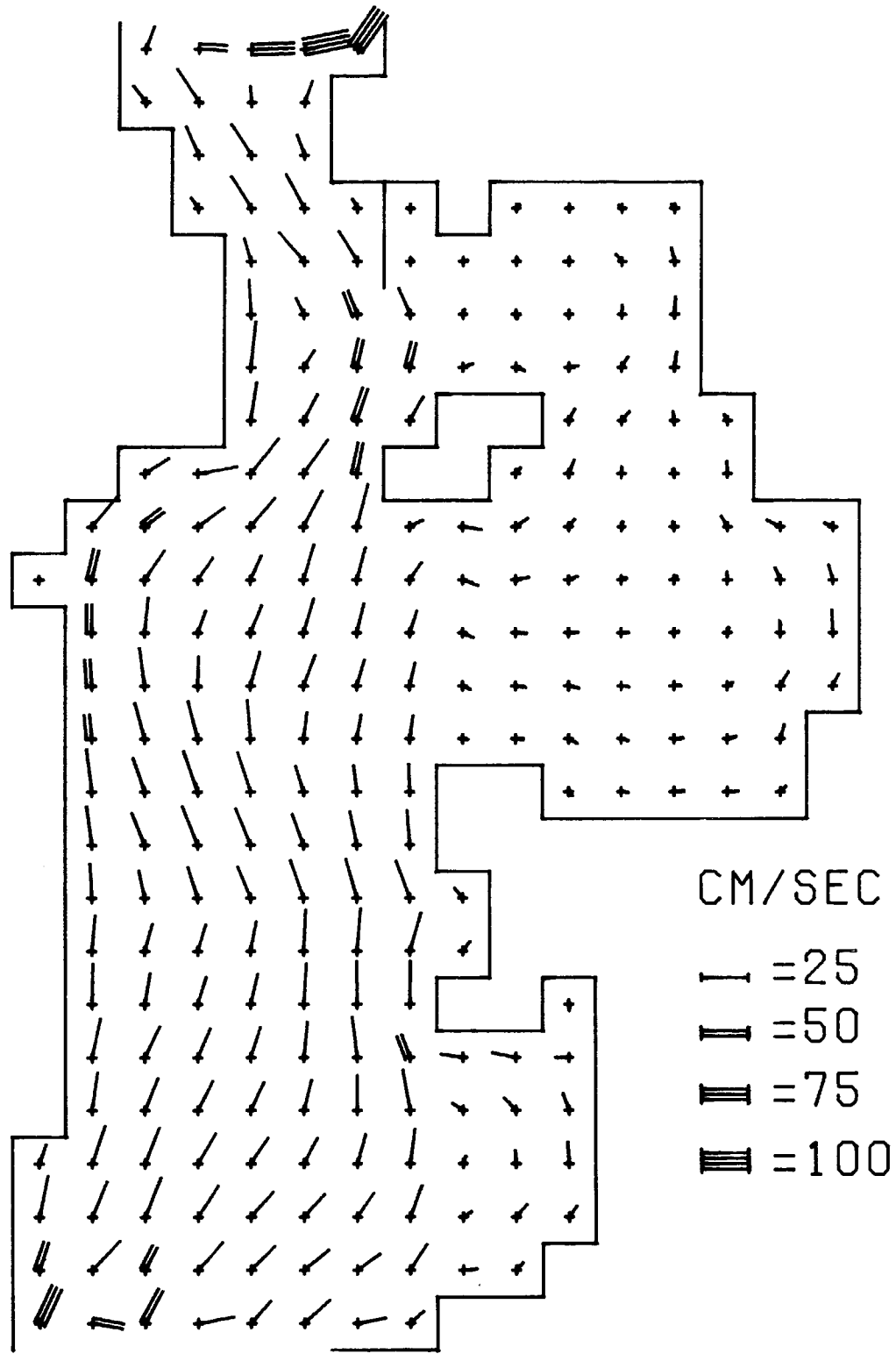

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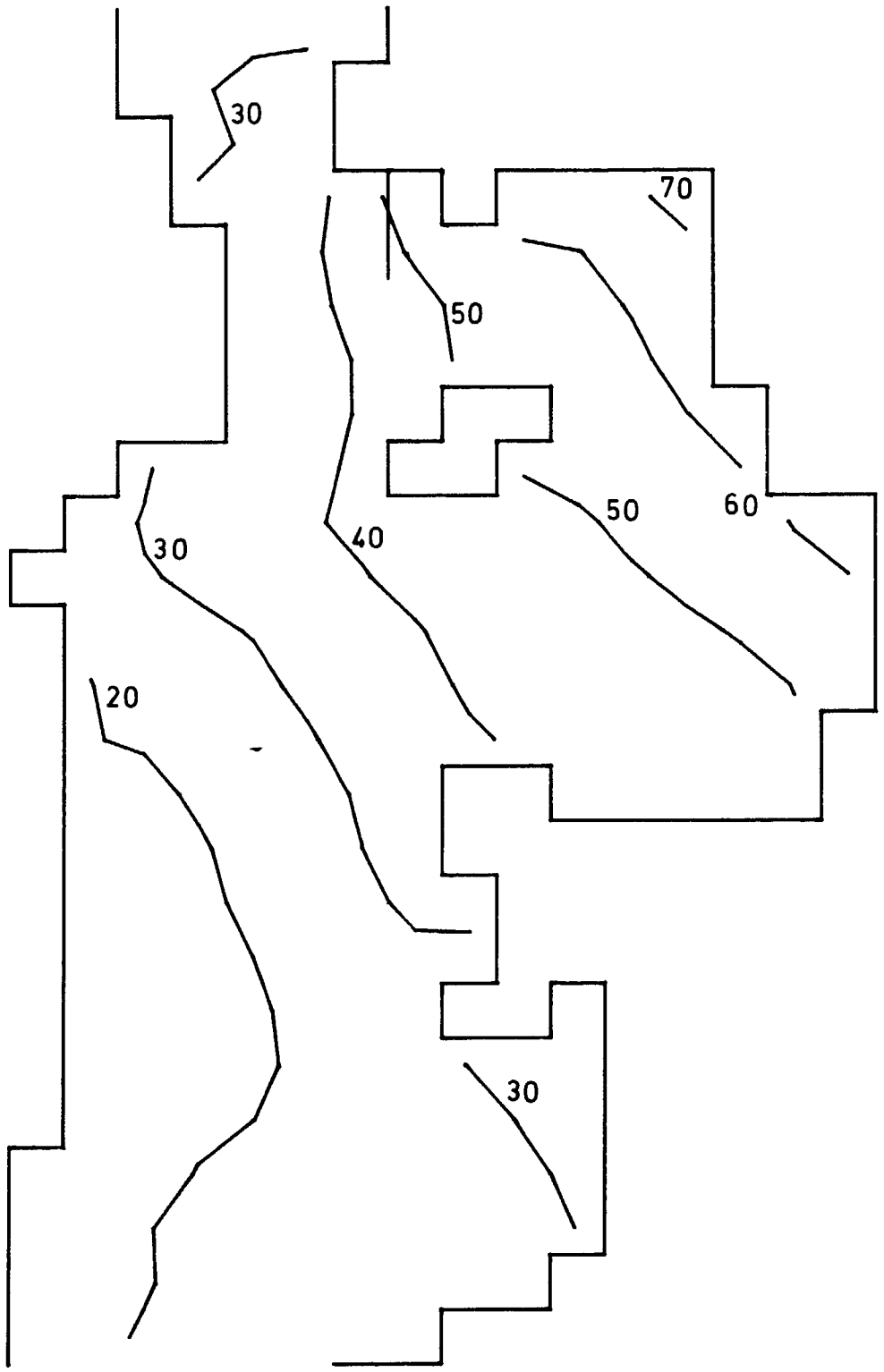

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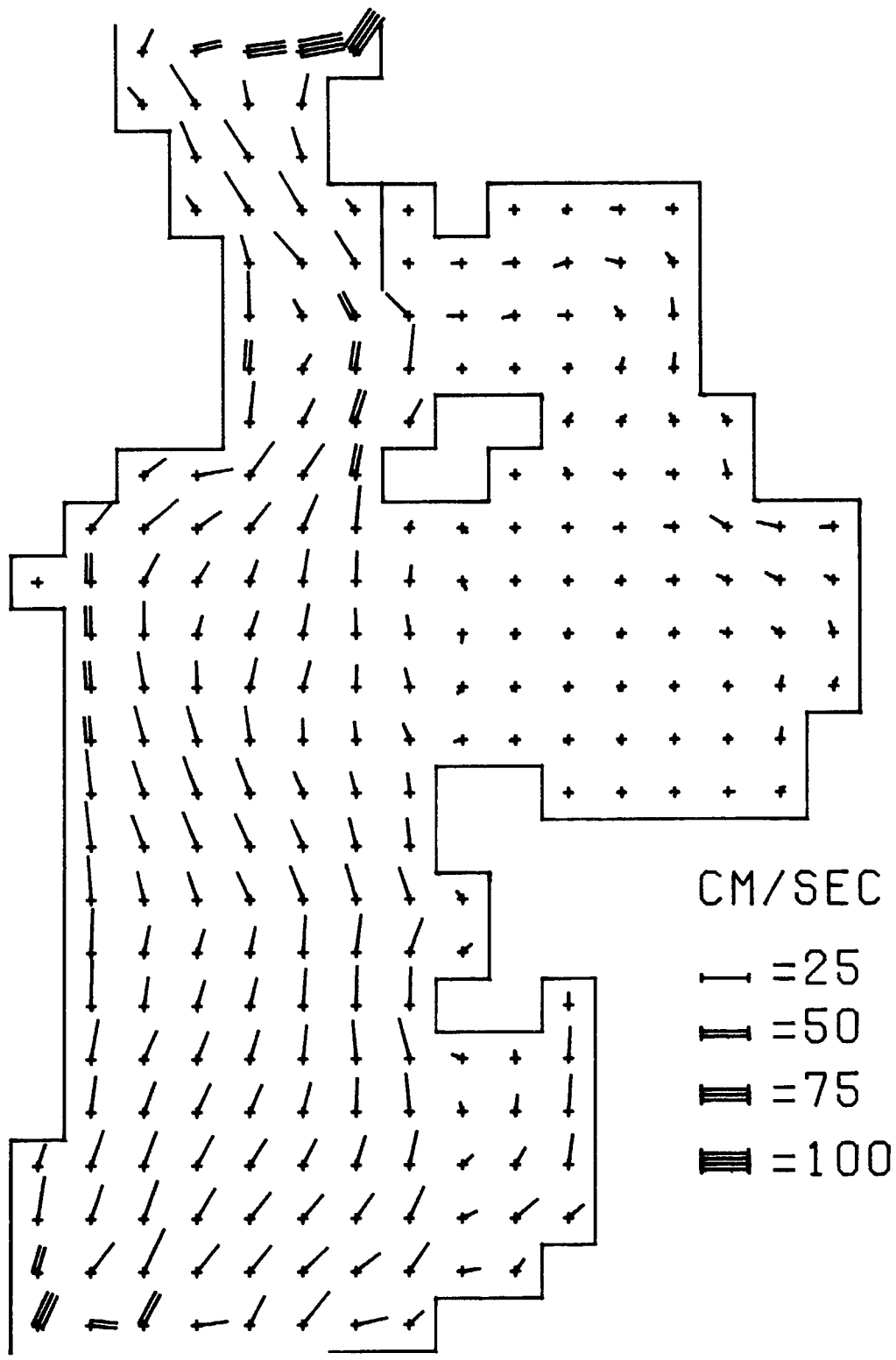

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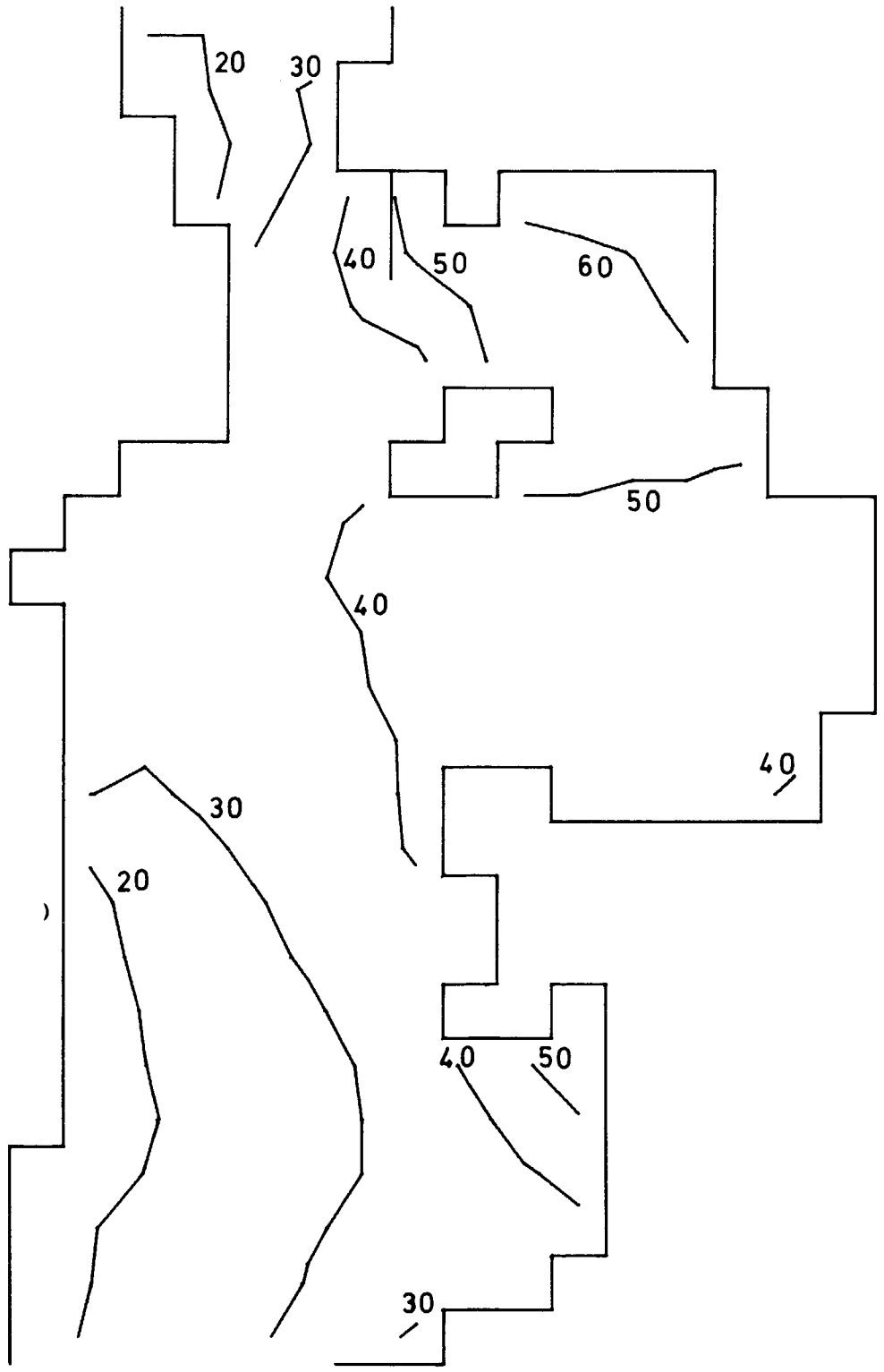

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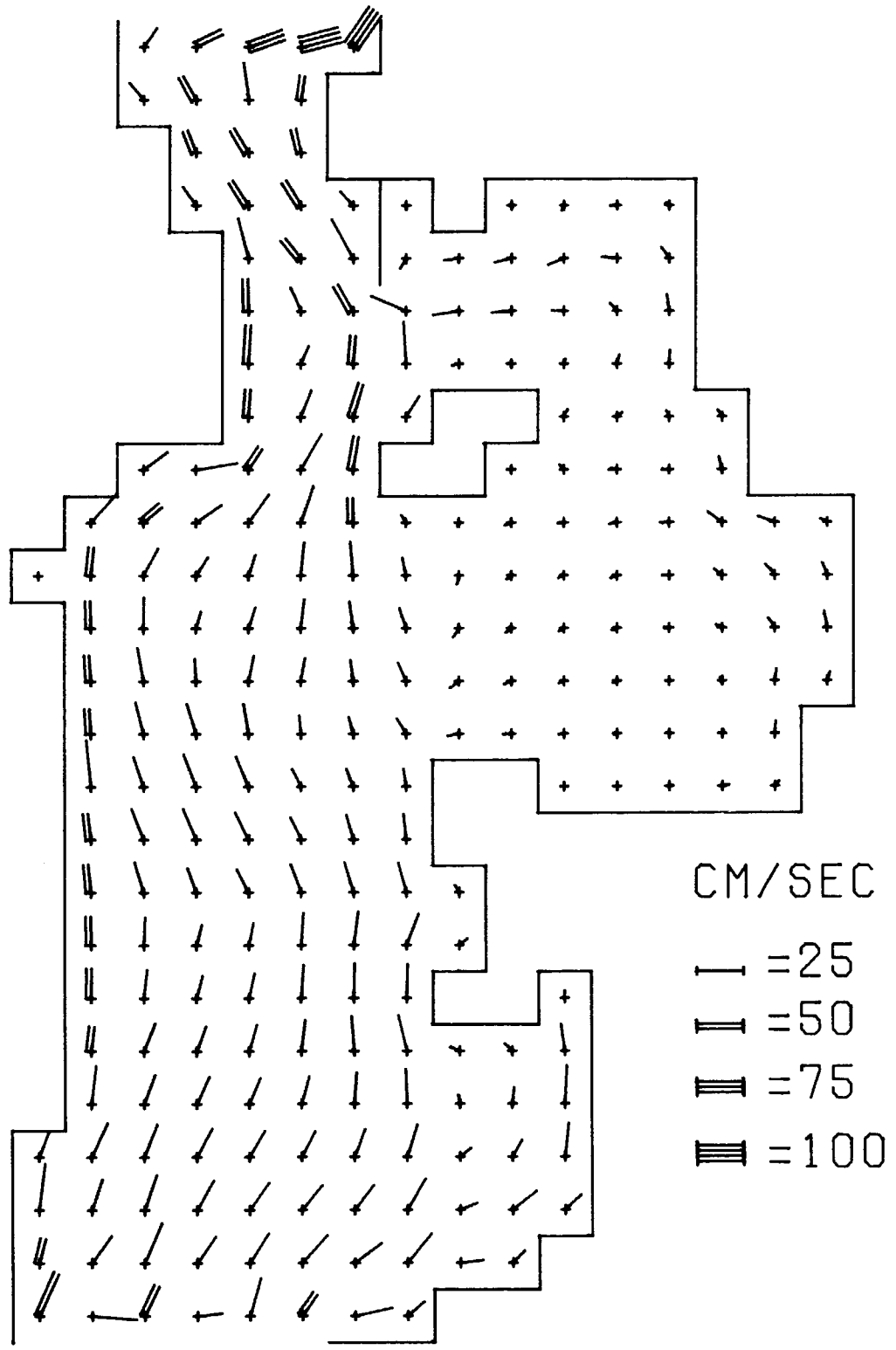

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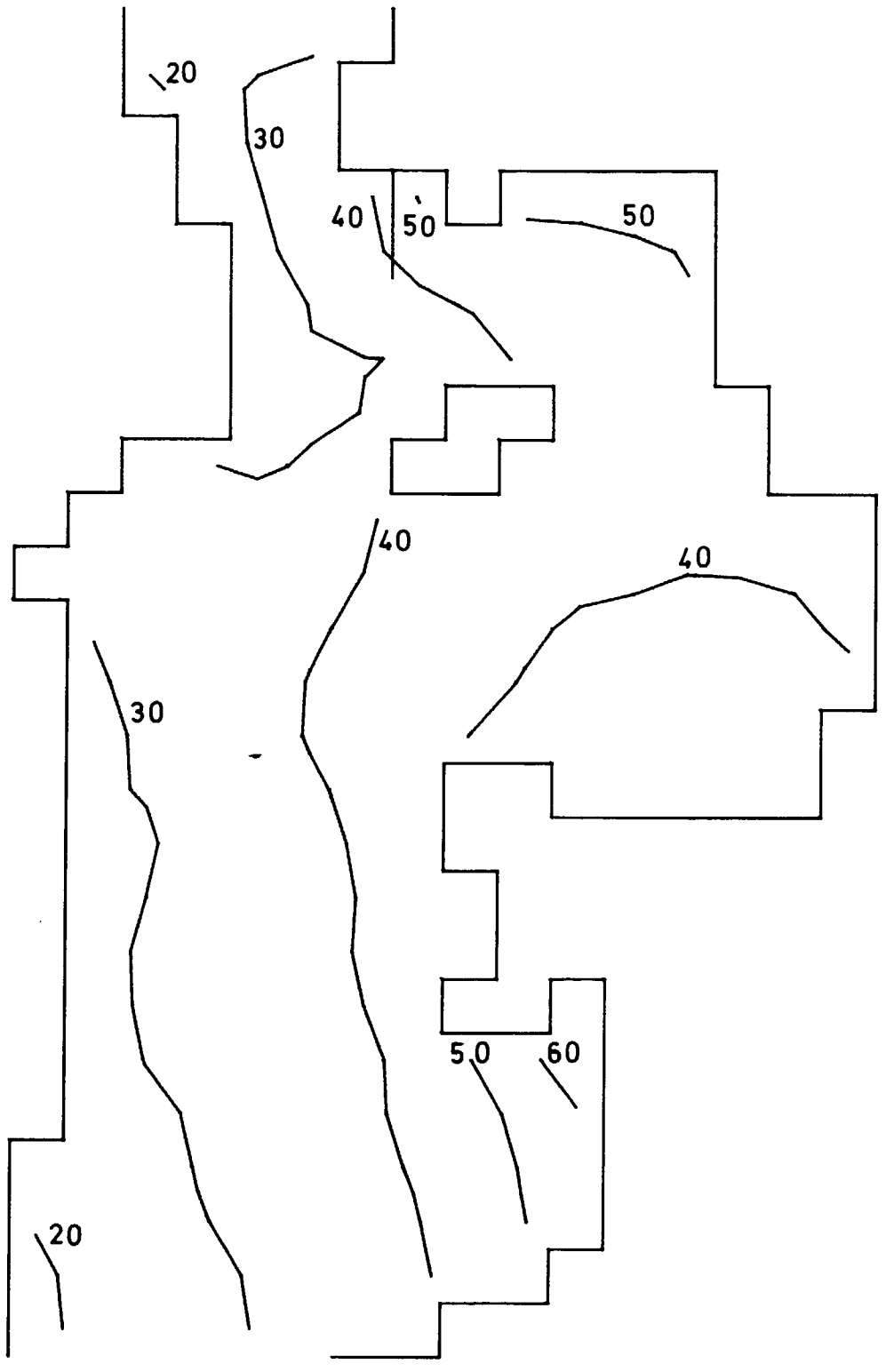

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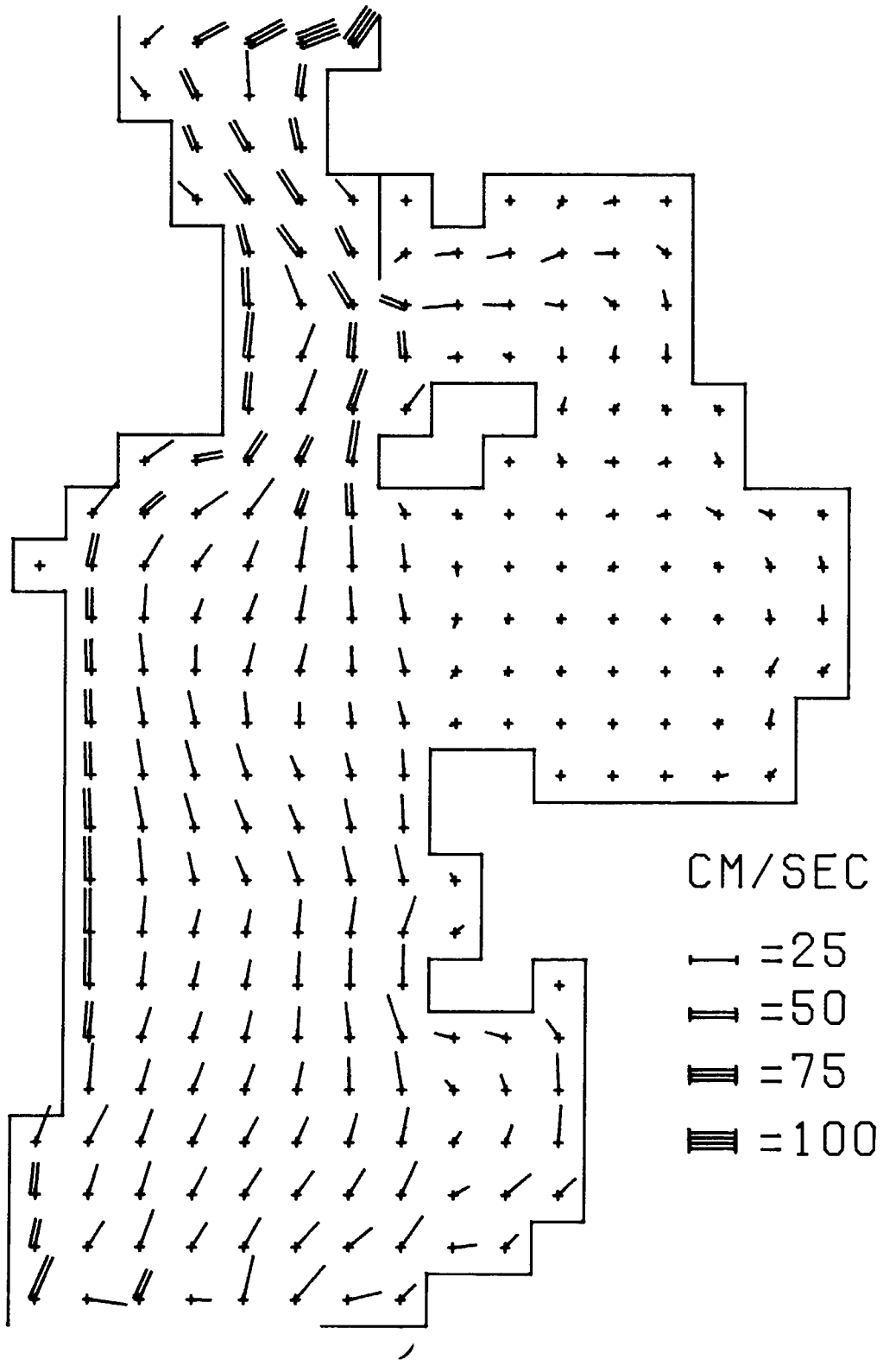

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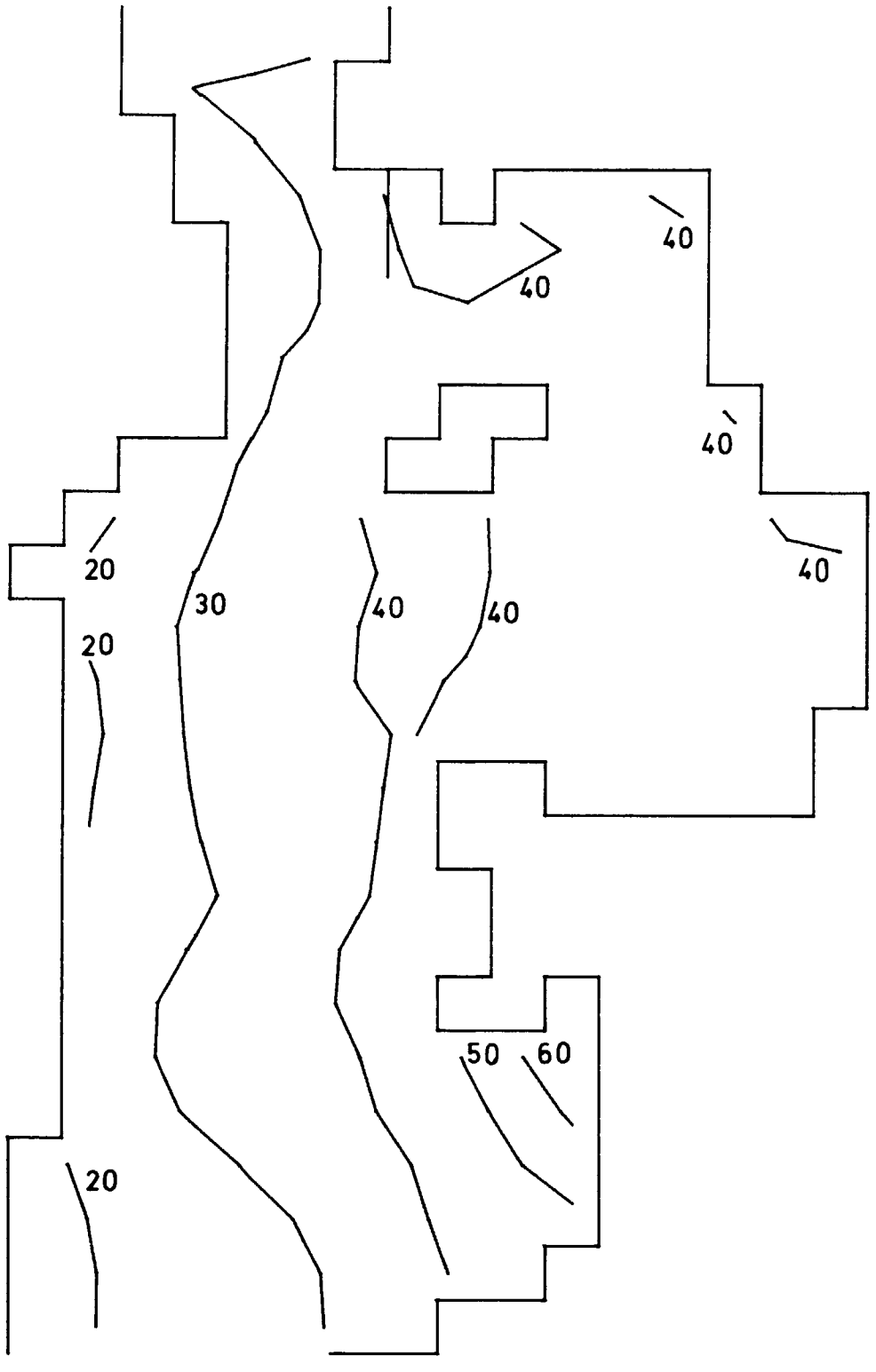

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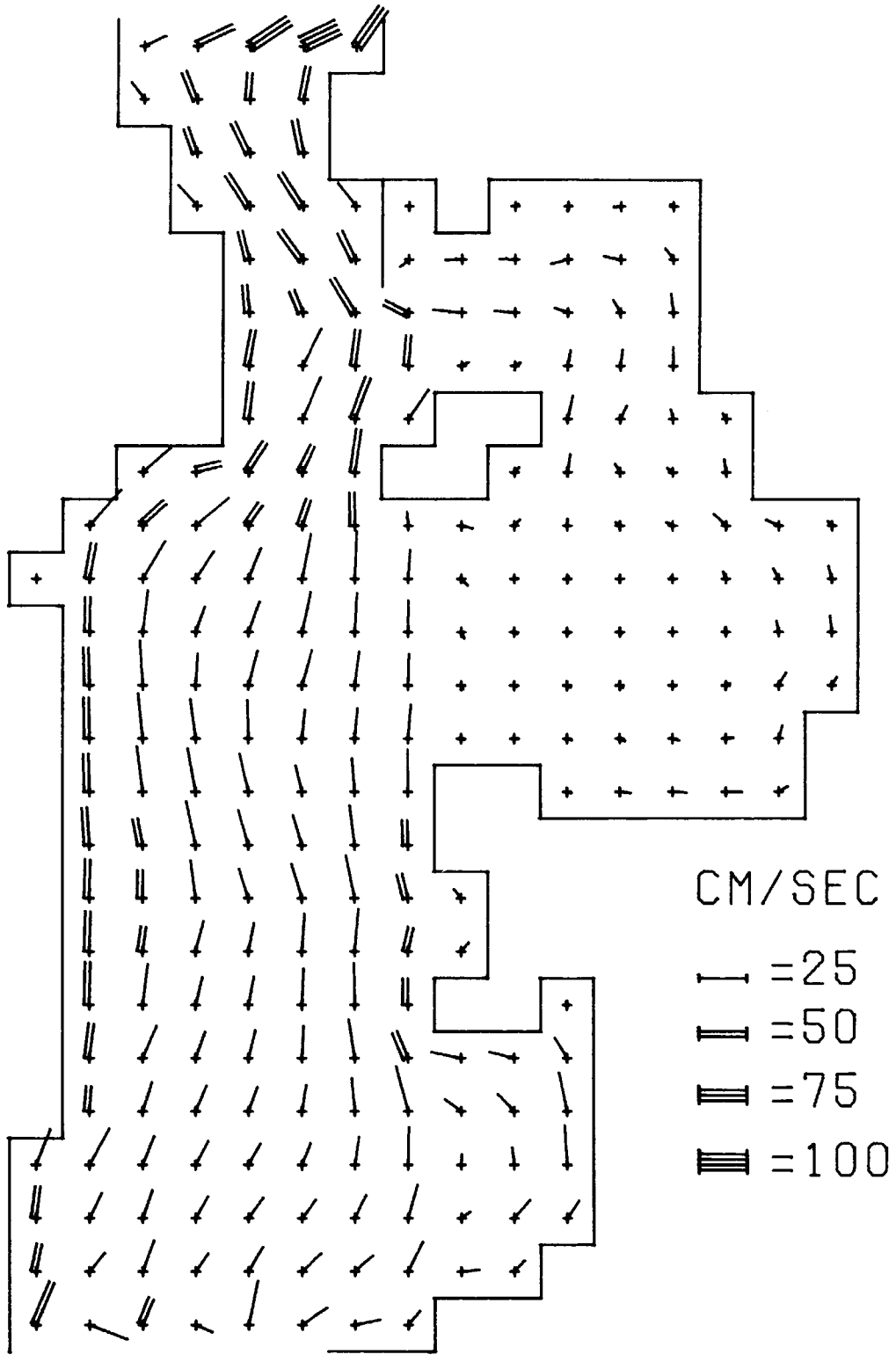

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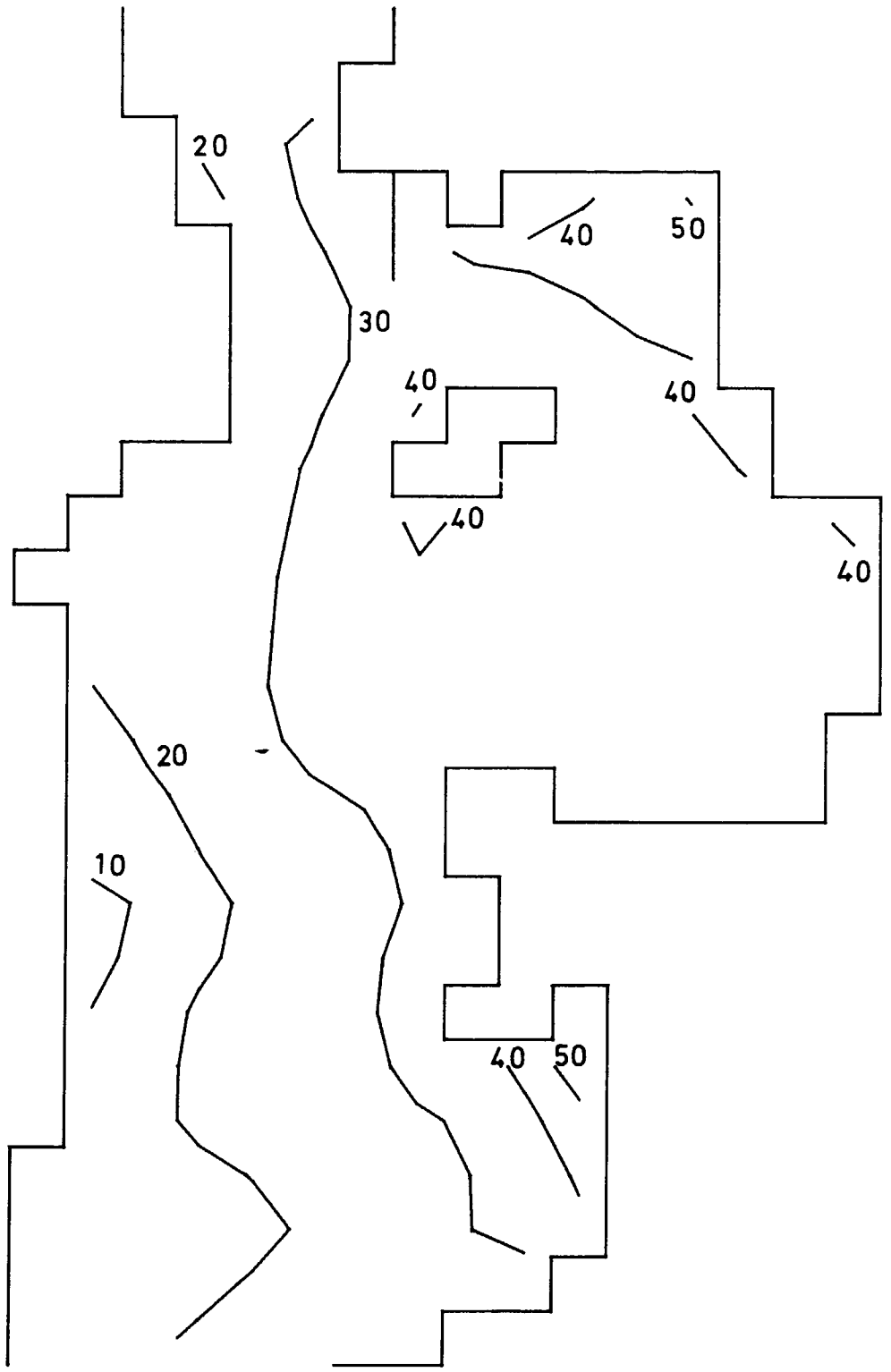

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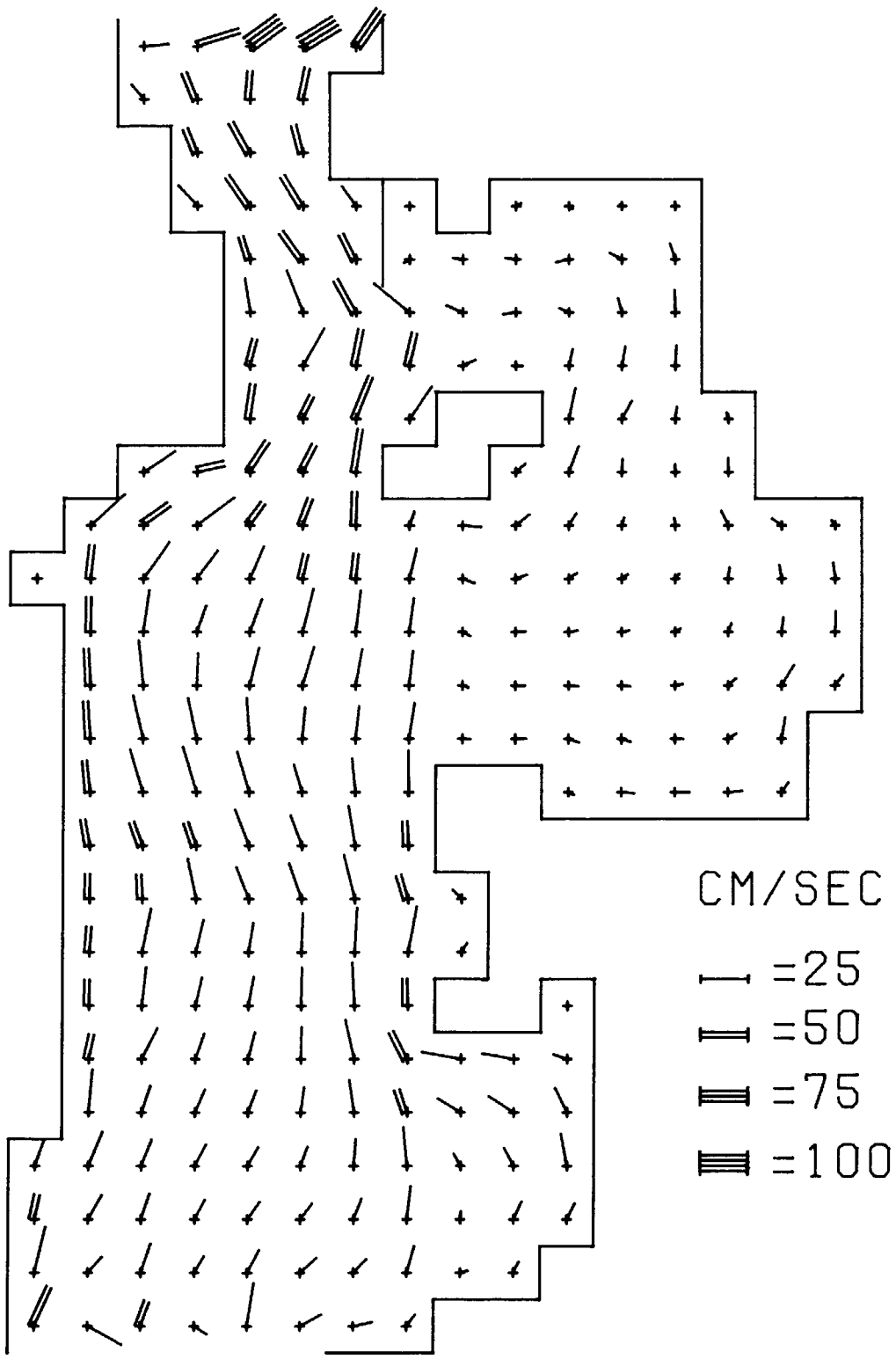

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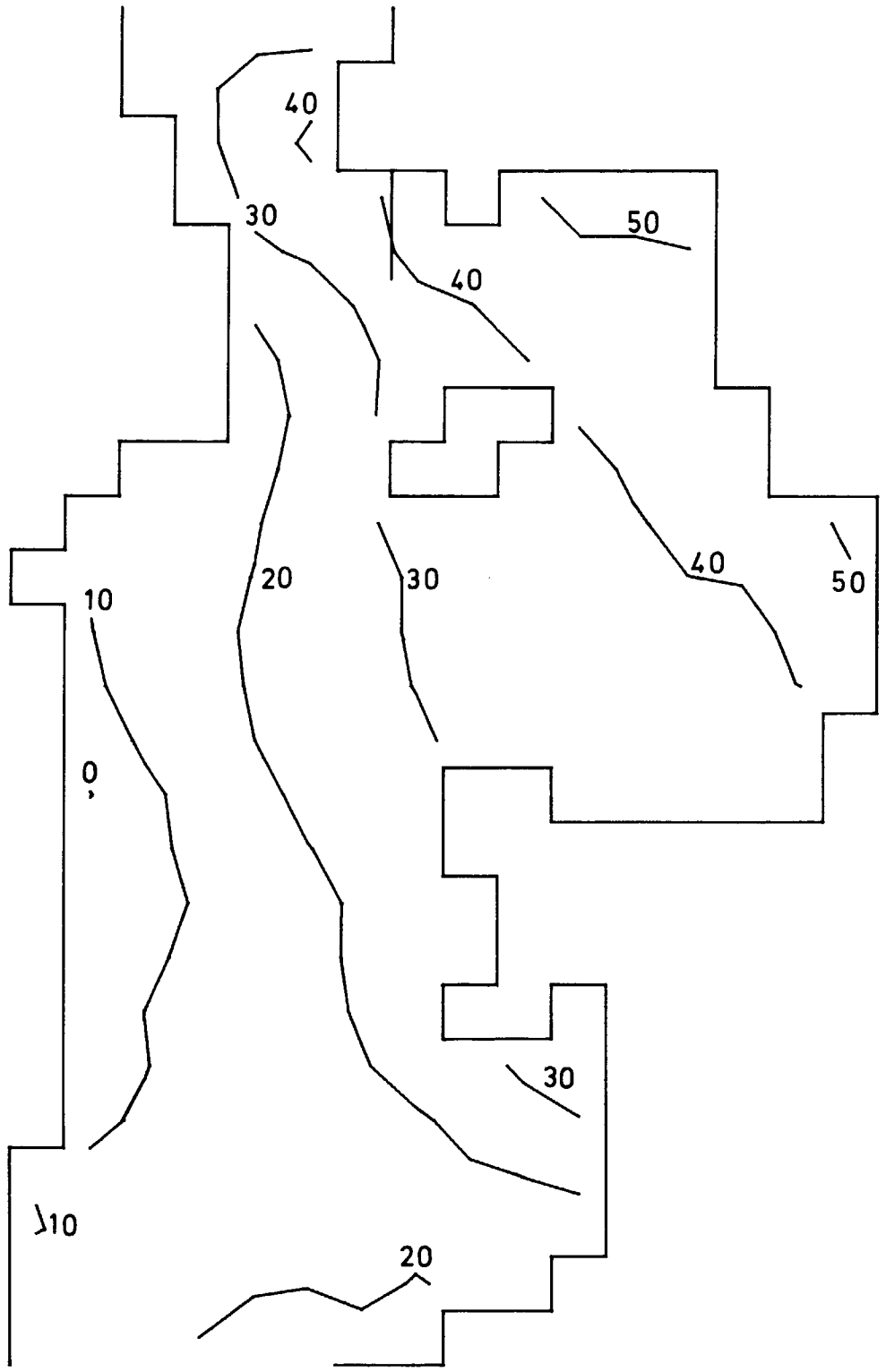

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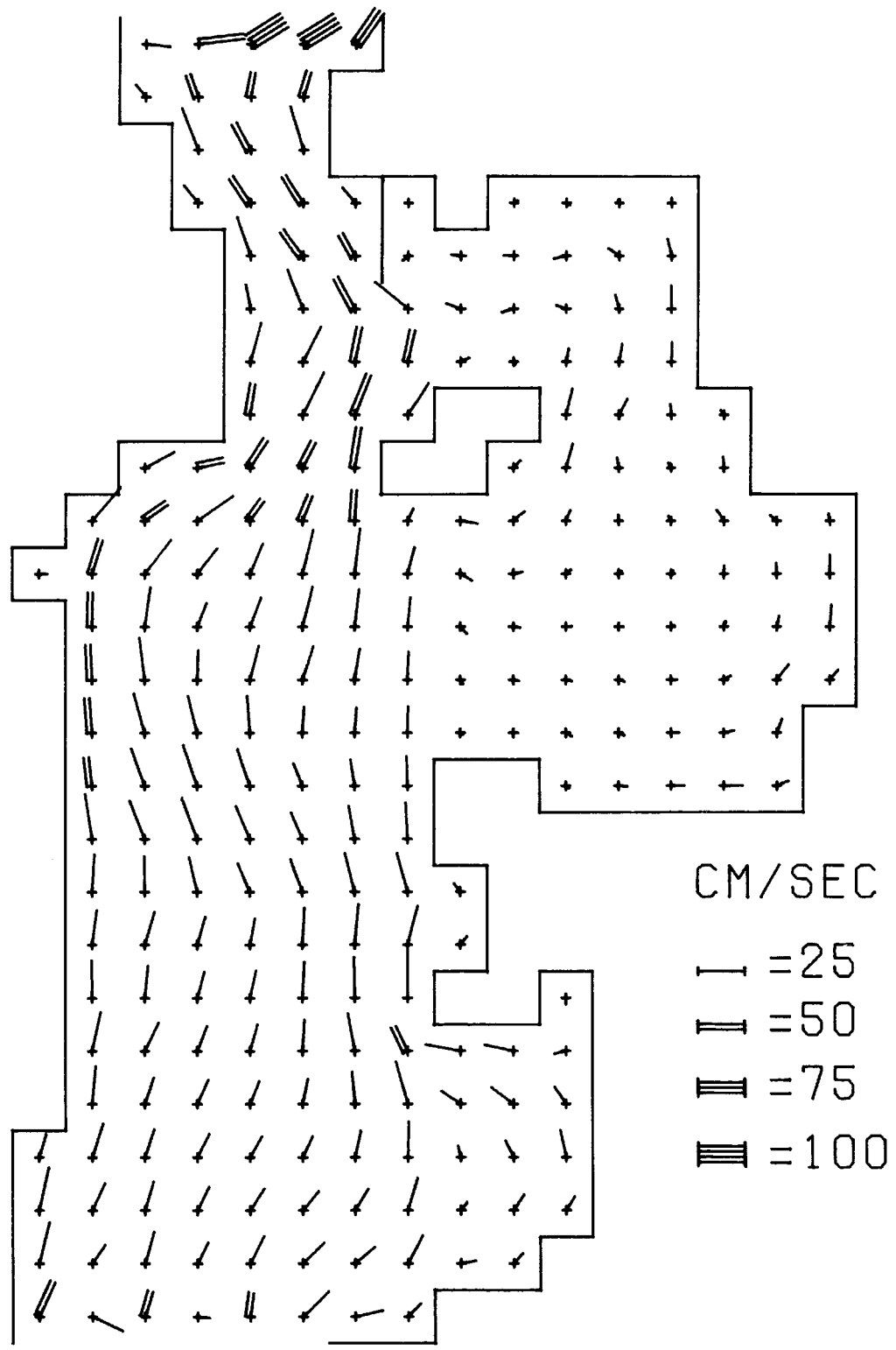

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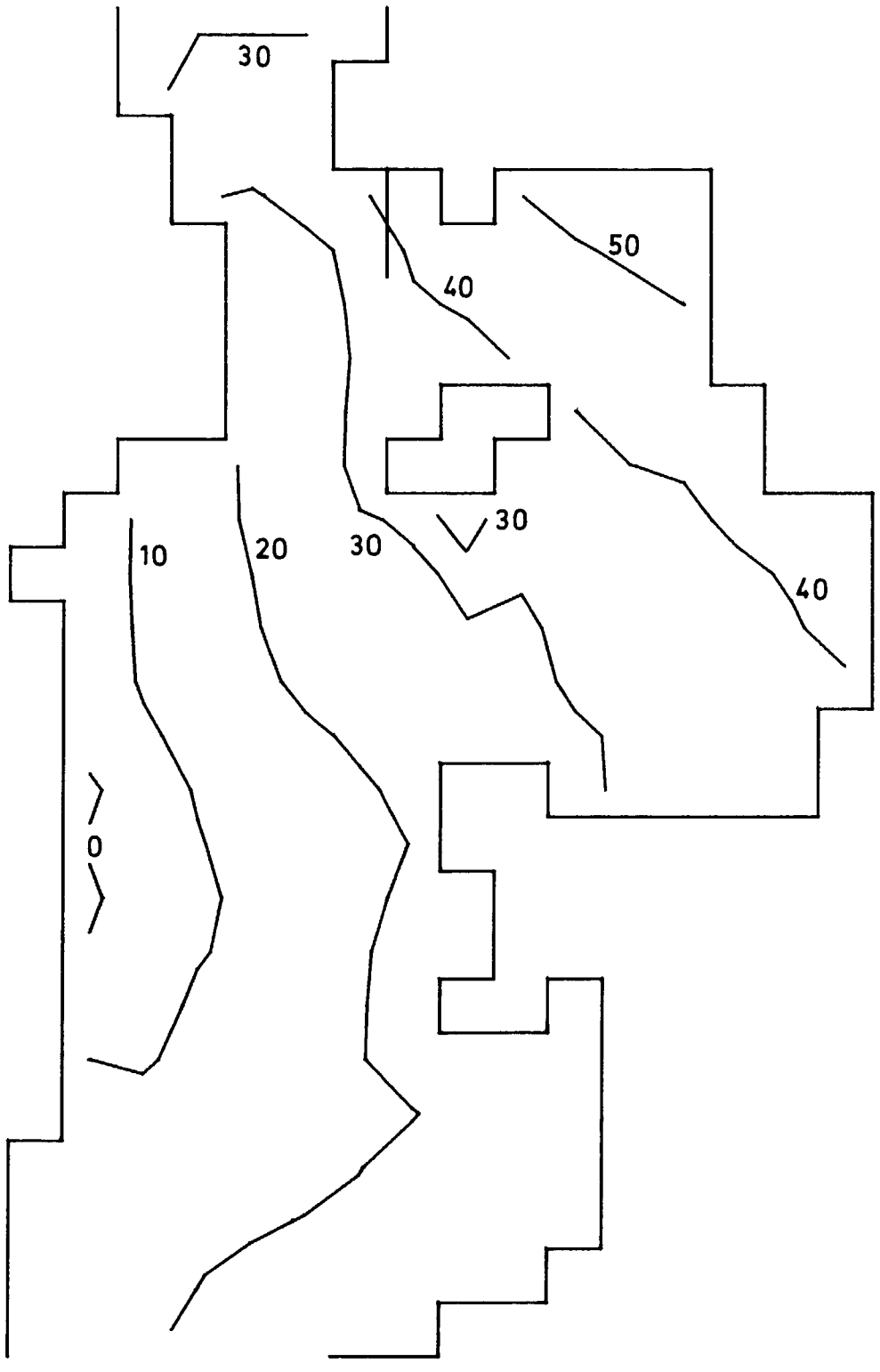

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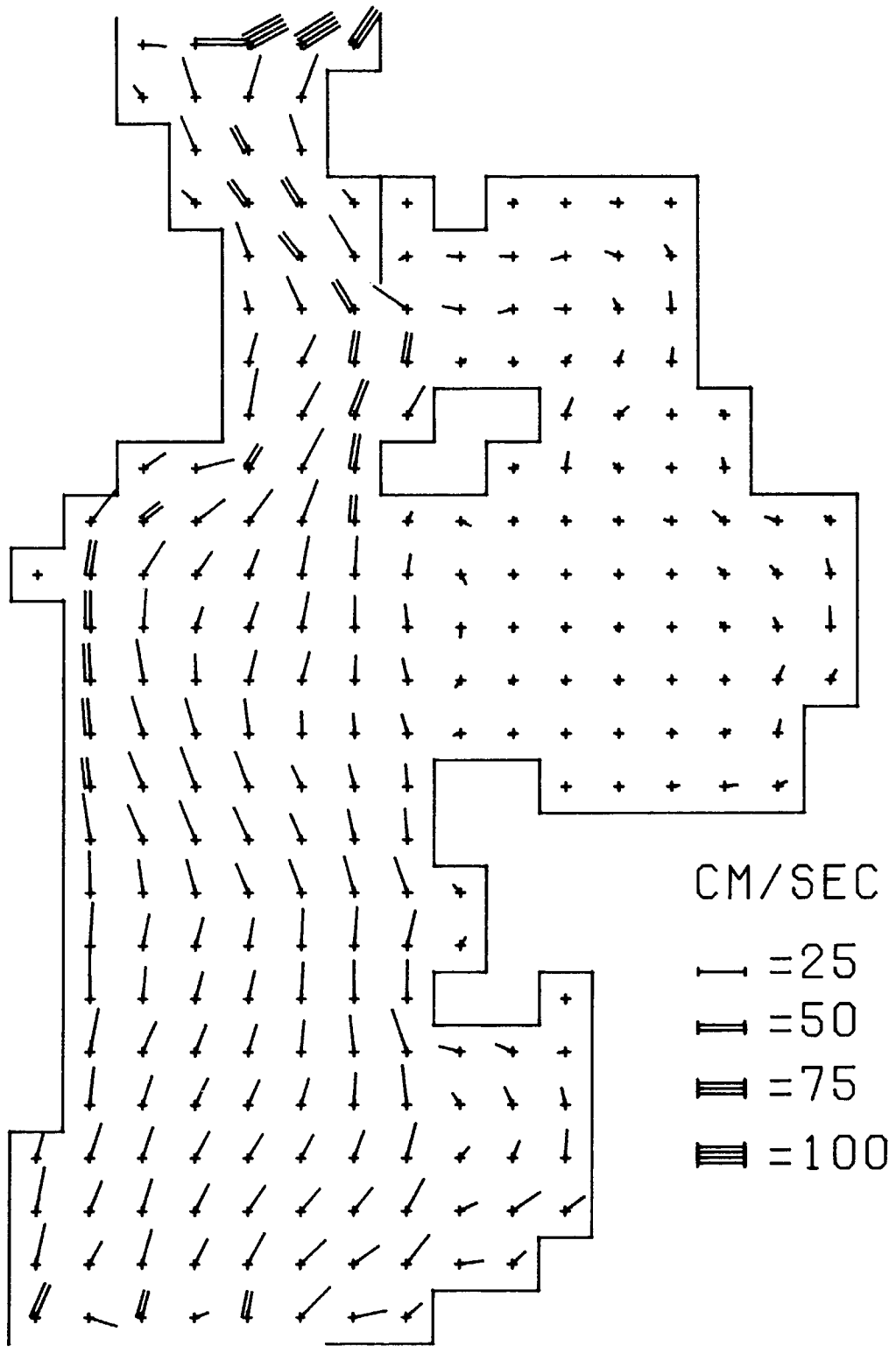

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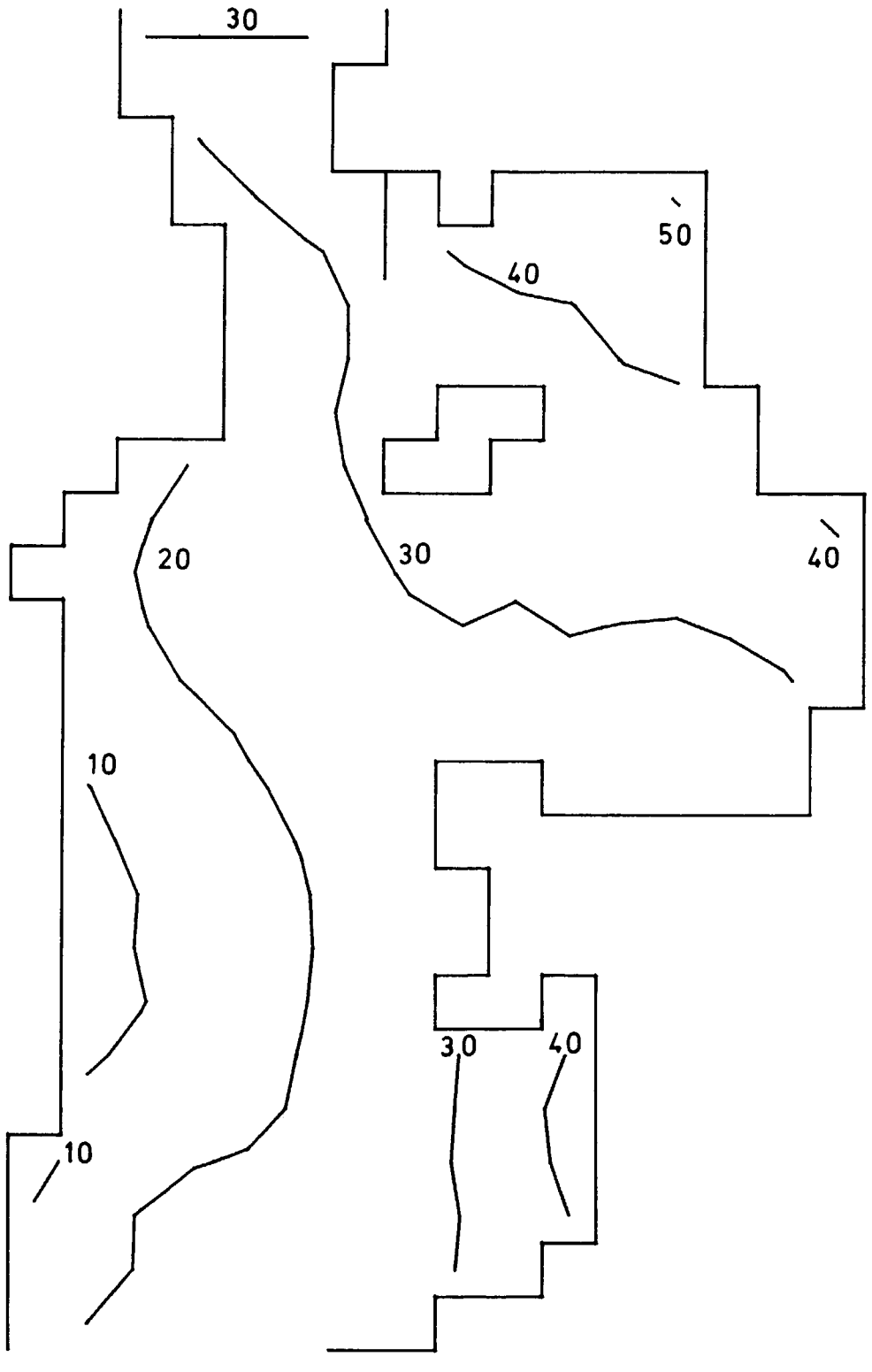

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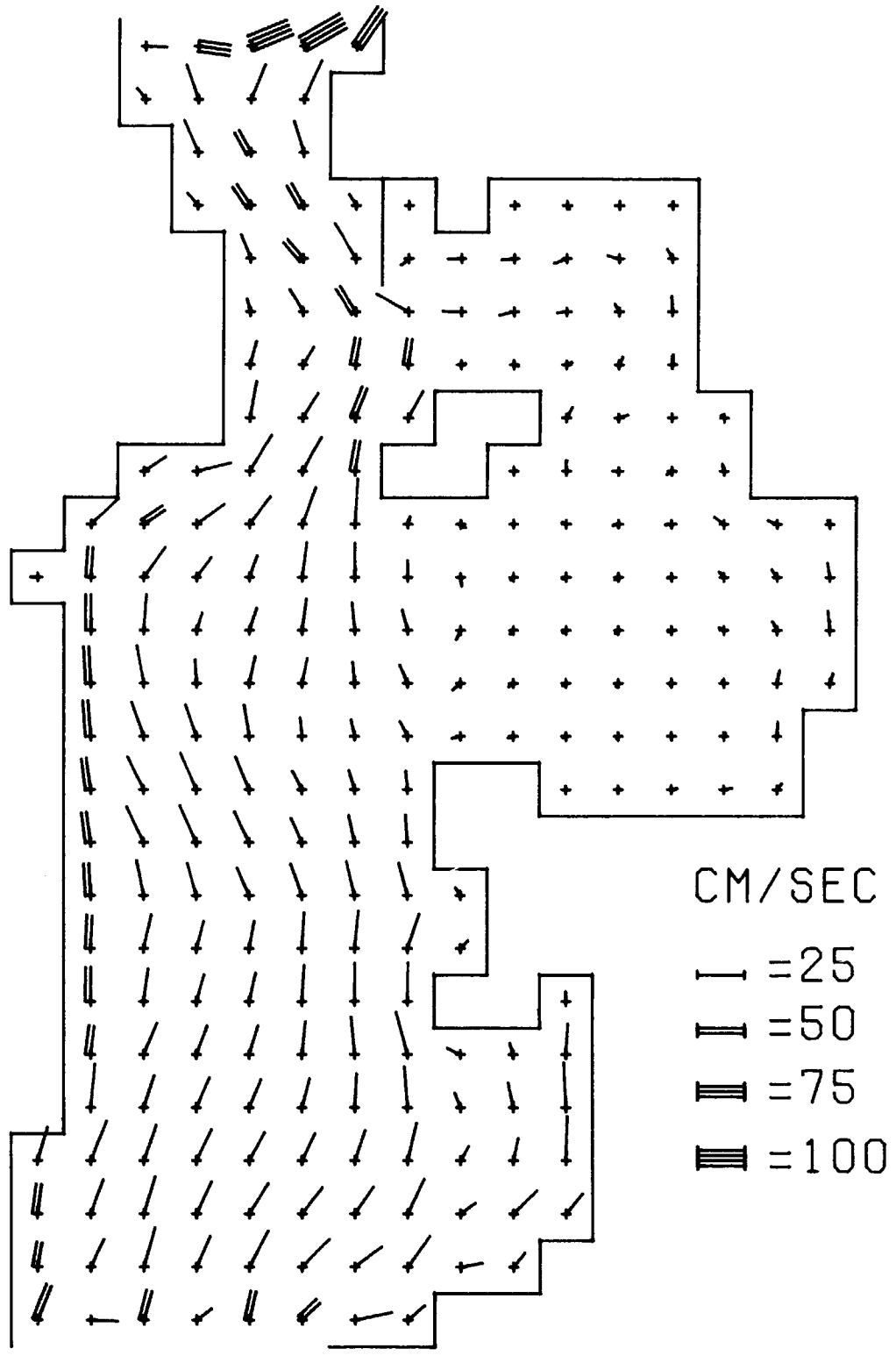

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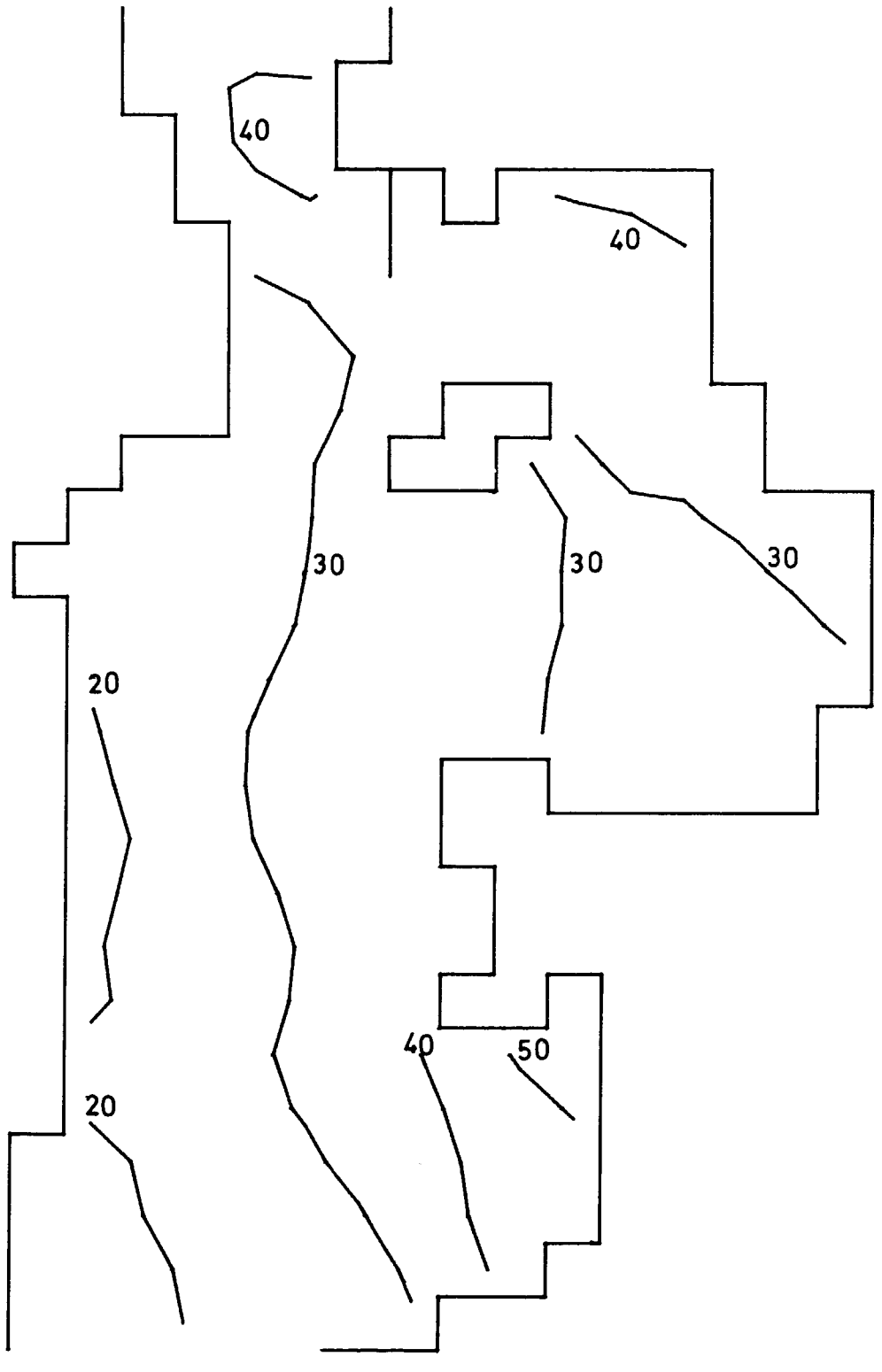

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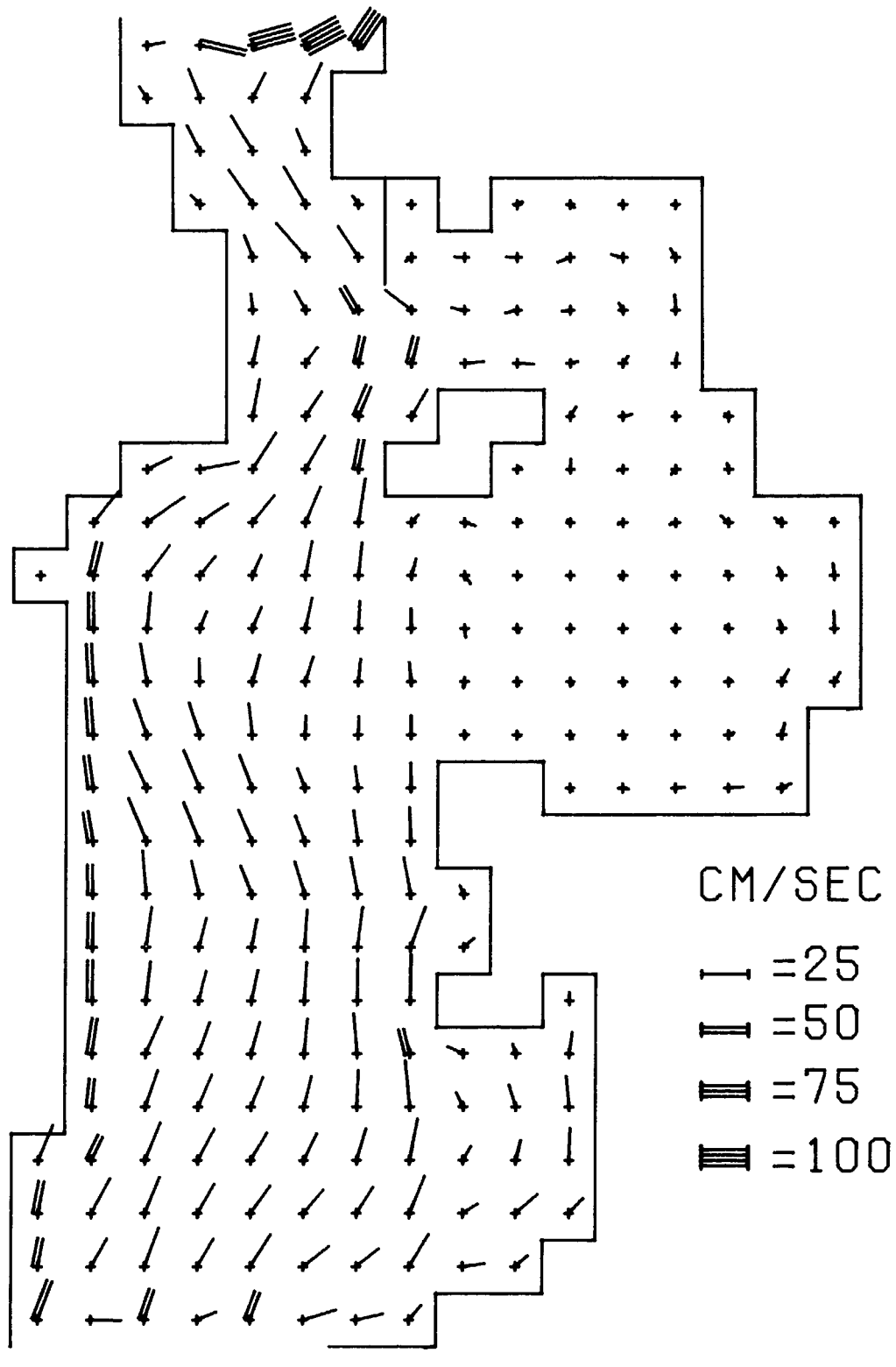

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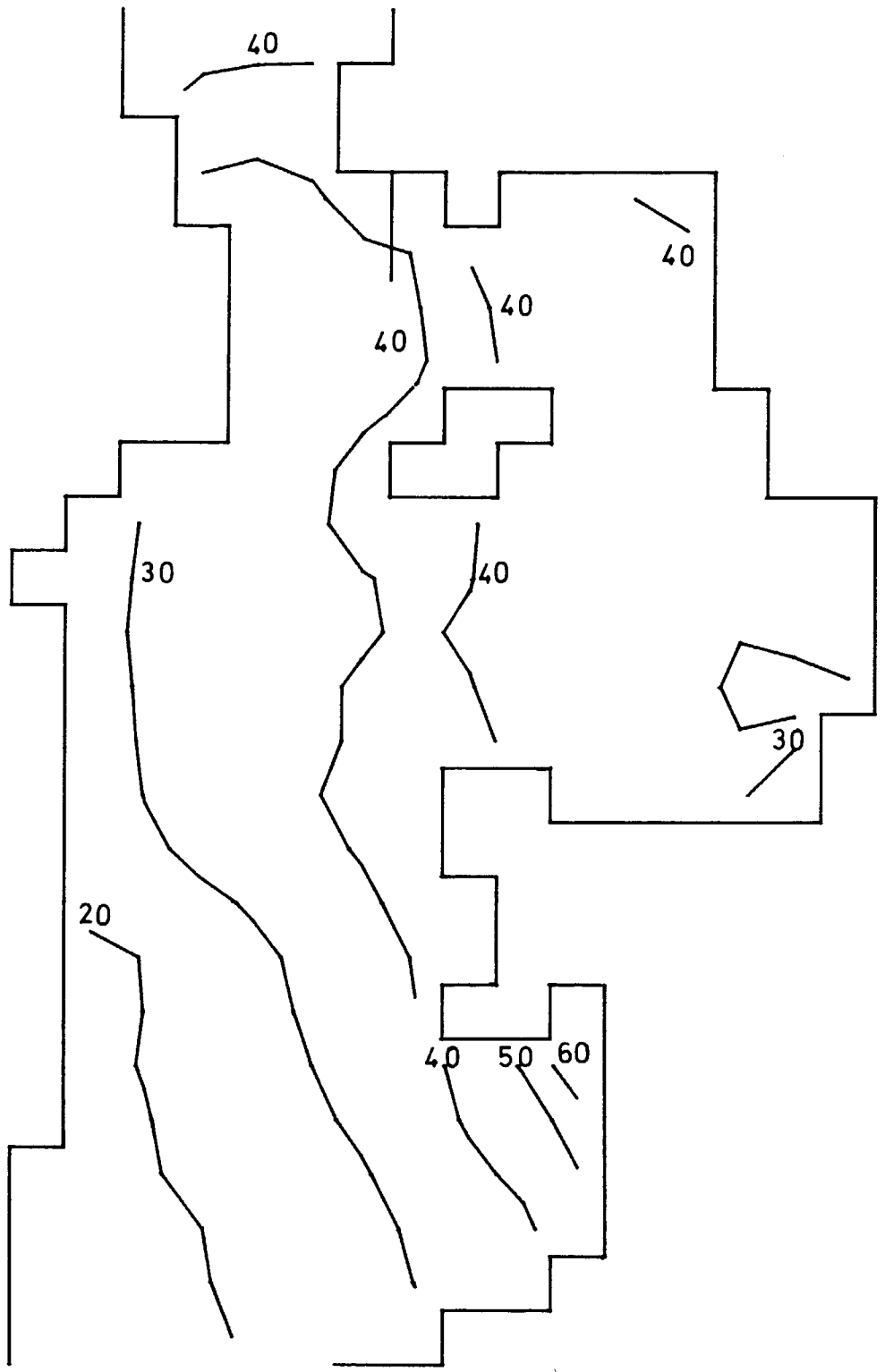

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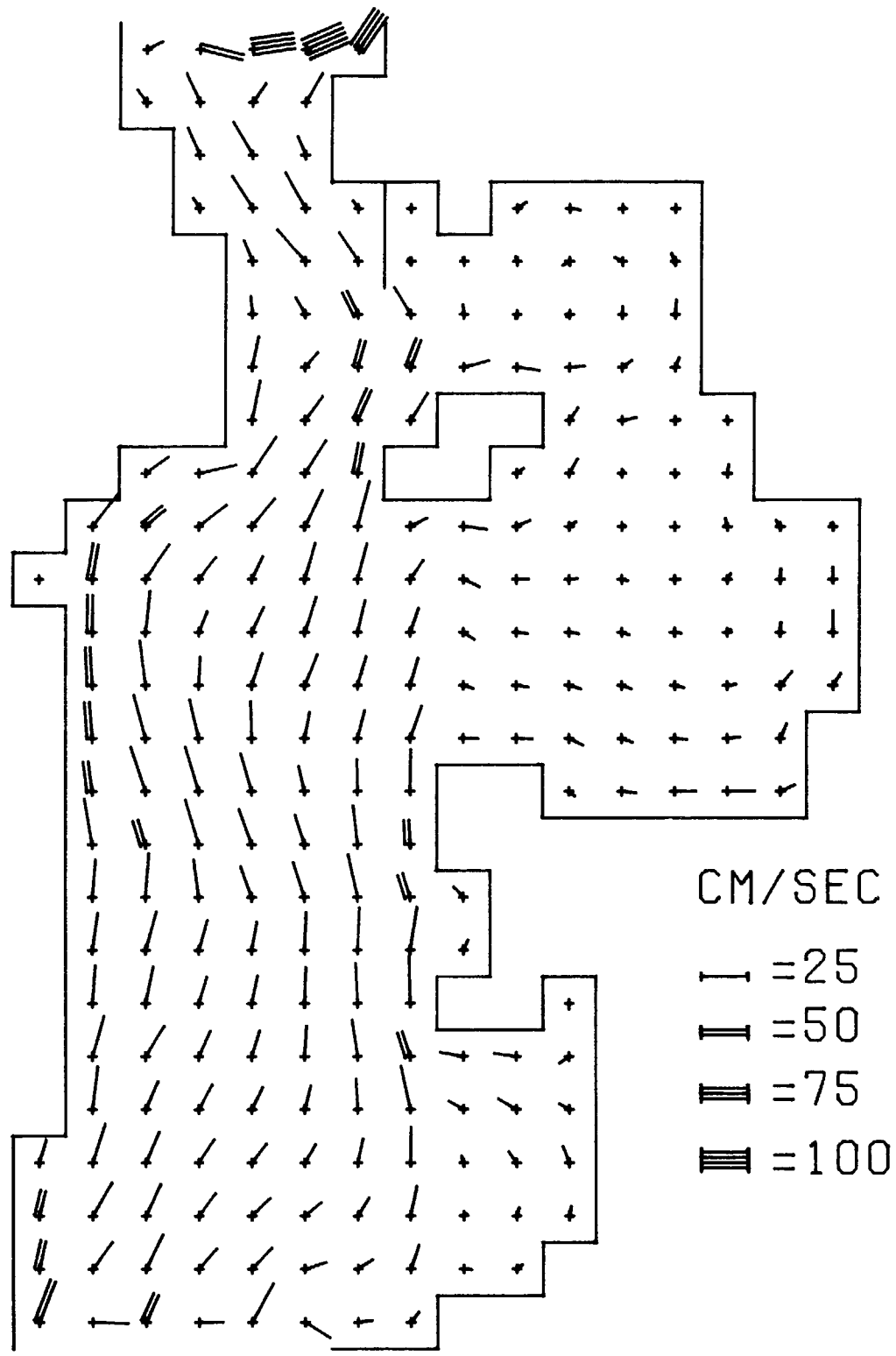

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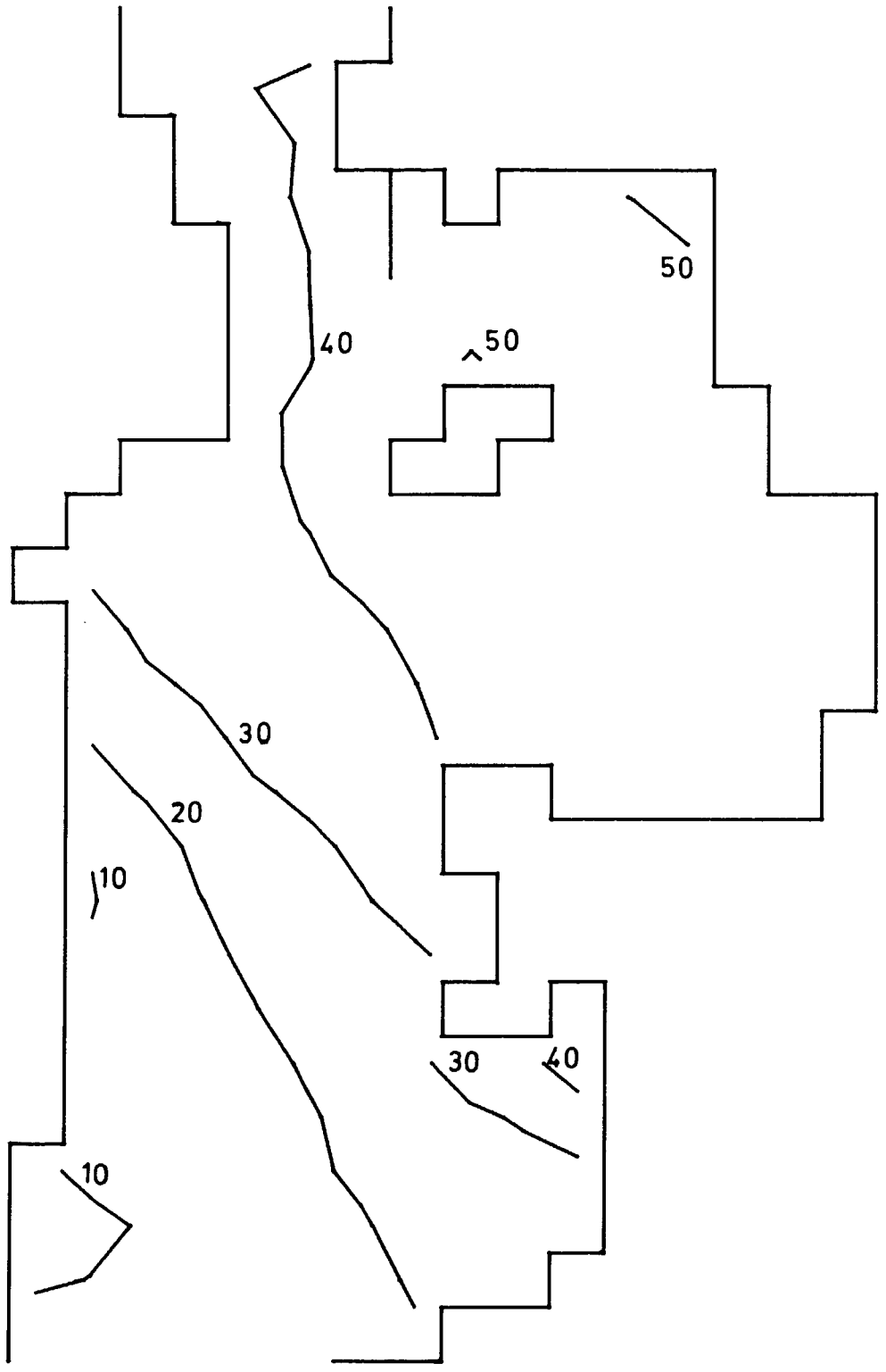

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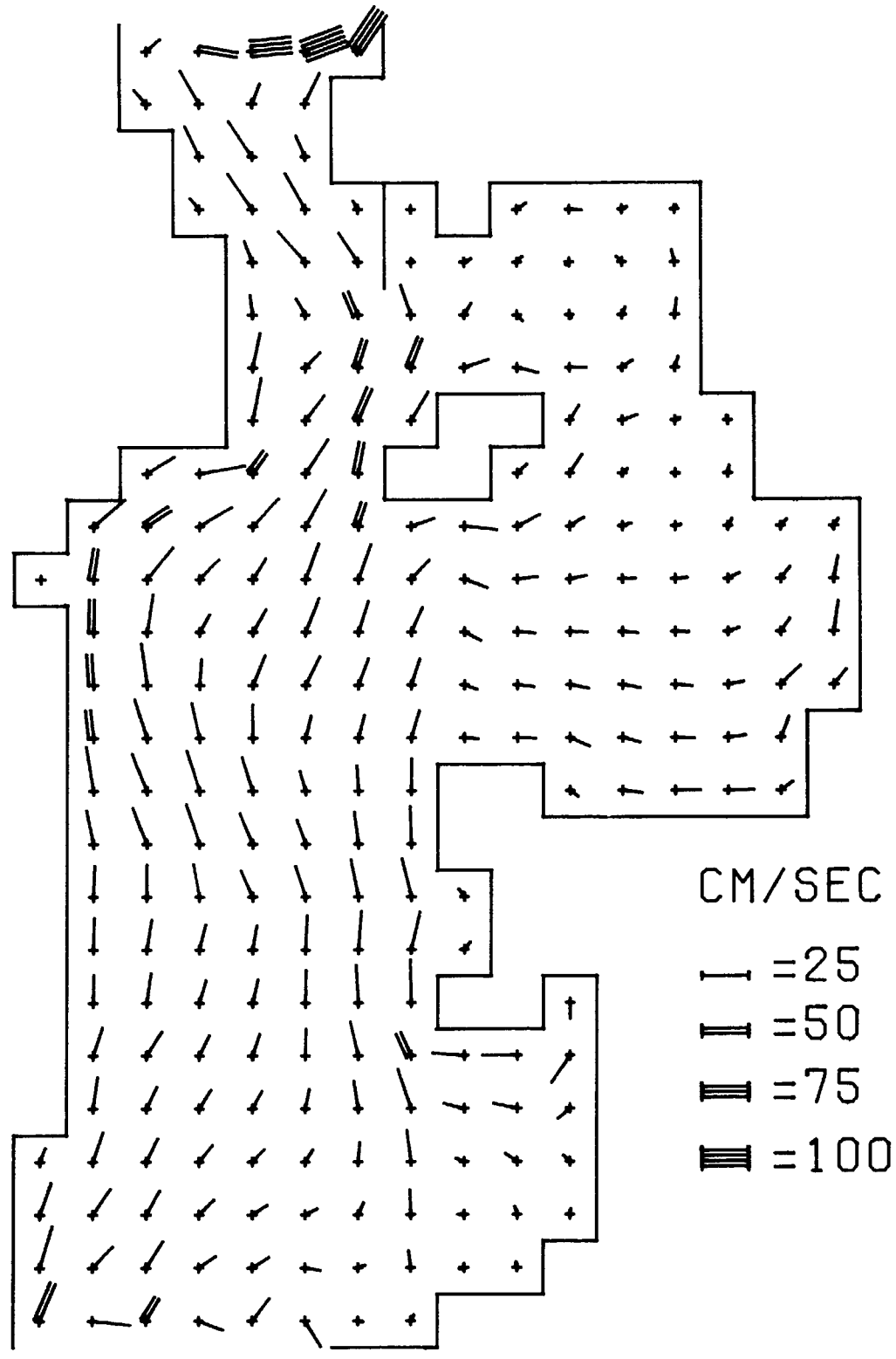

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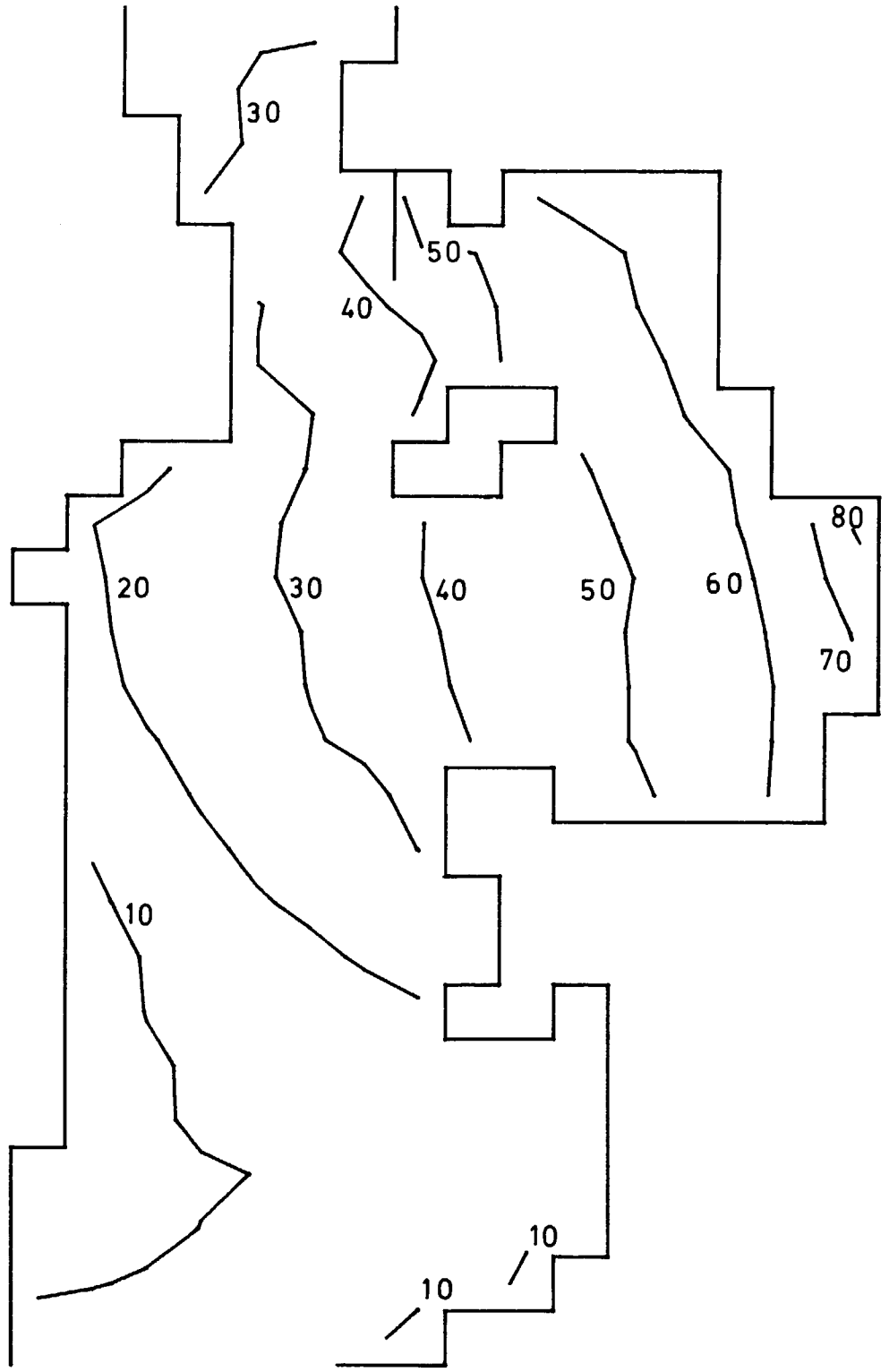

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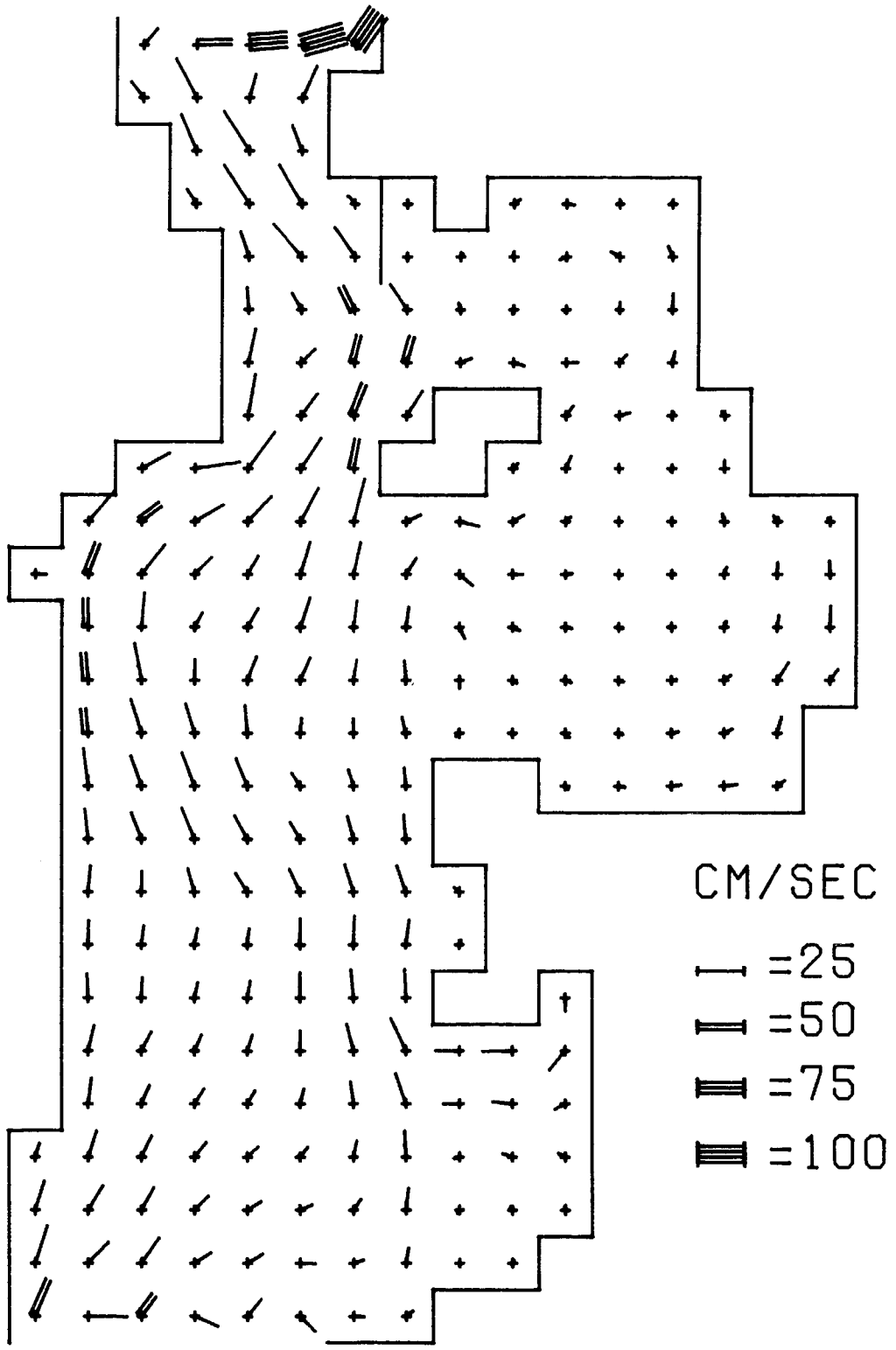

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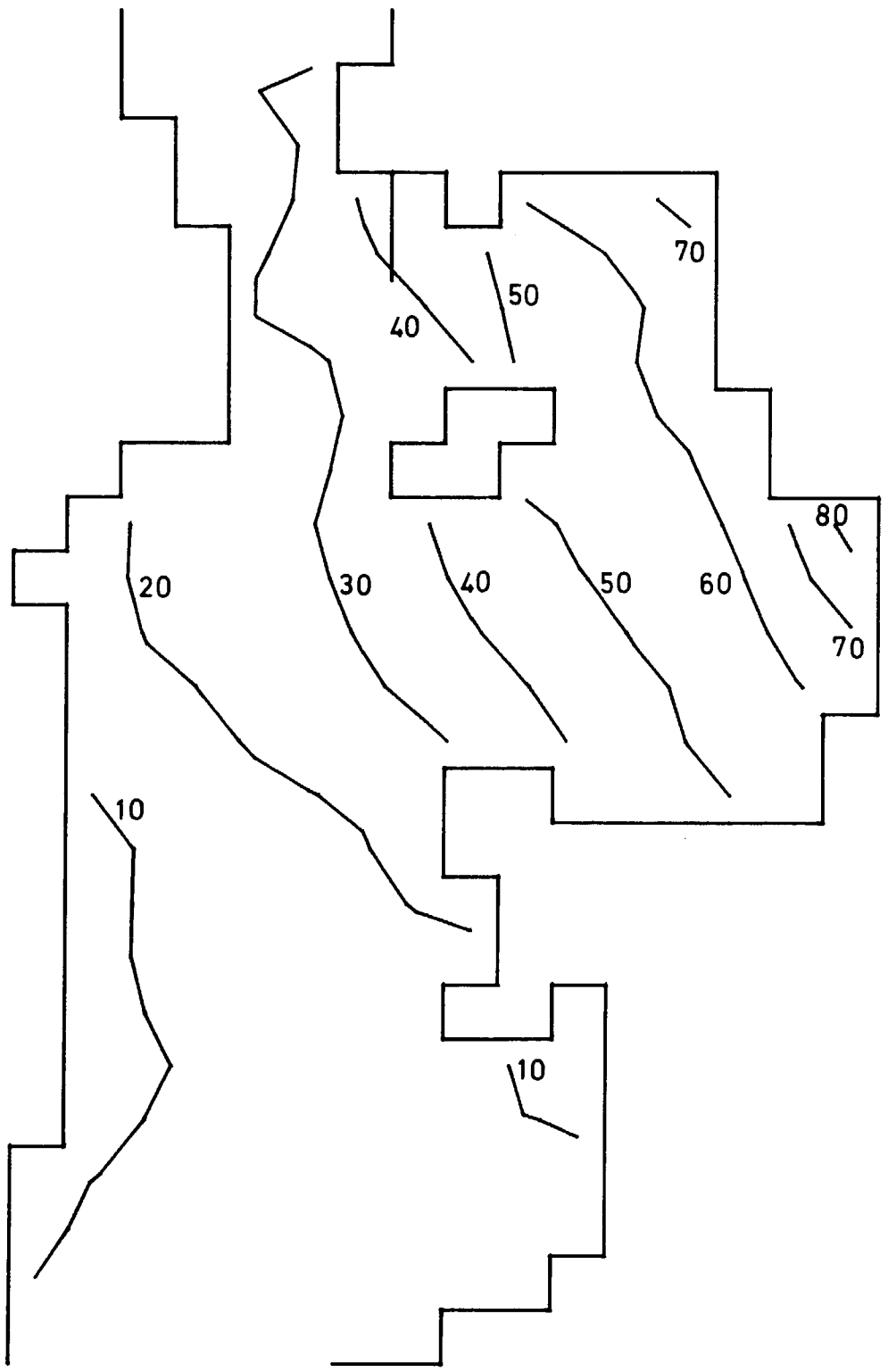

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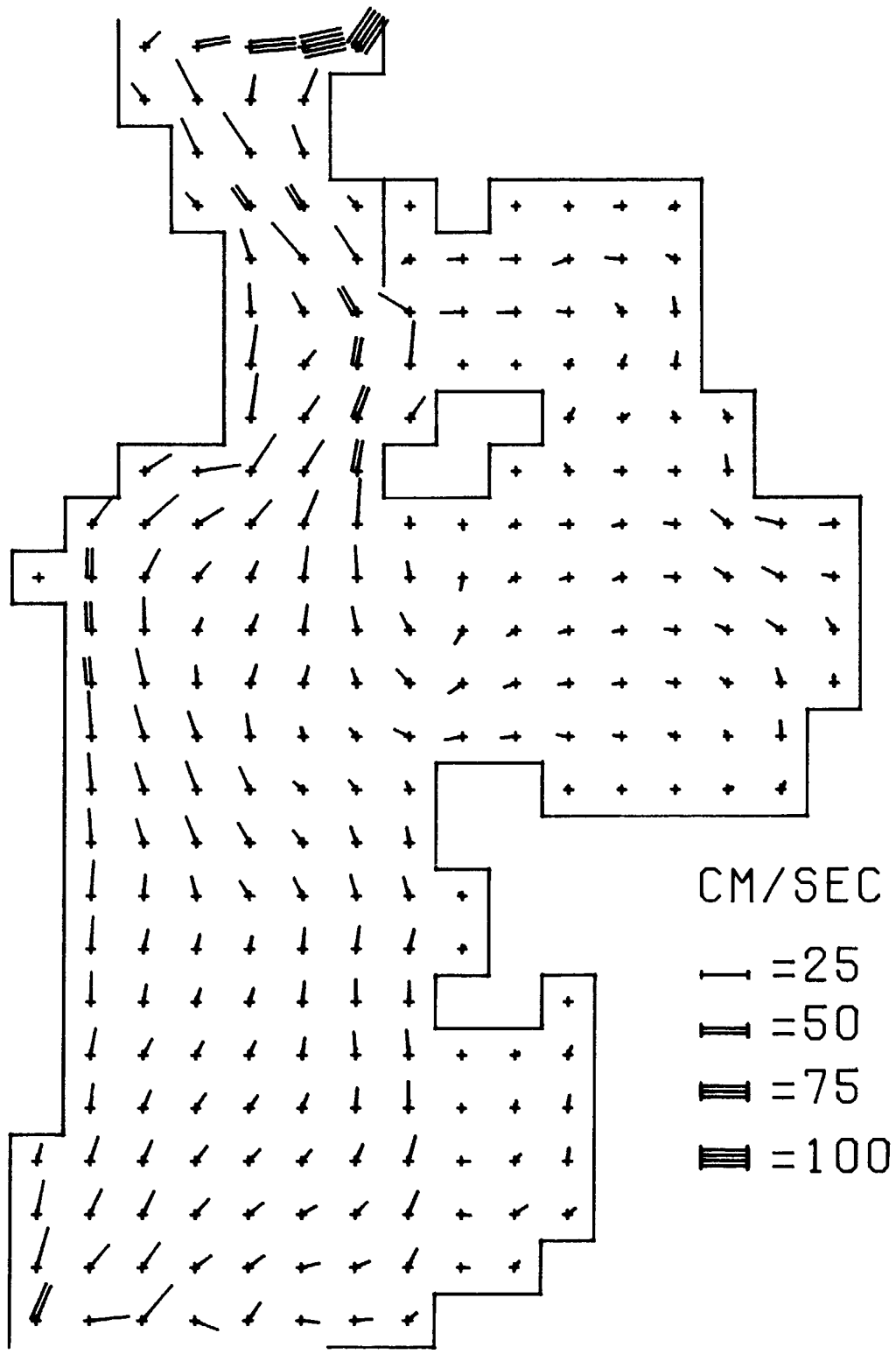

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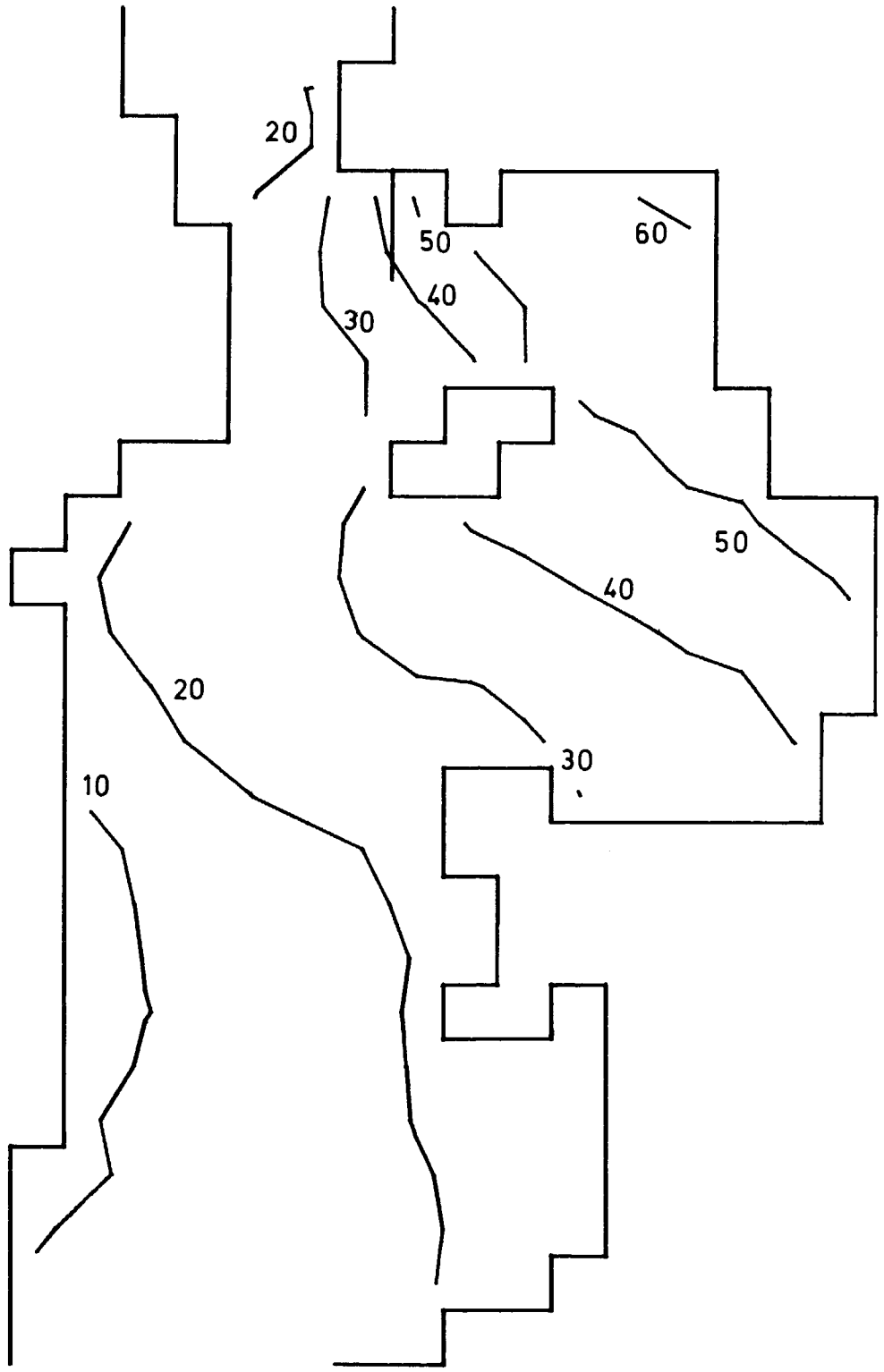

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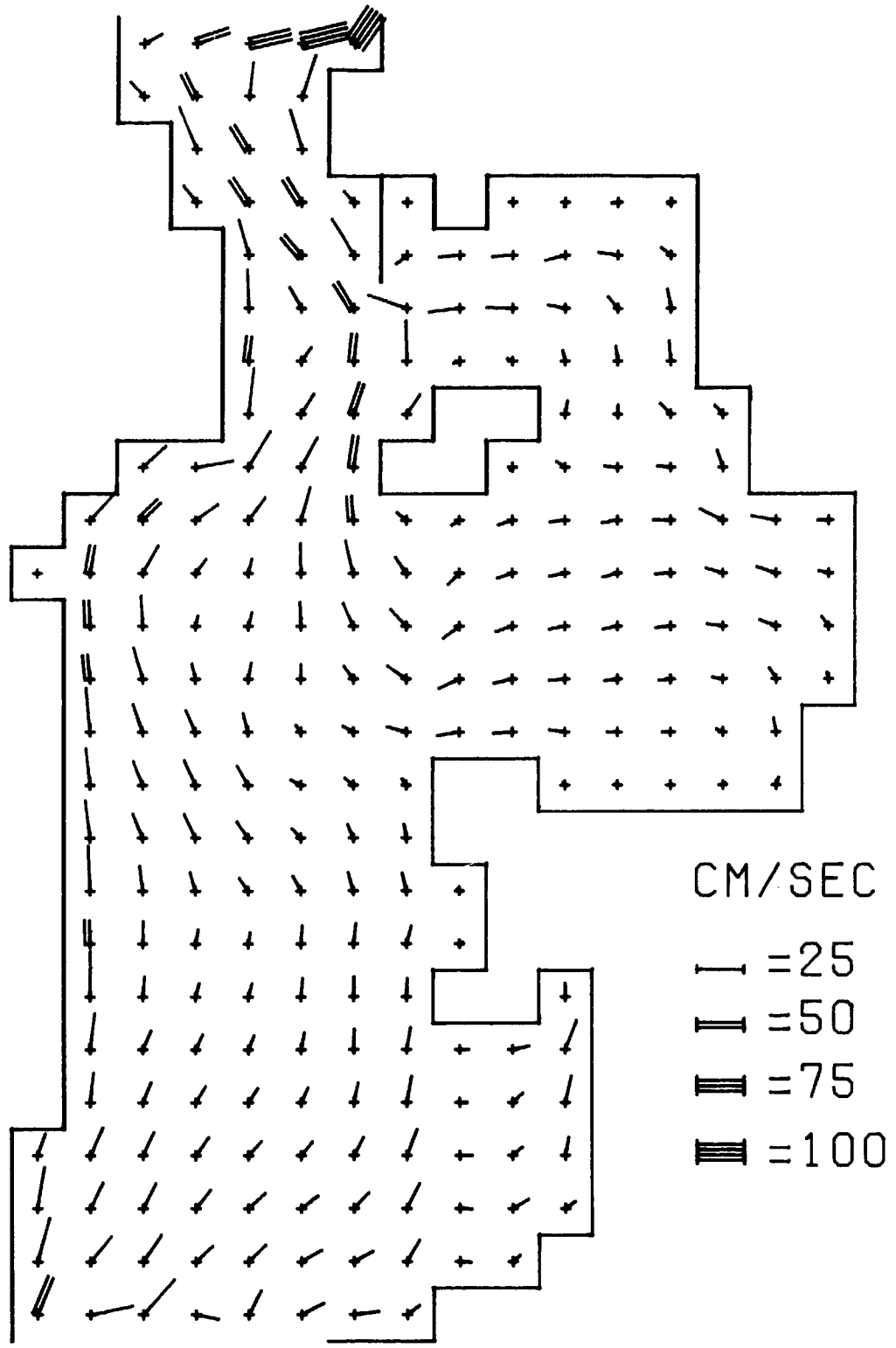

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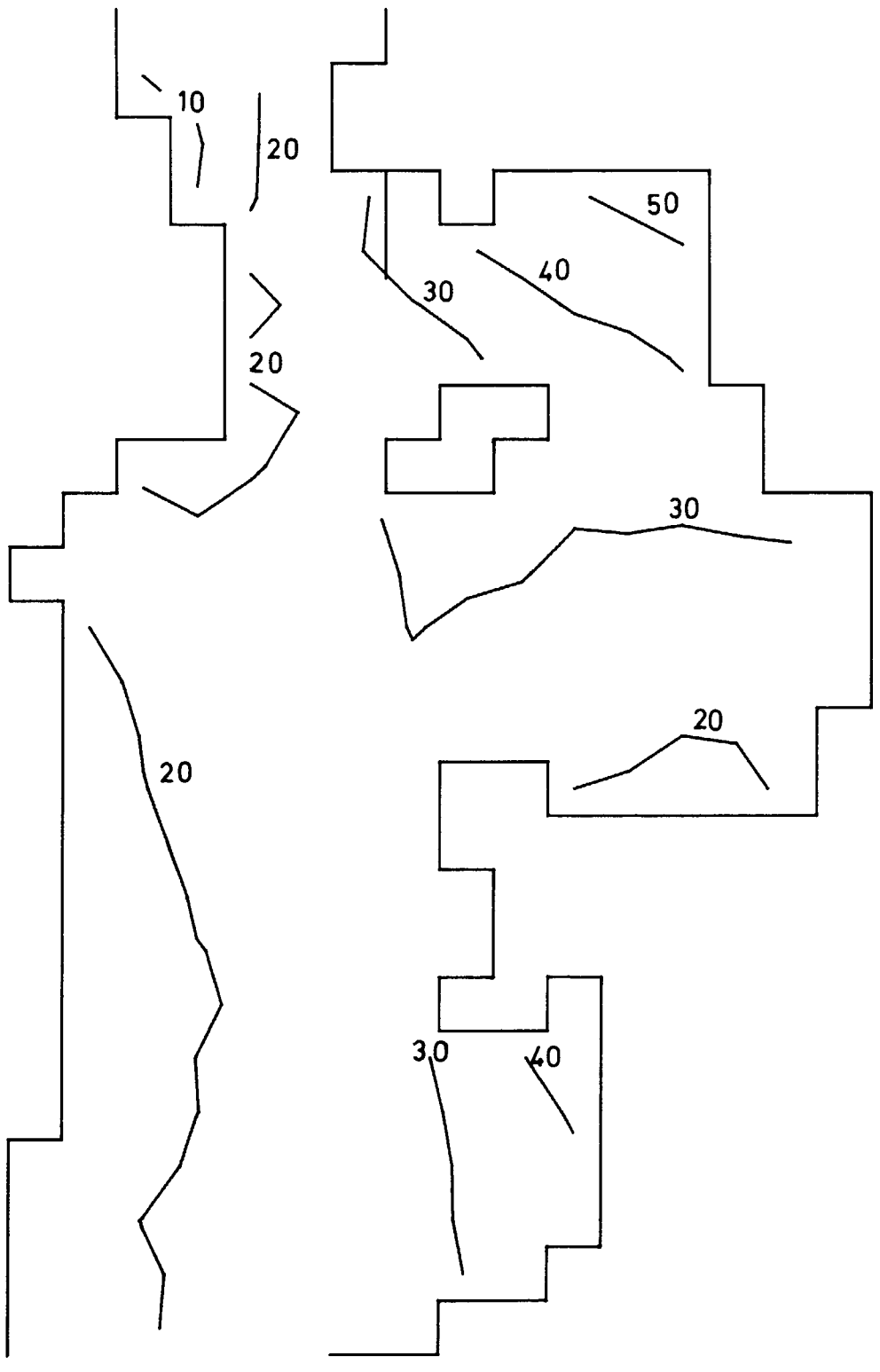

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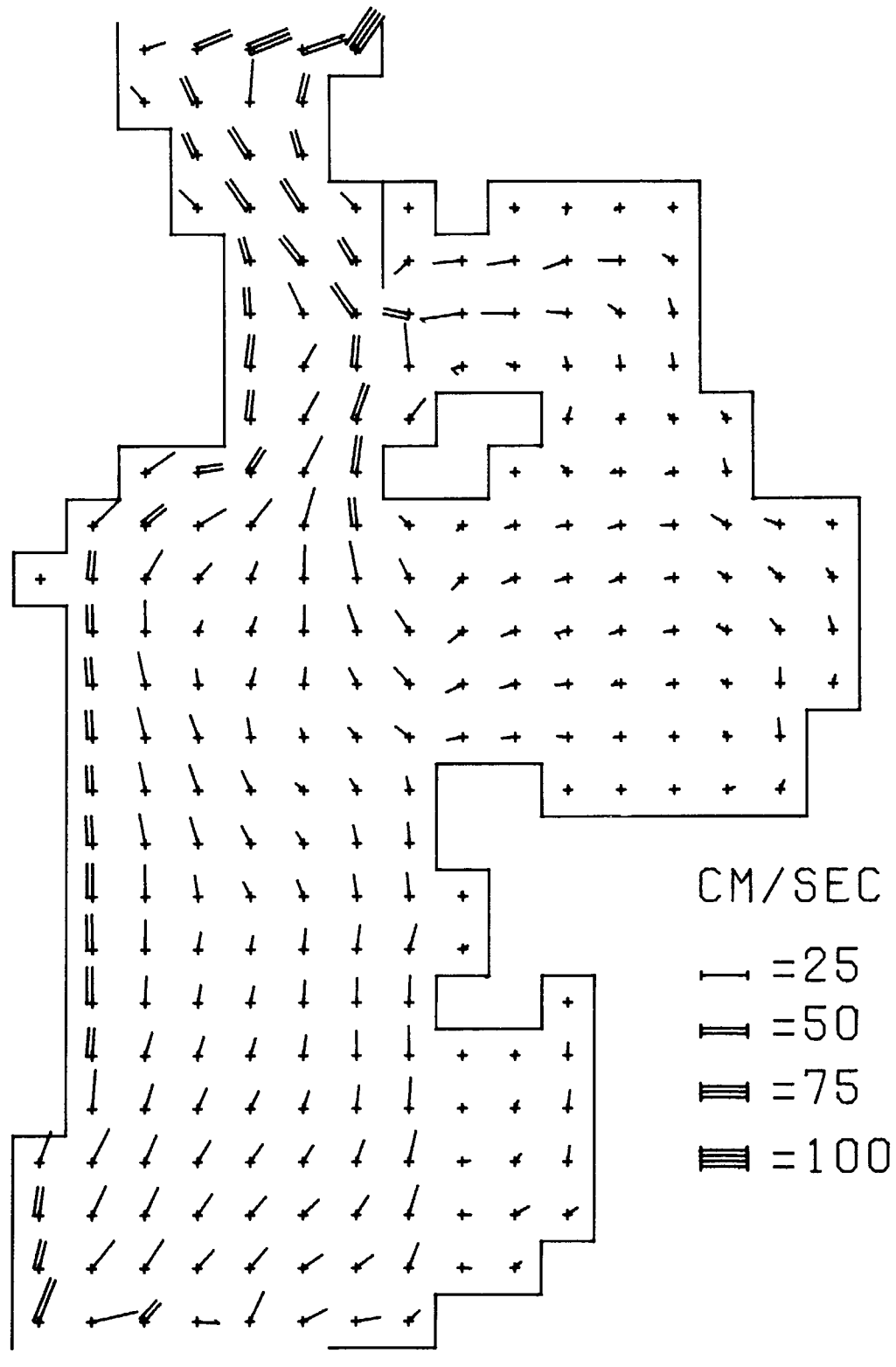

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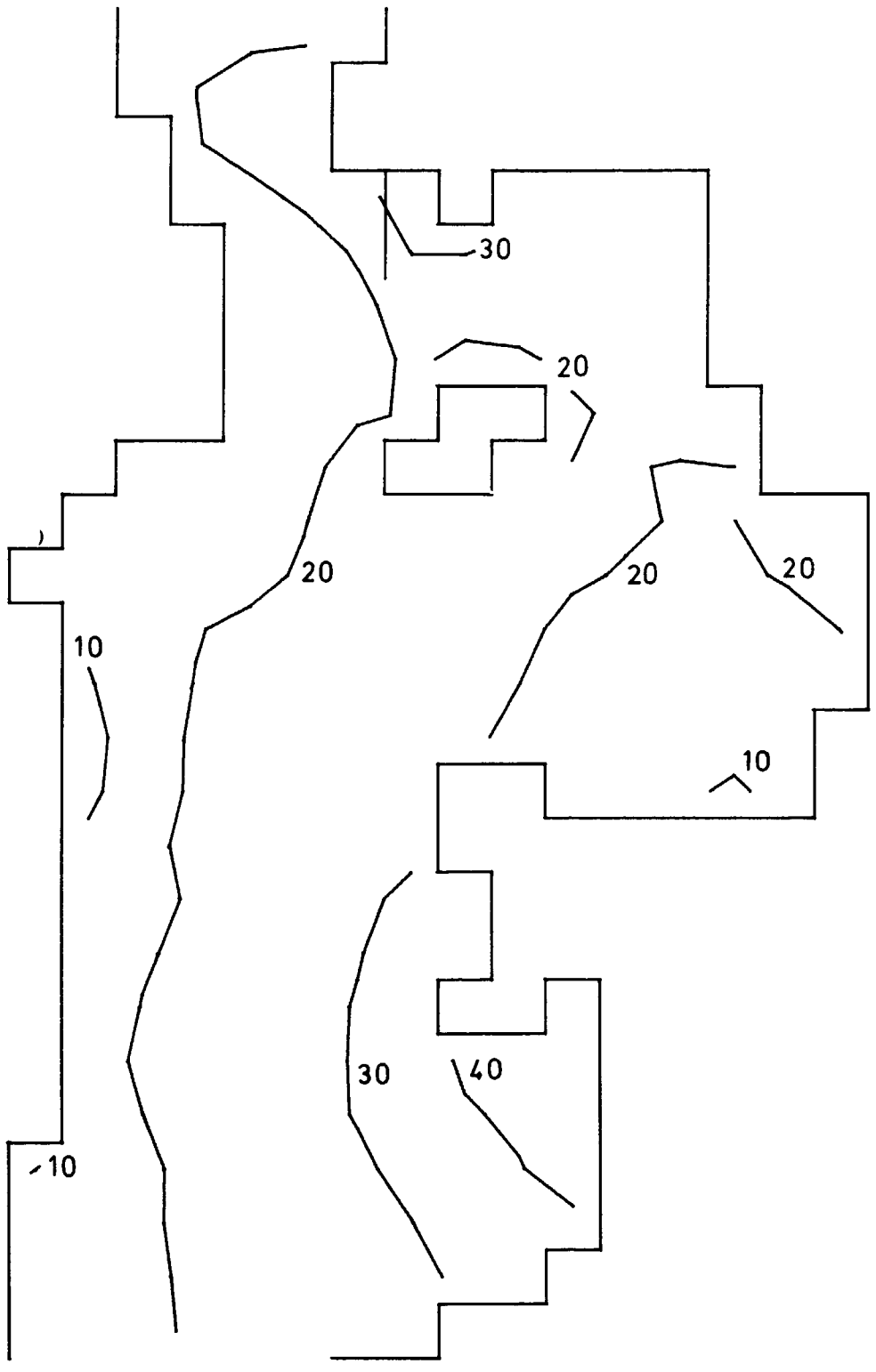

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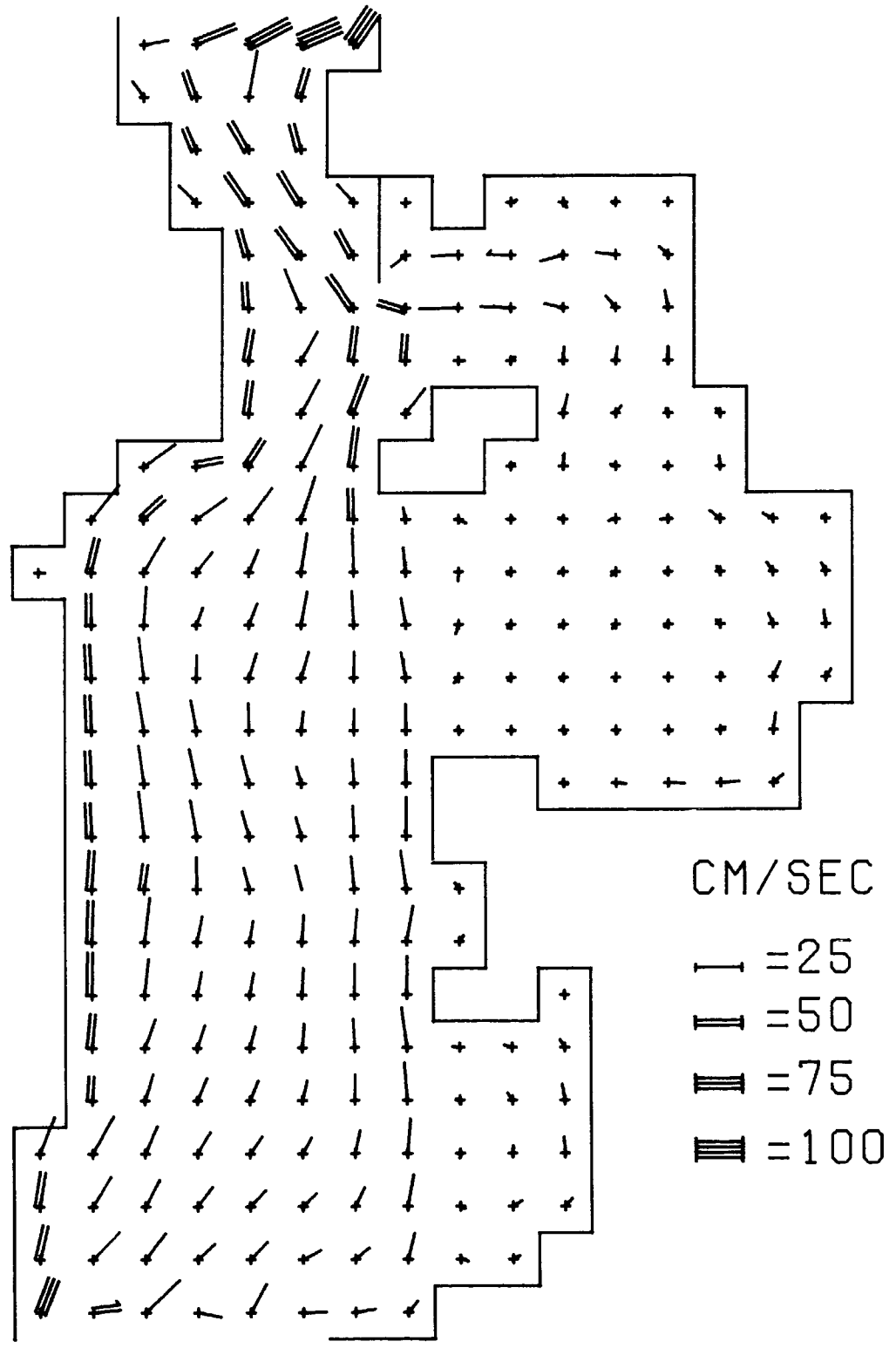

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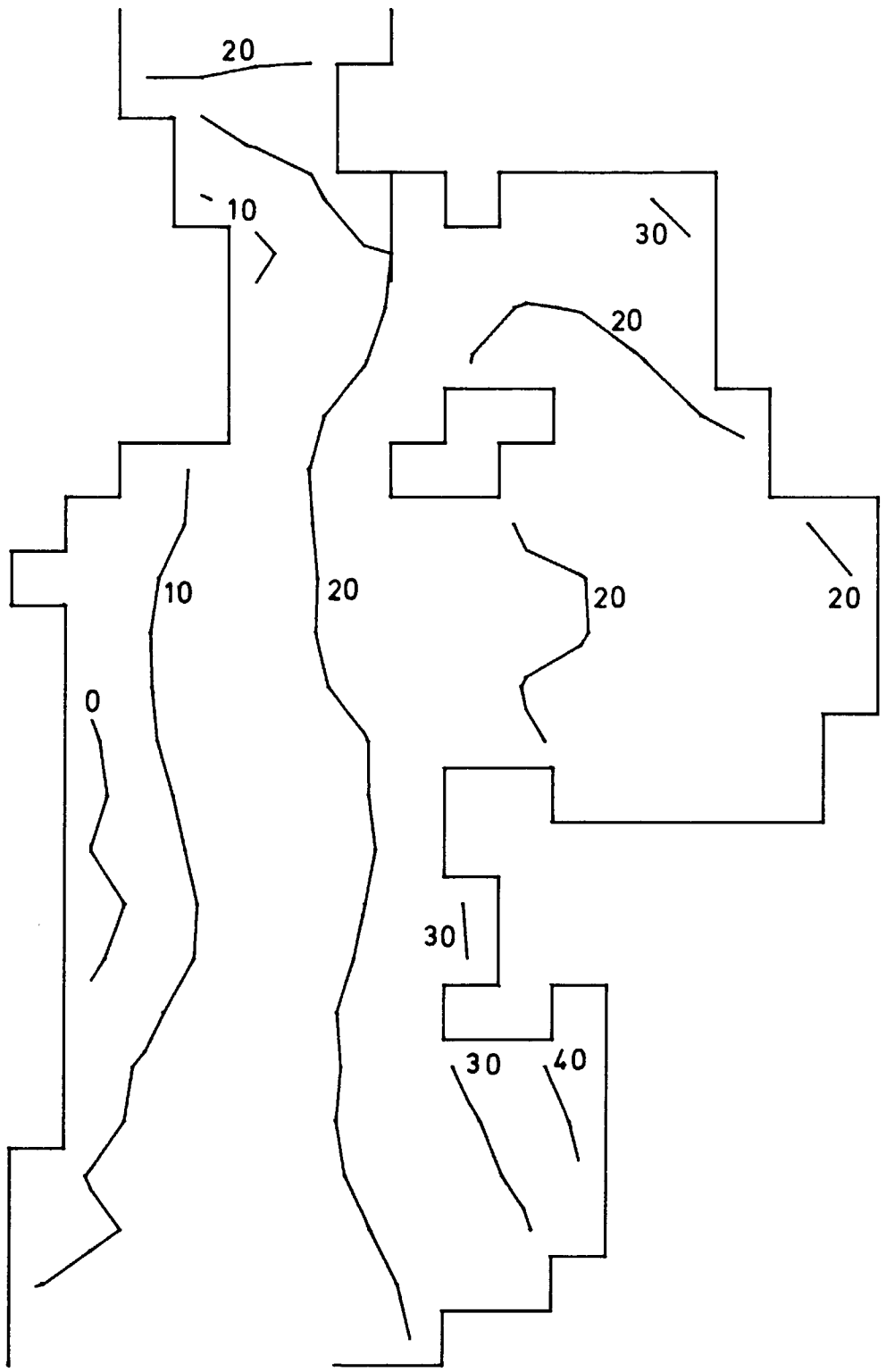

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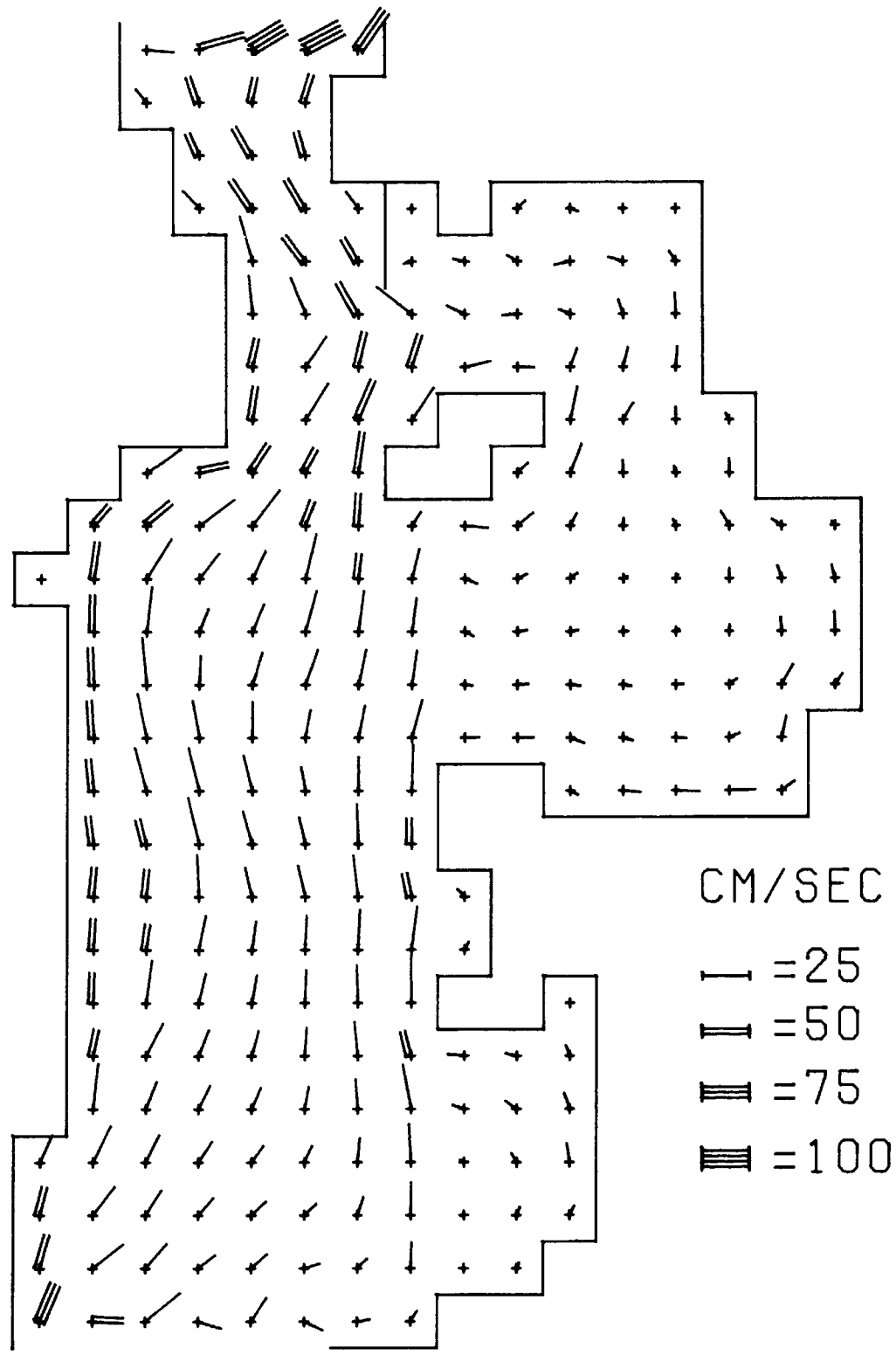

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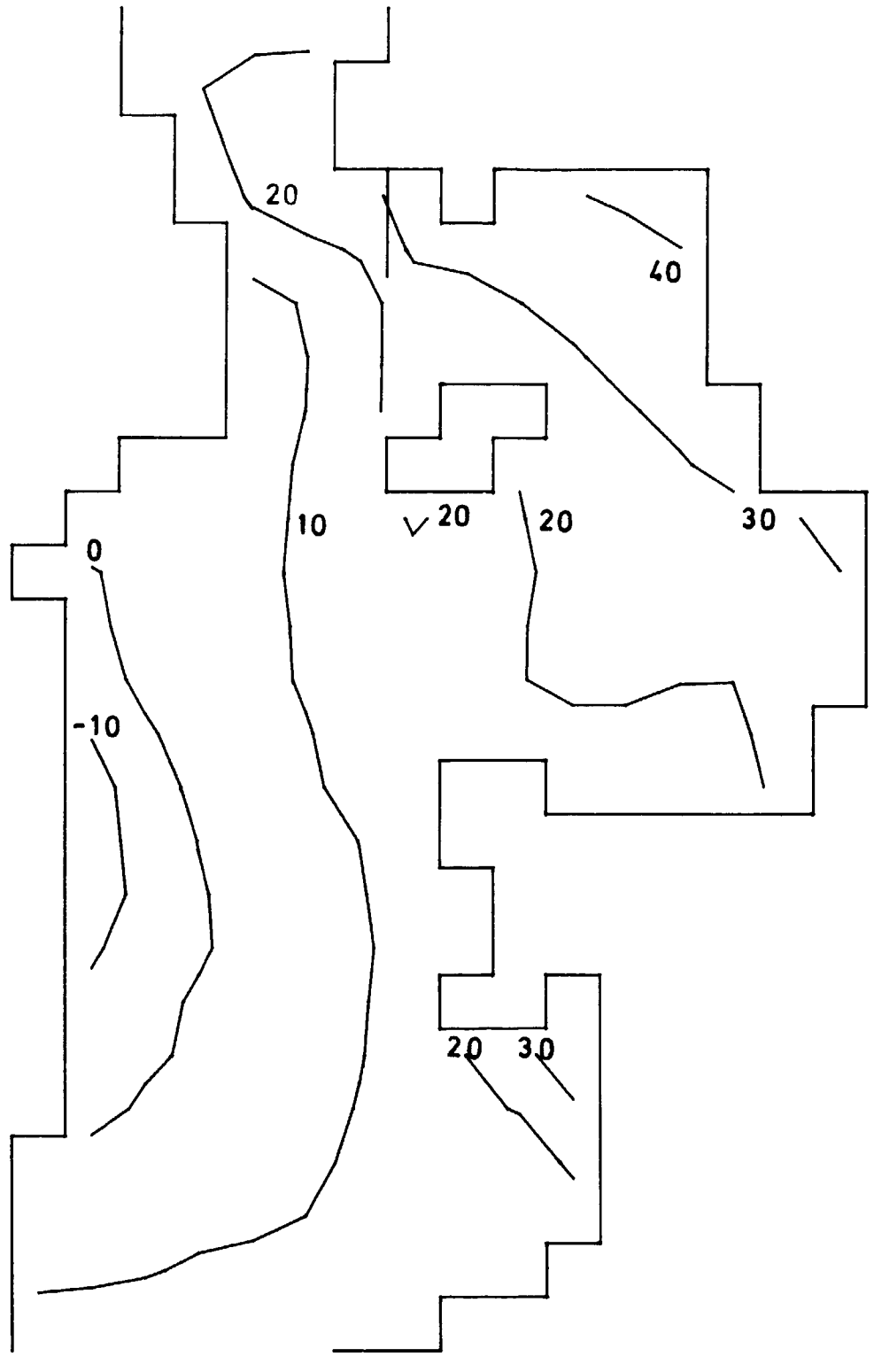

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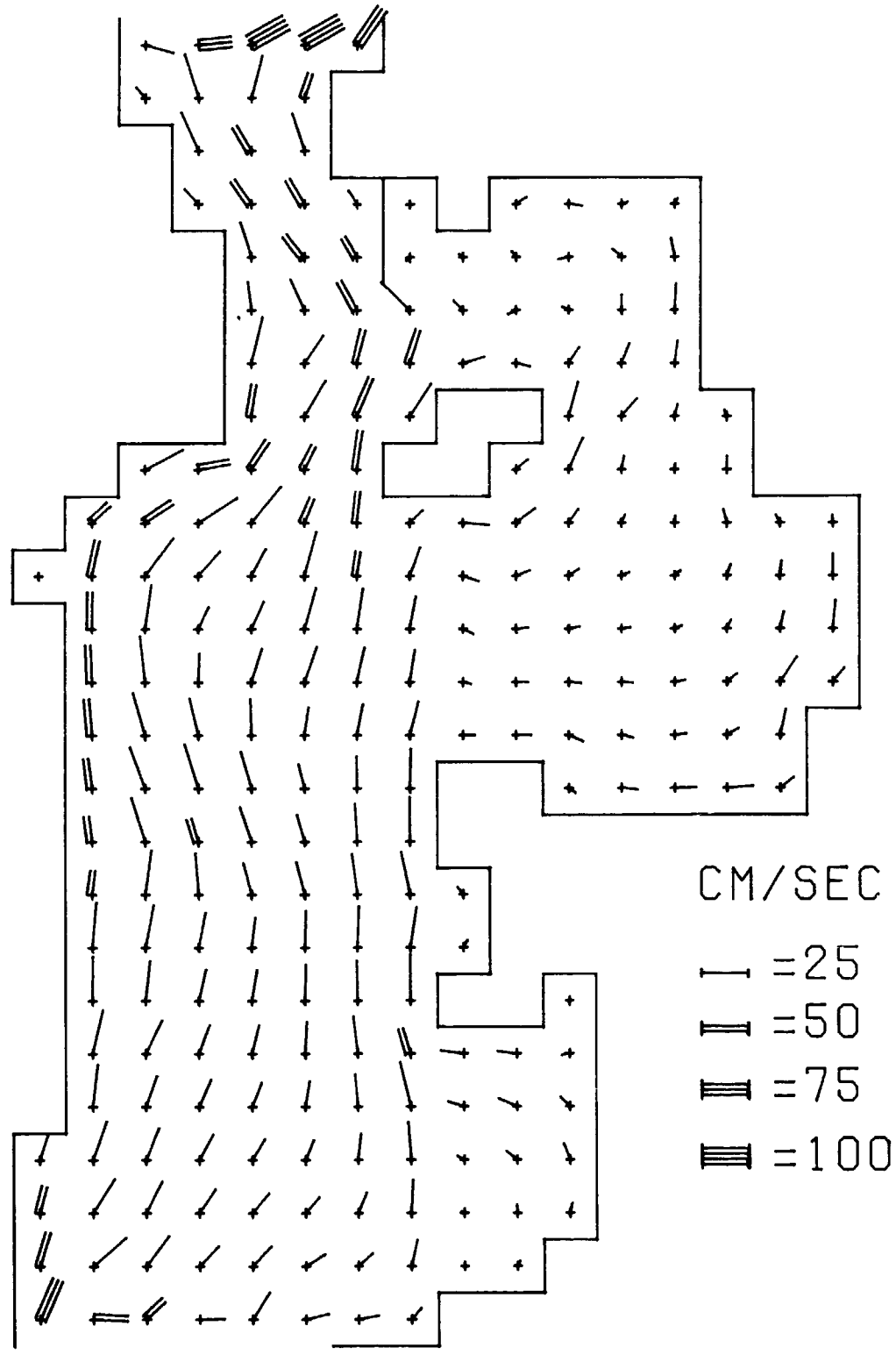
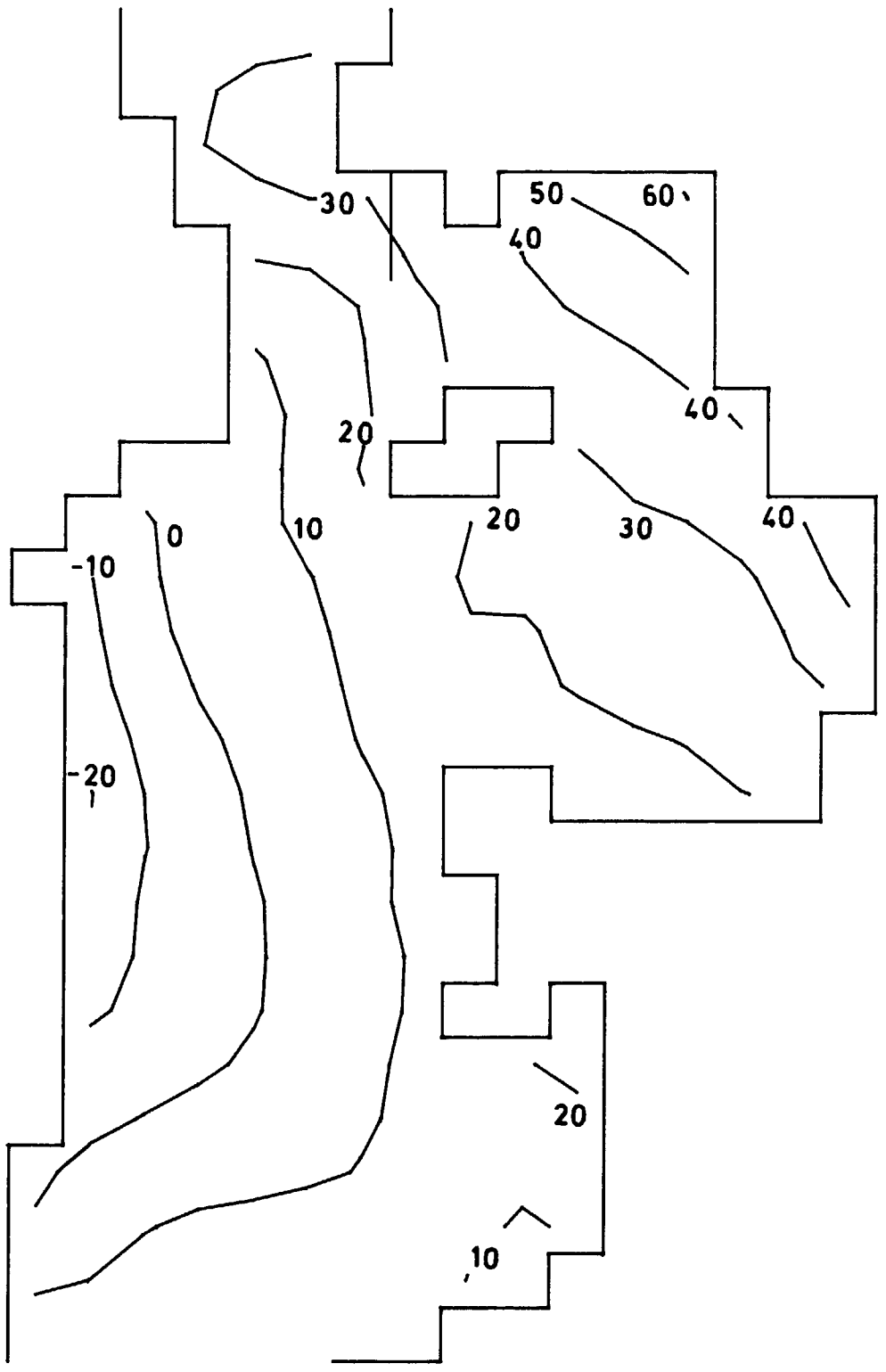


2 HRS 11TH

ELEVATIONS



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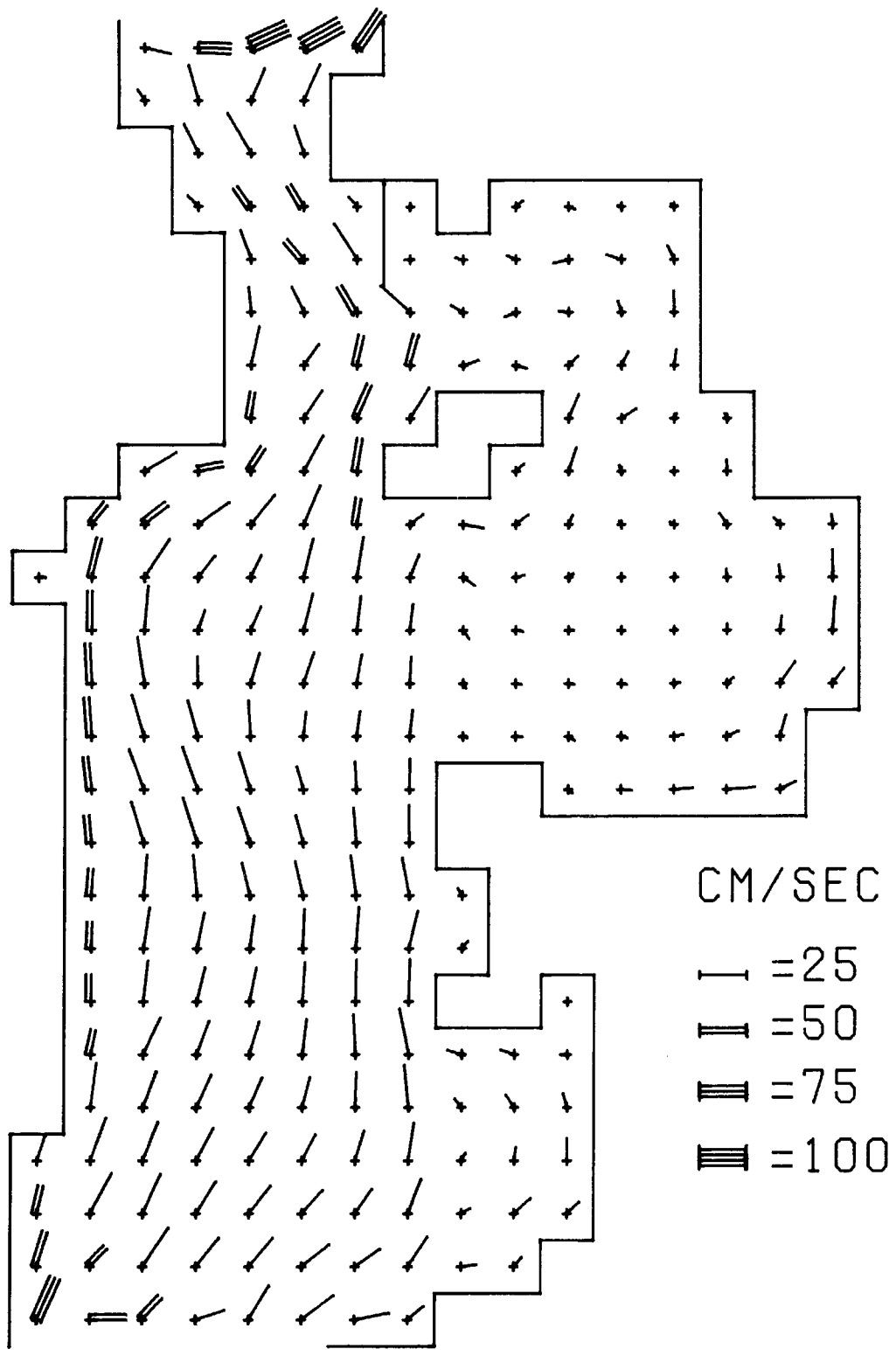

3 HRS 11TH

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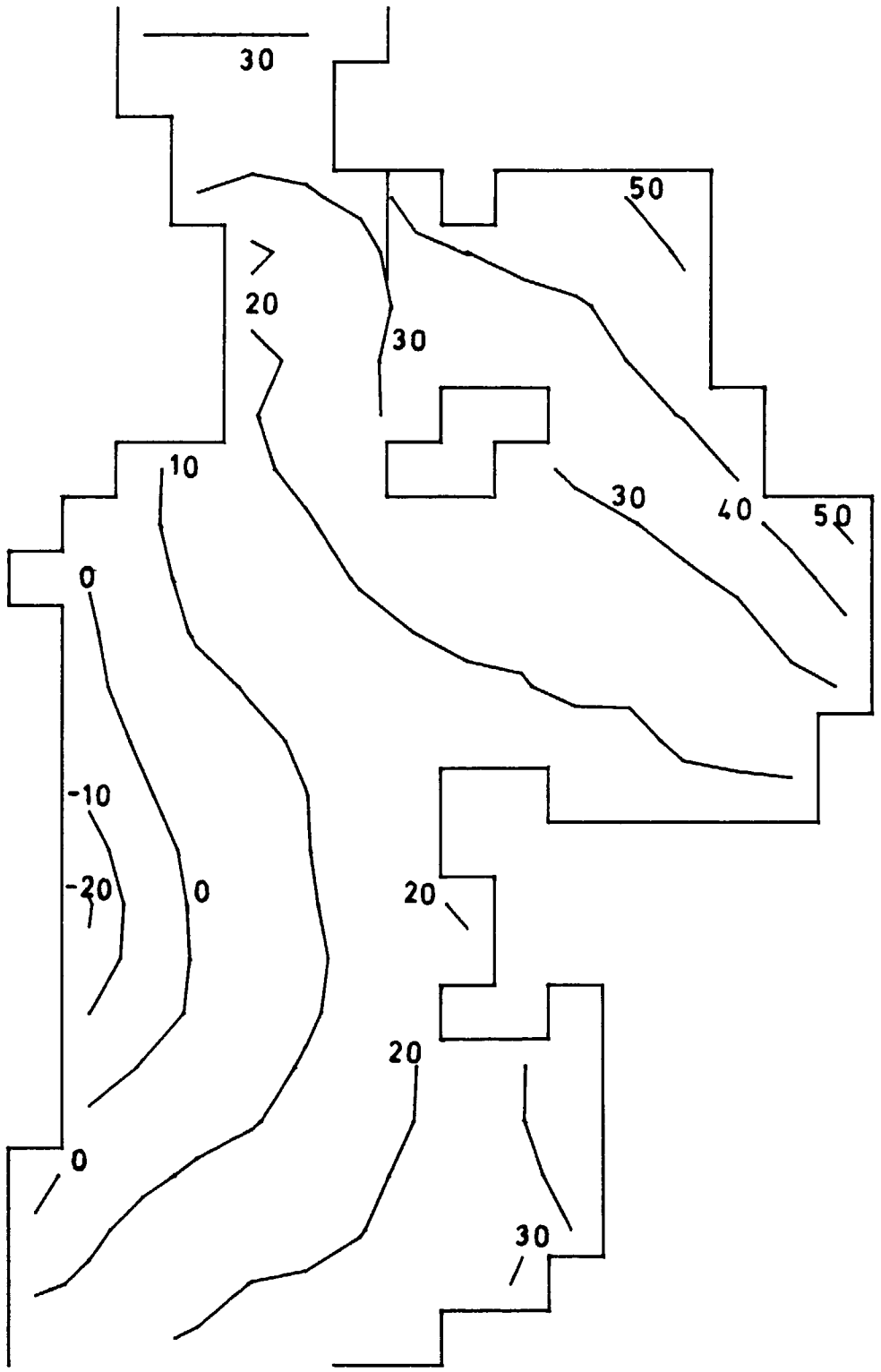

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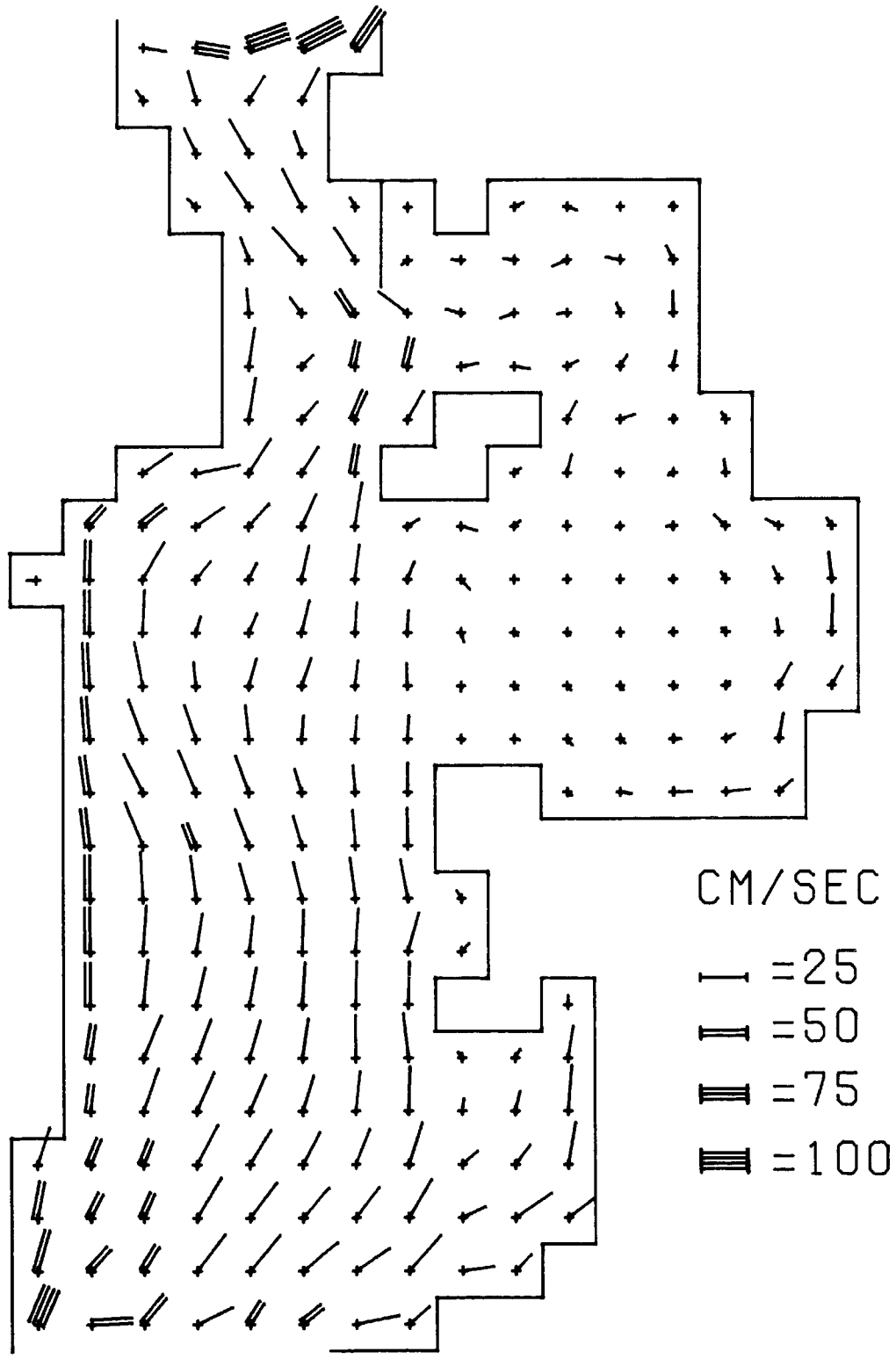

4 HRS 11TH

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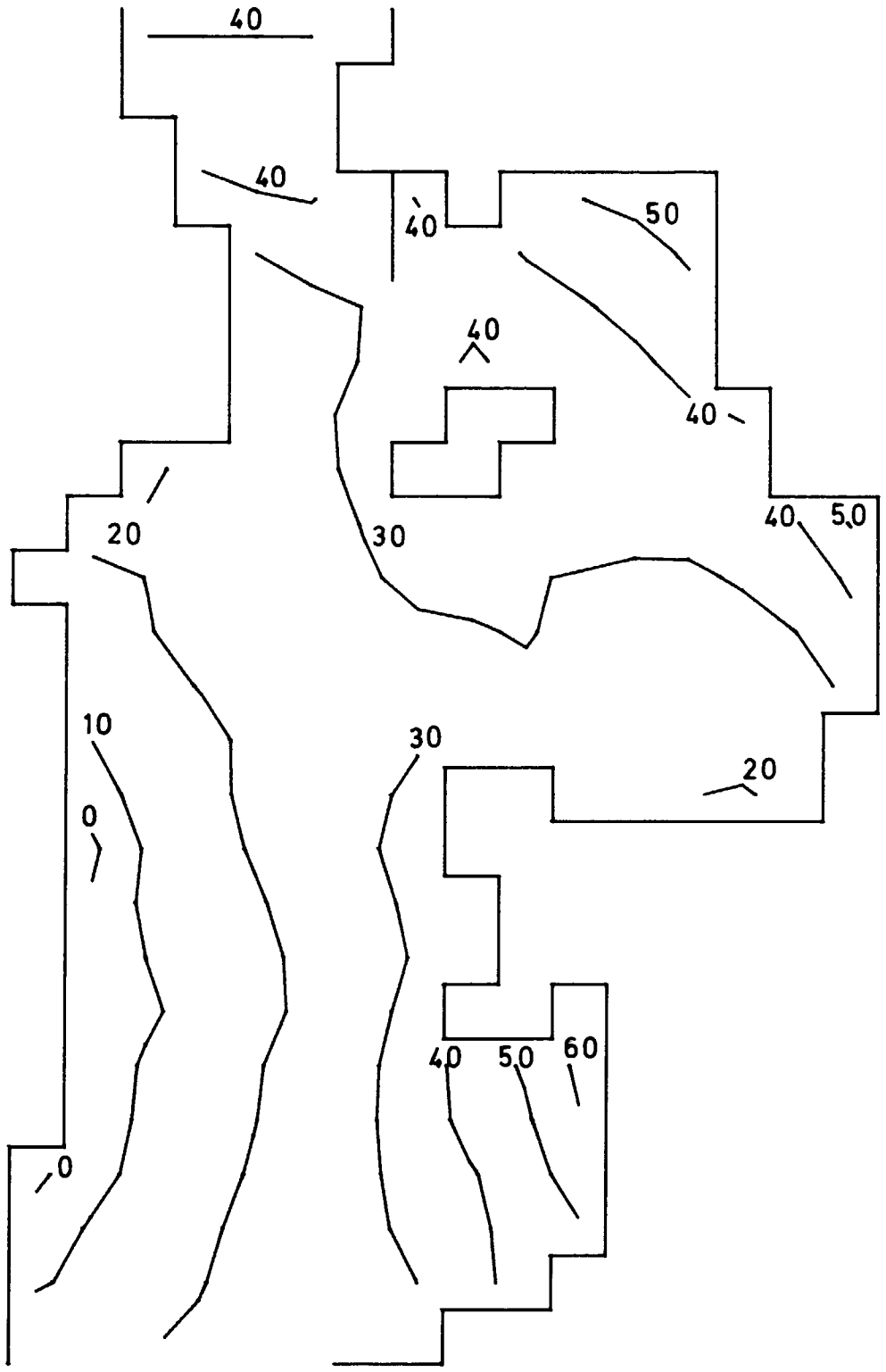

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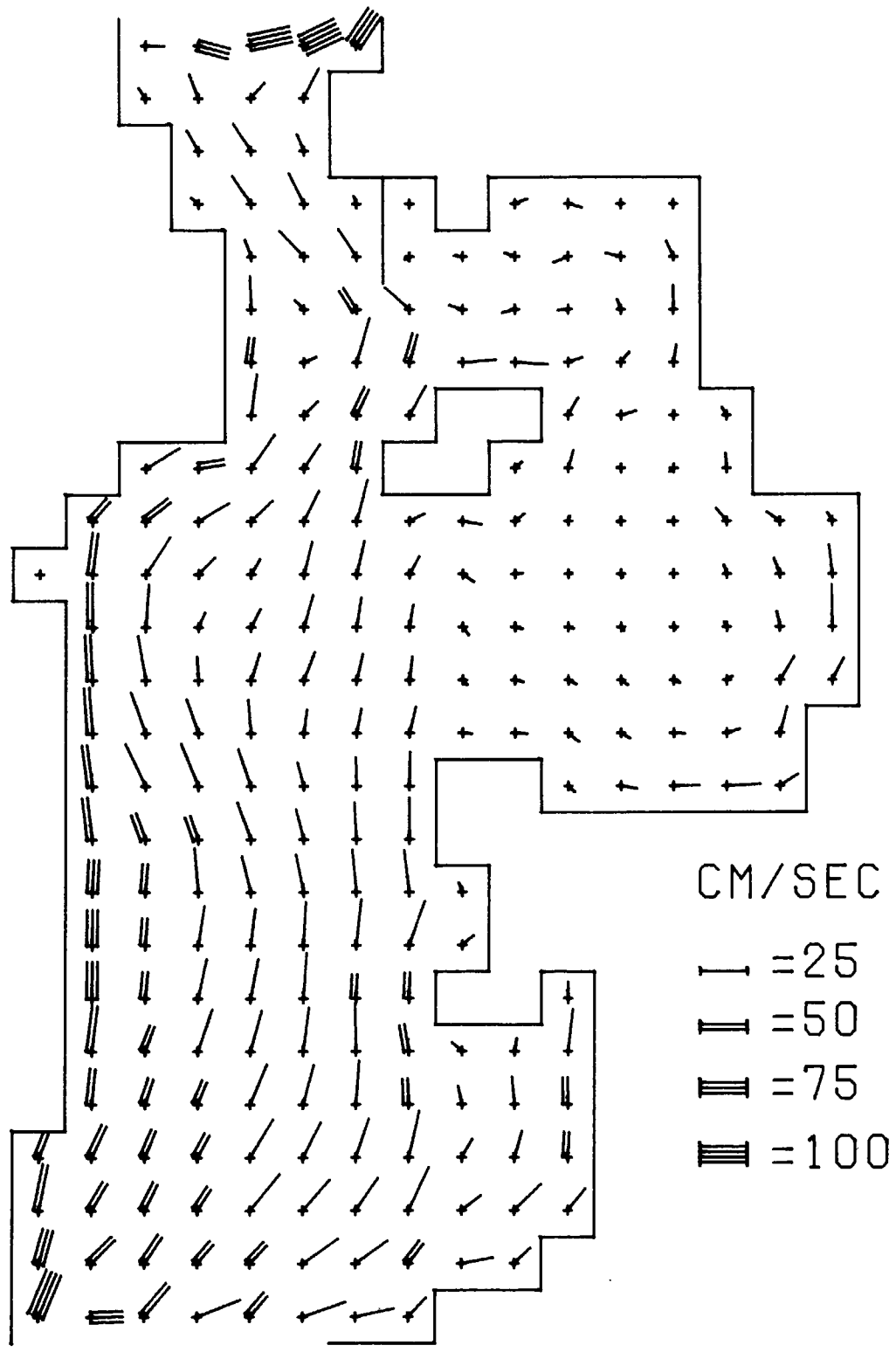

5 HRS 11TH

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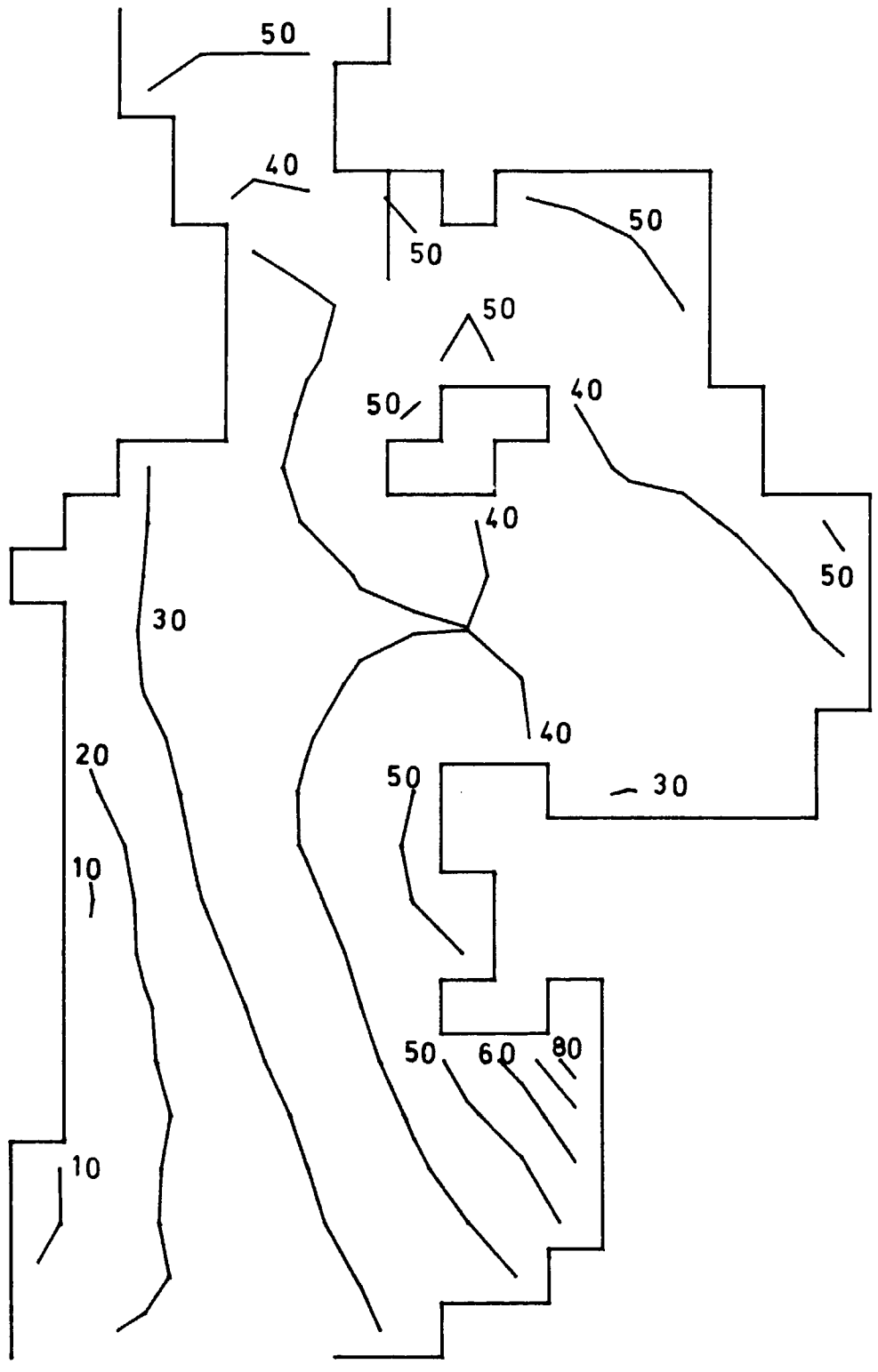

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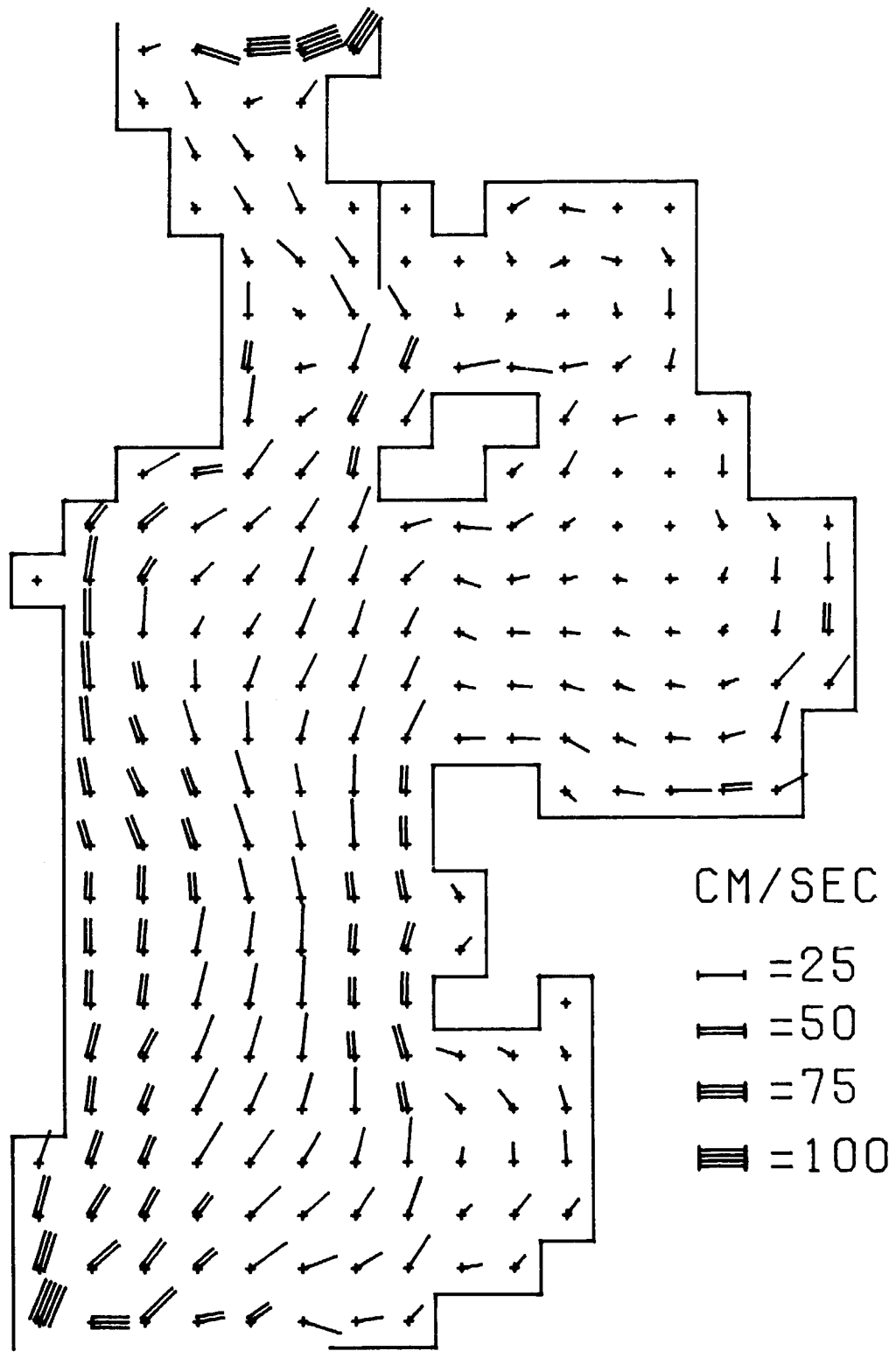

6 HRS 11TH

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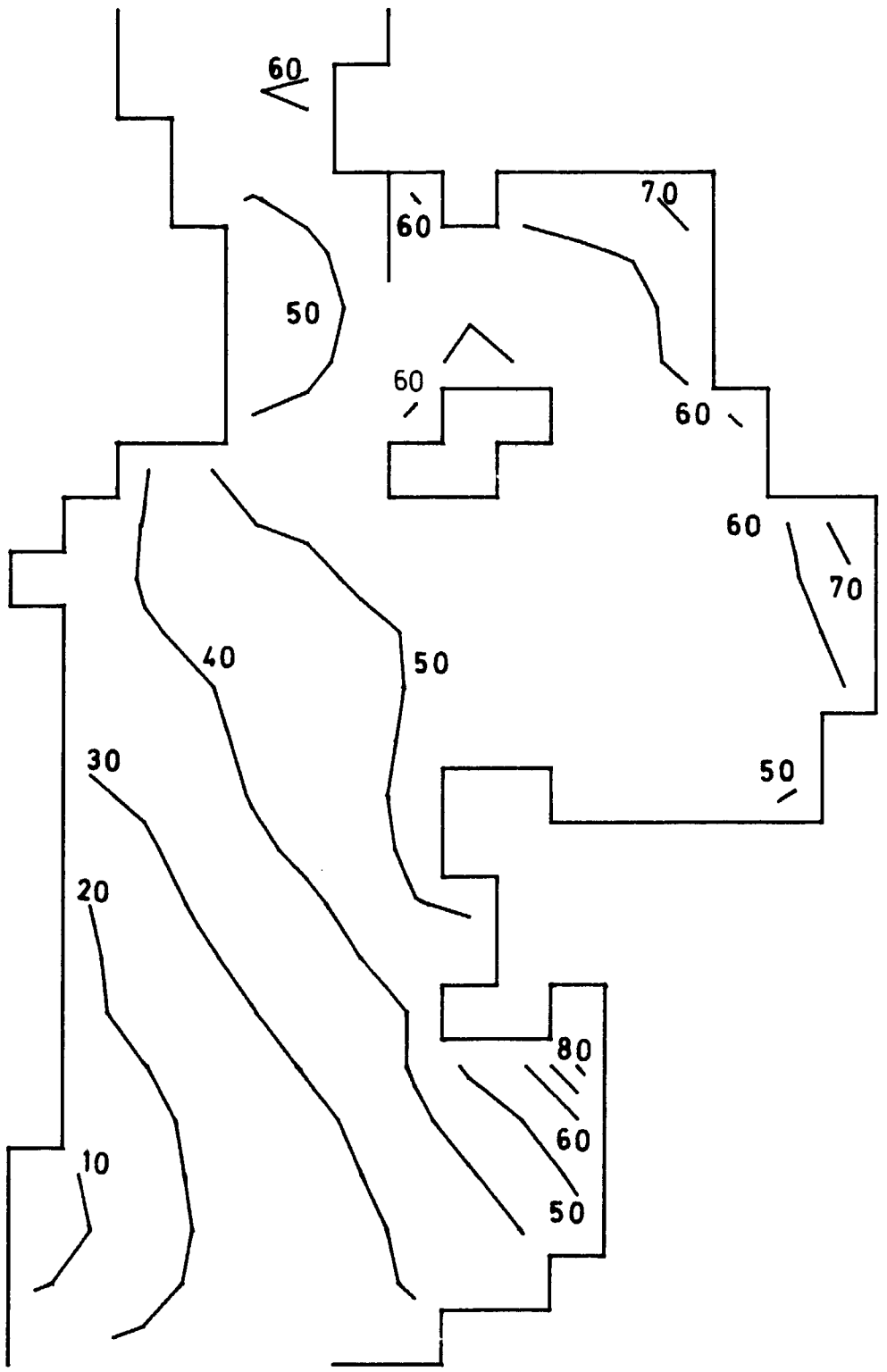

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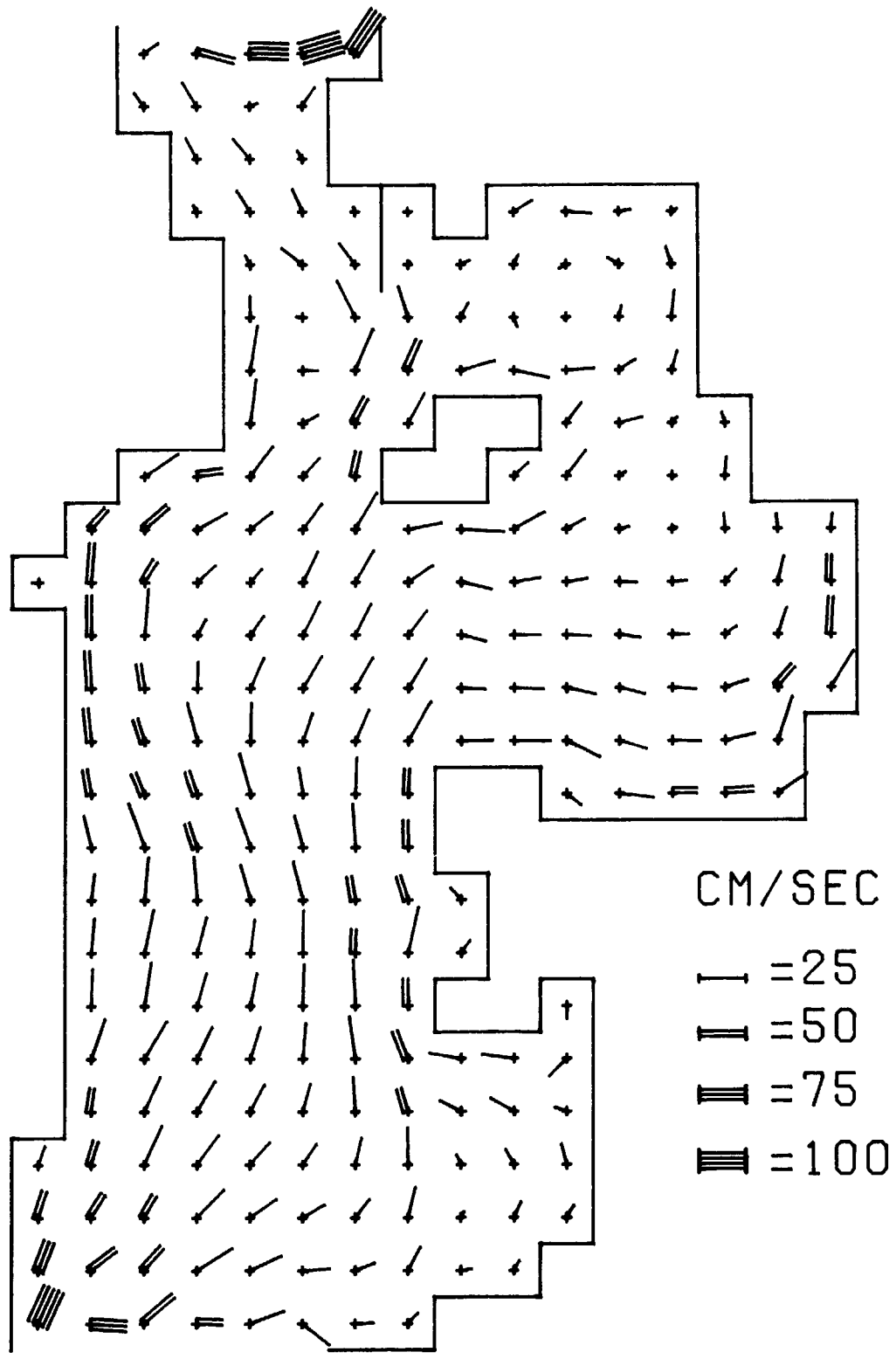

7 HRS 11TH

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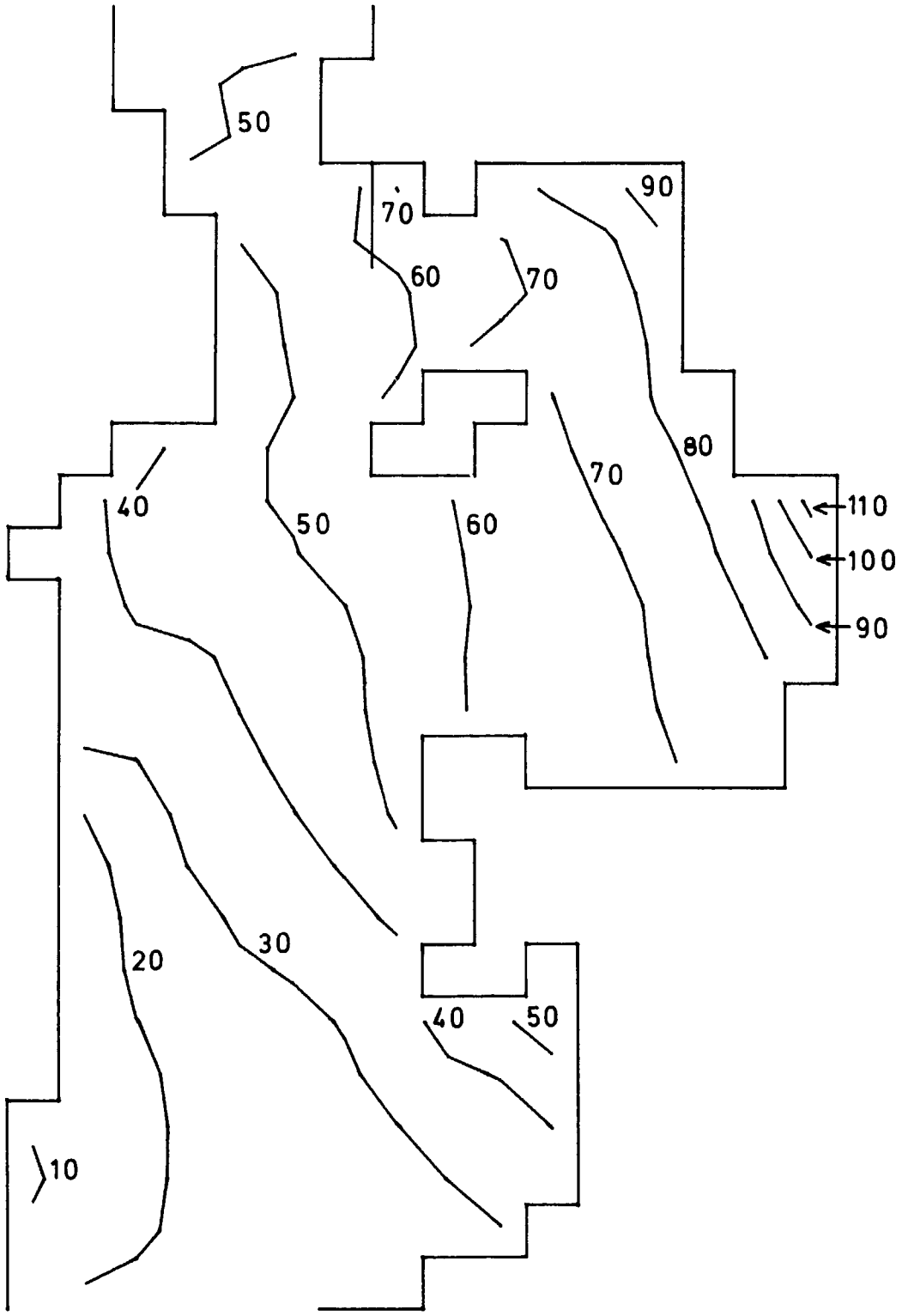

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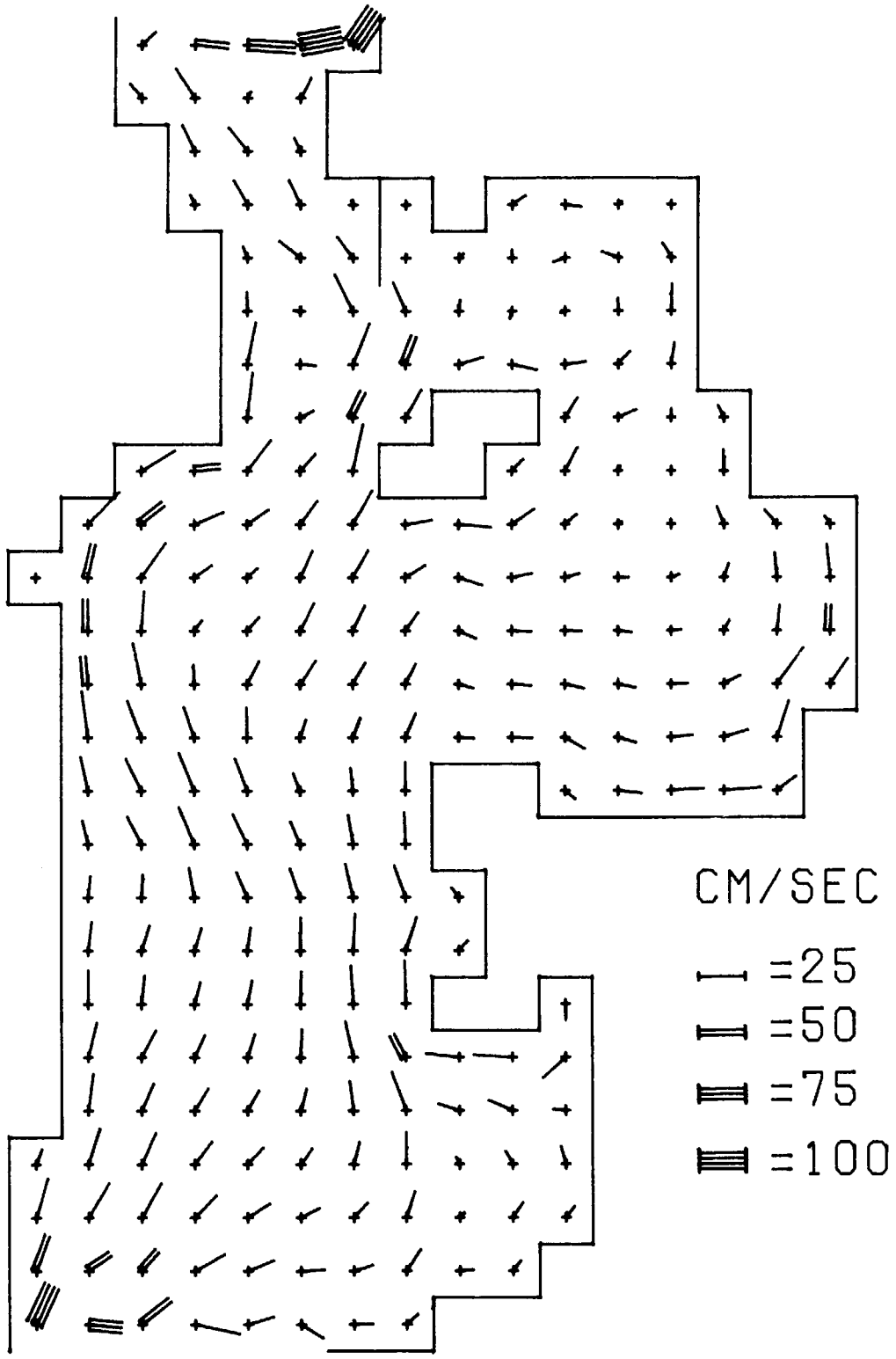

8 HRS 11TH

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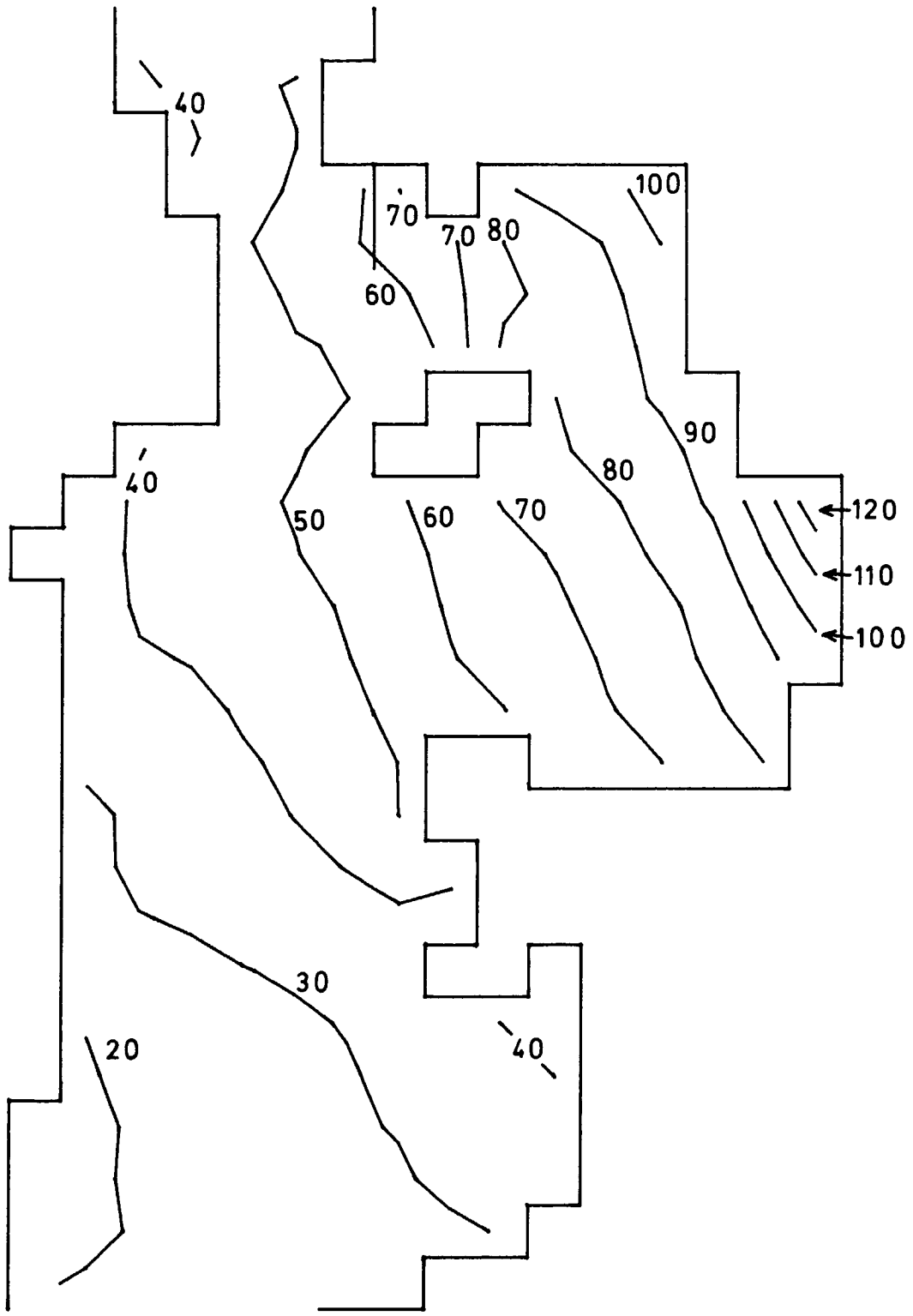

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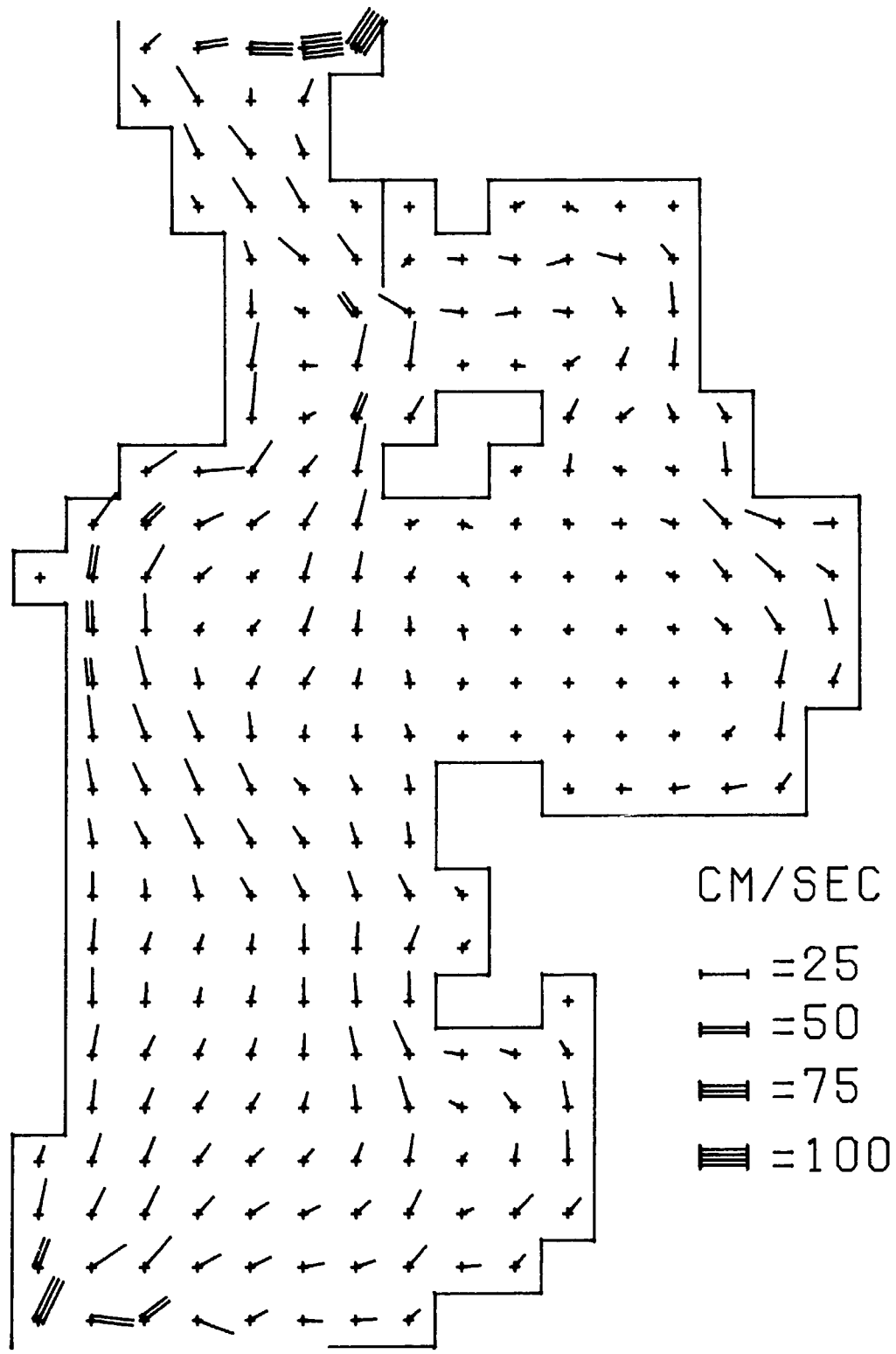

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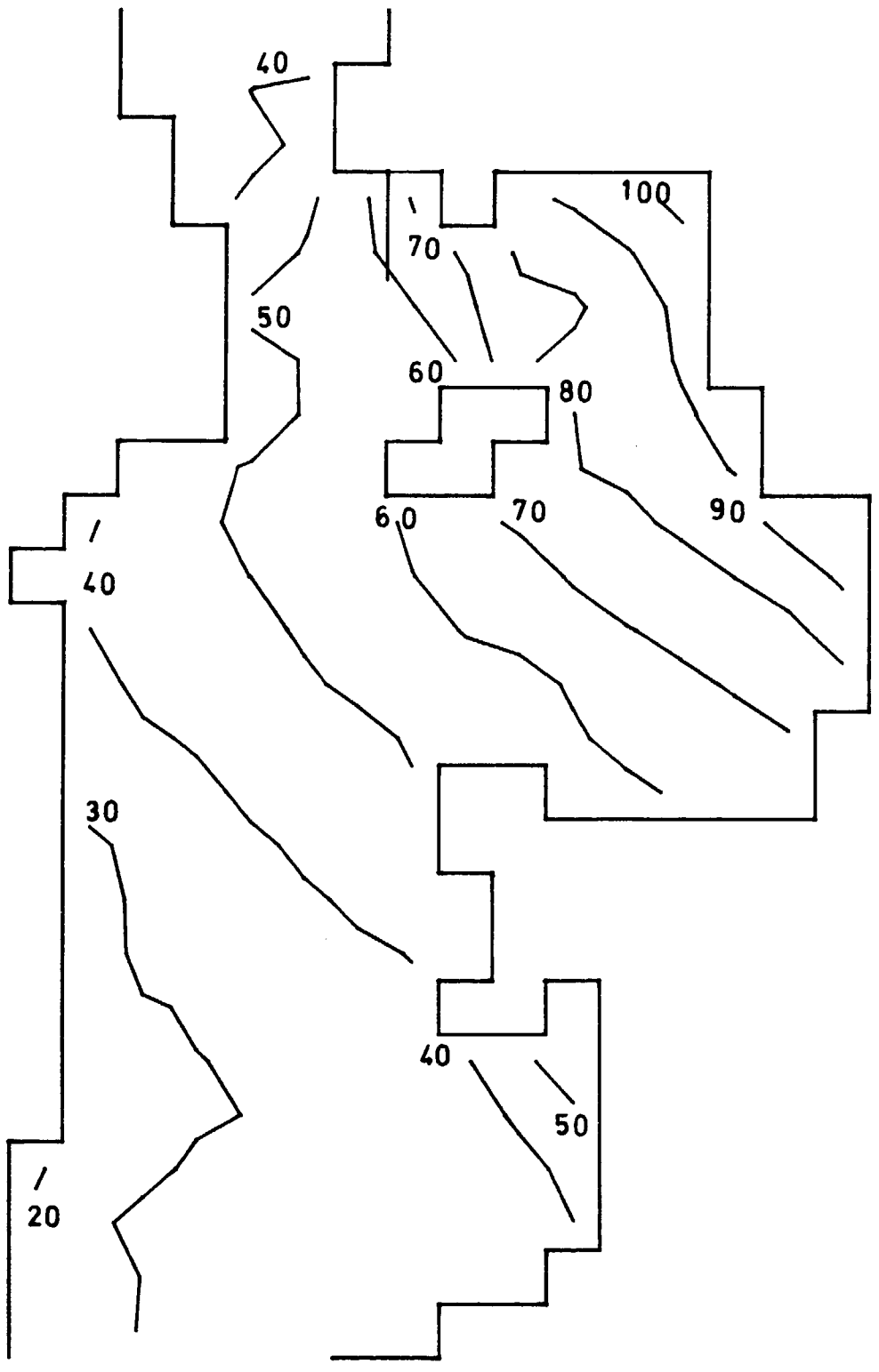

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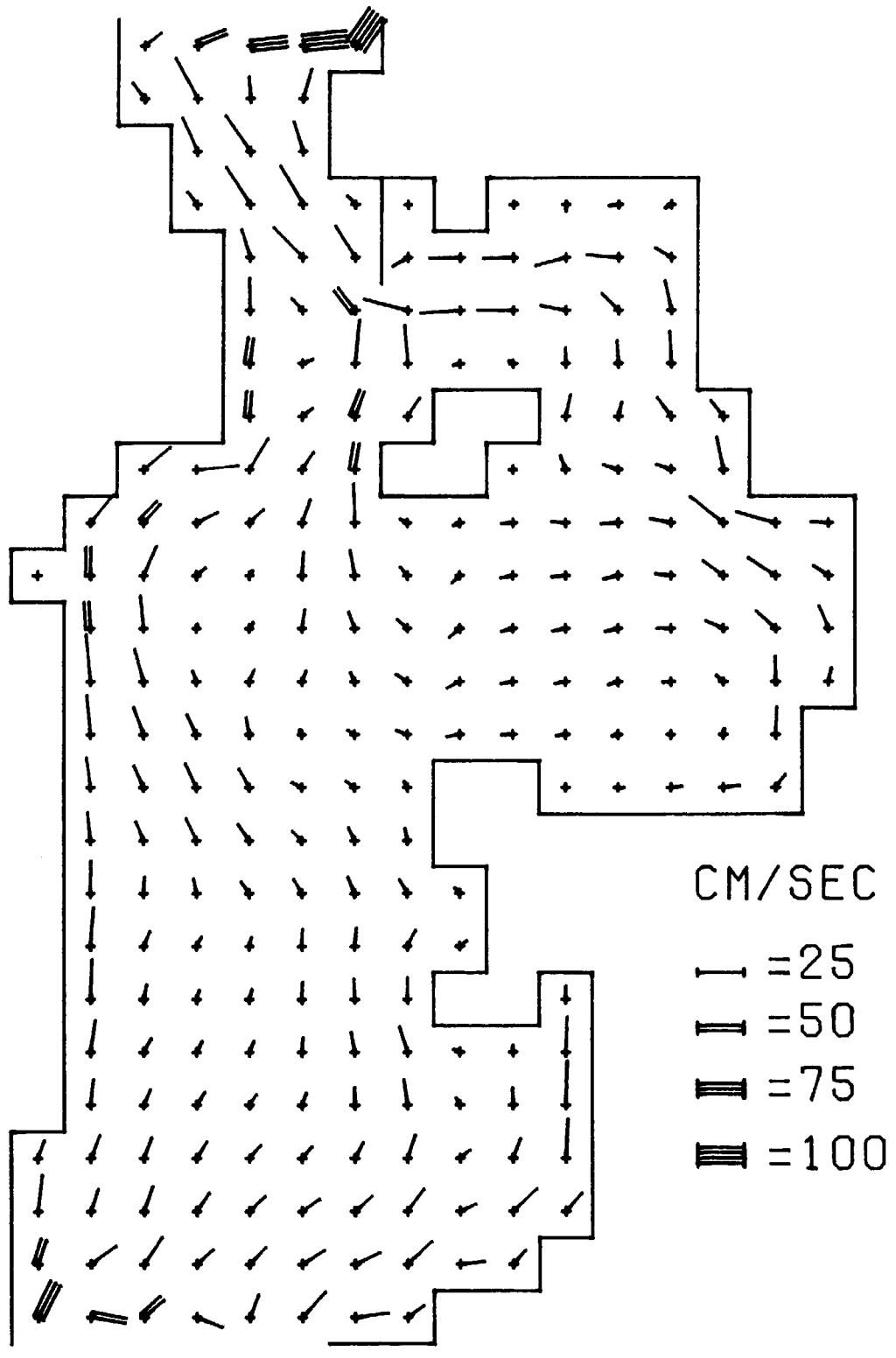

10 HRS 11TH

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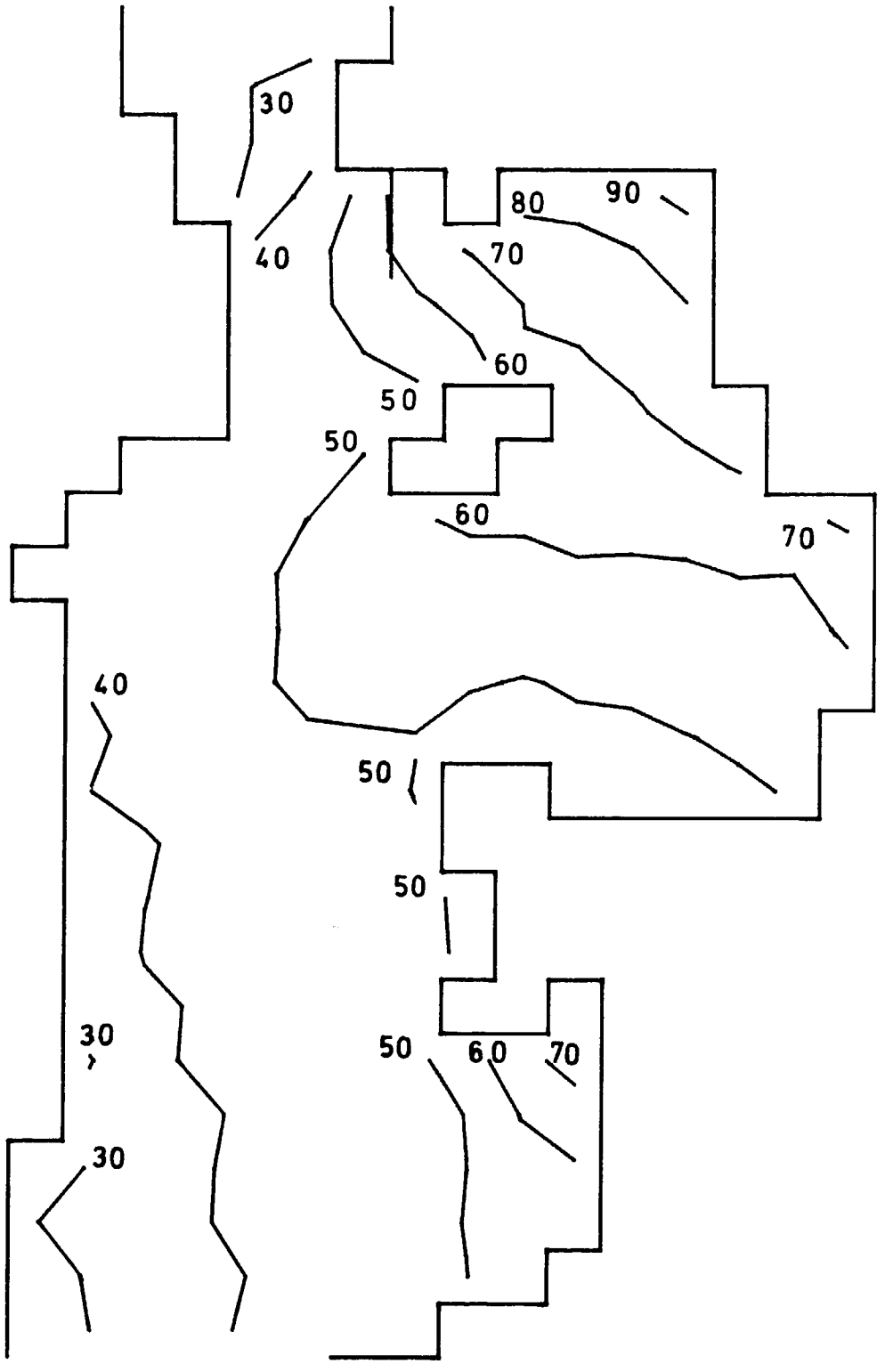

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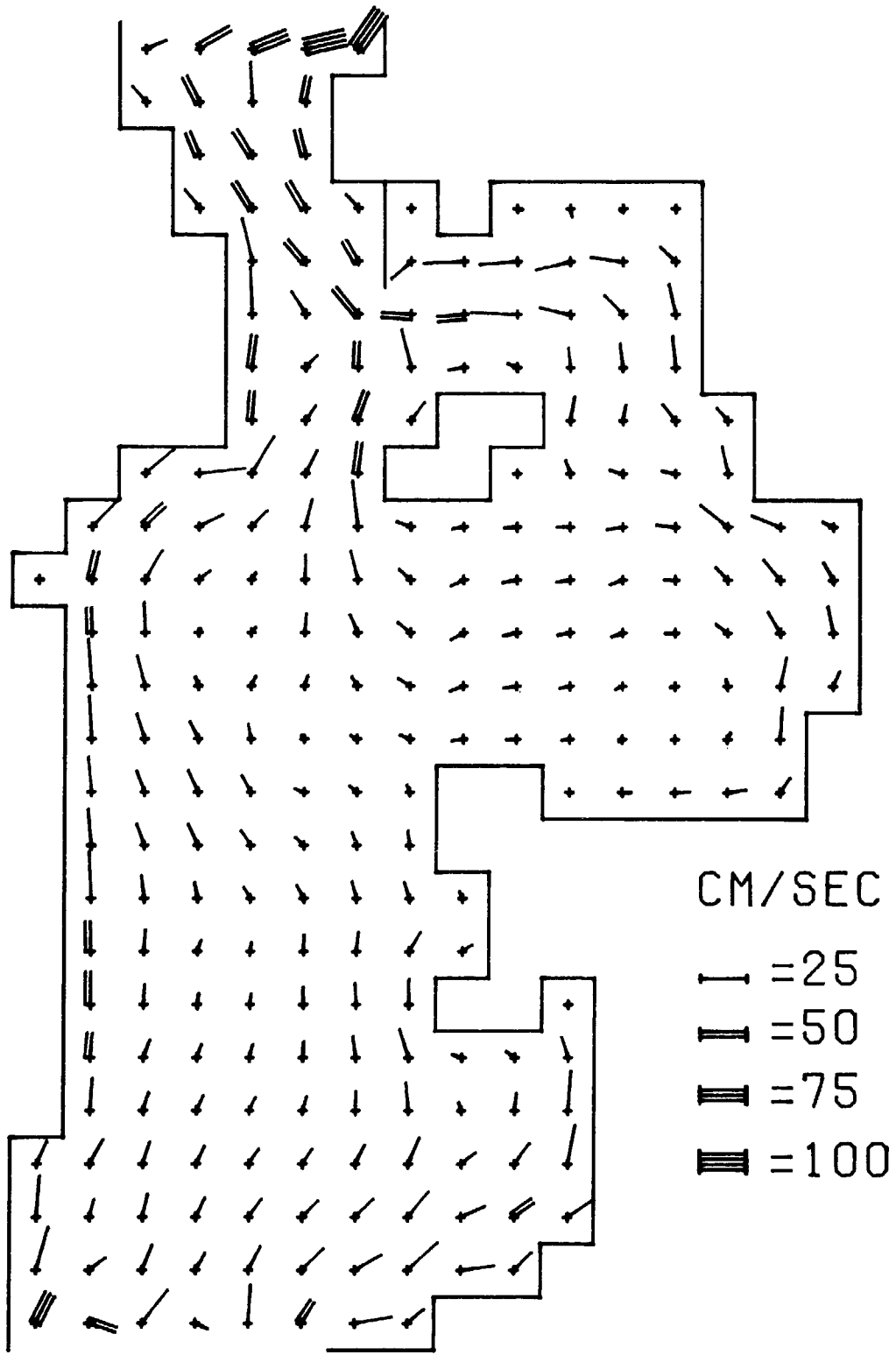

11 HRS 11TH

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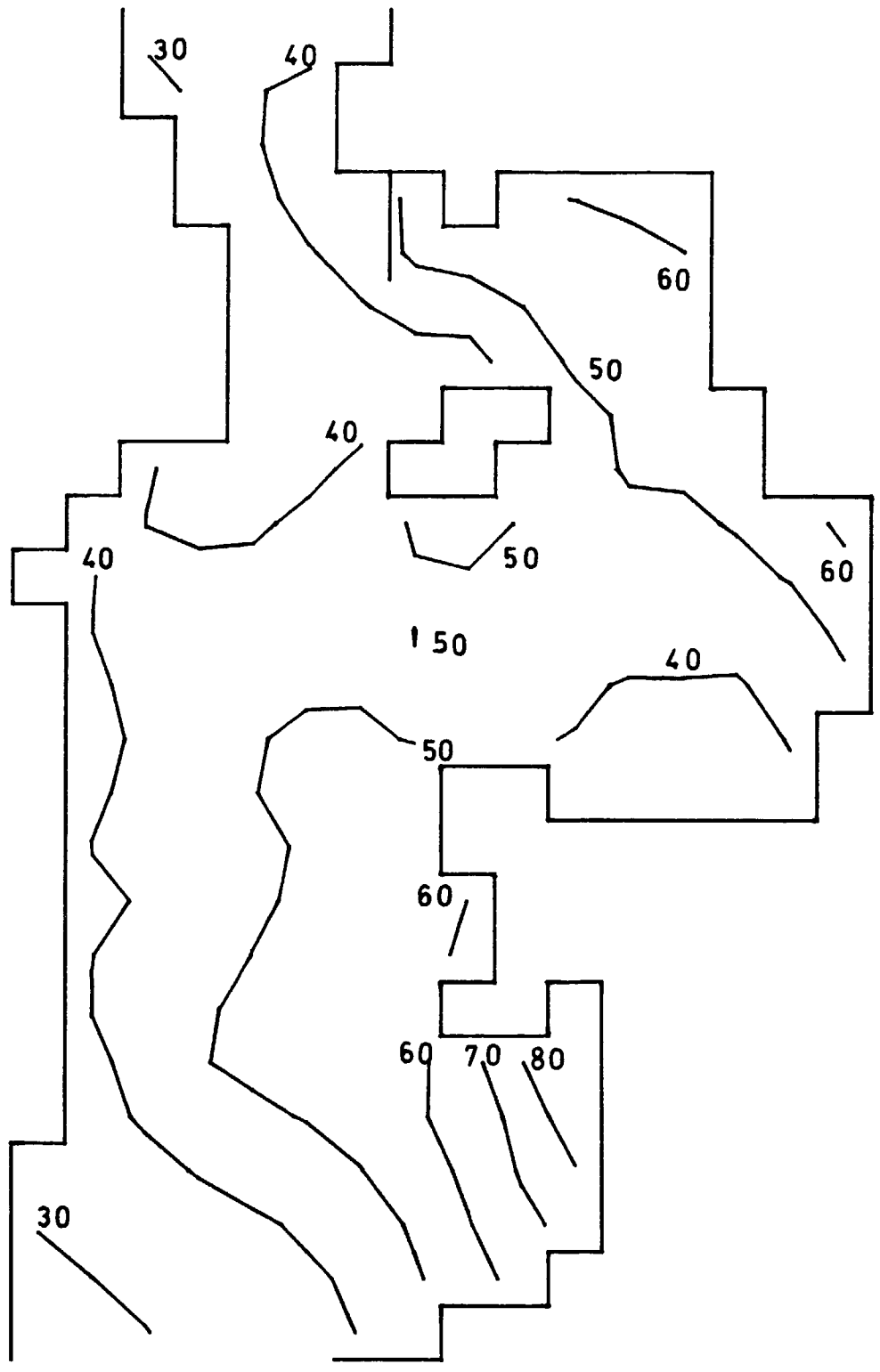

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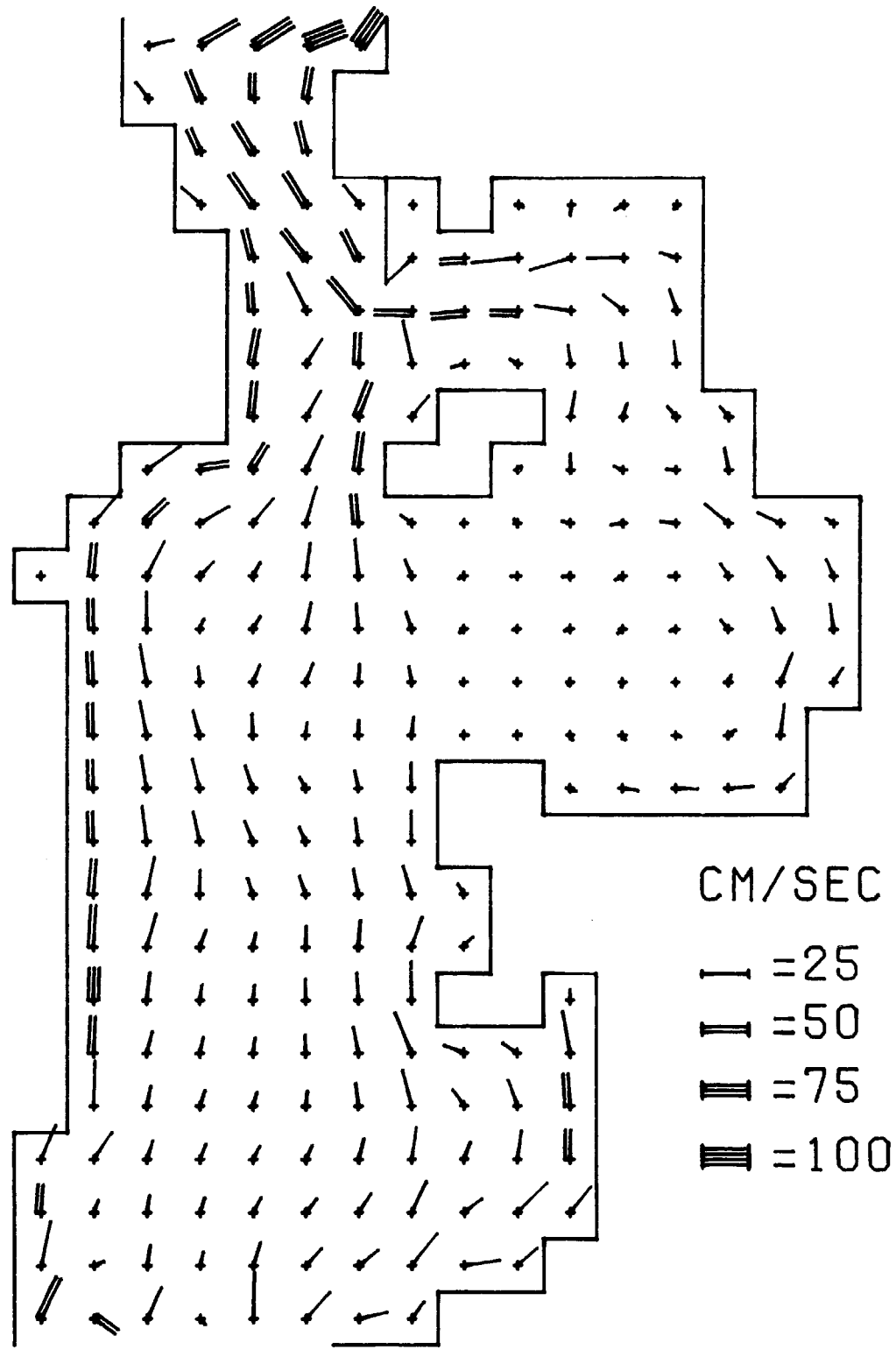

12 HRS 11TH

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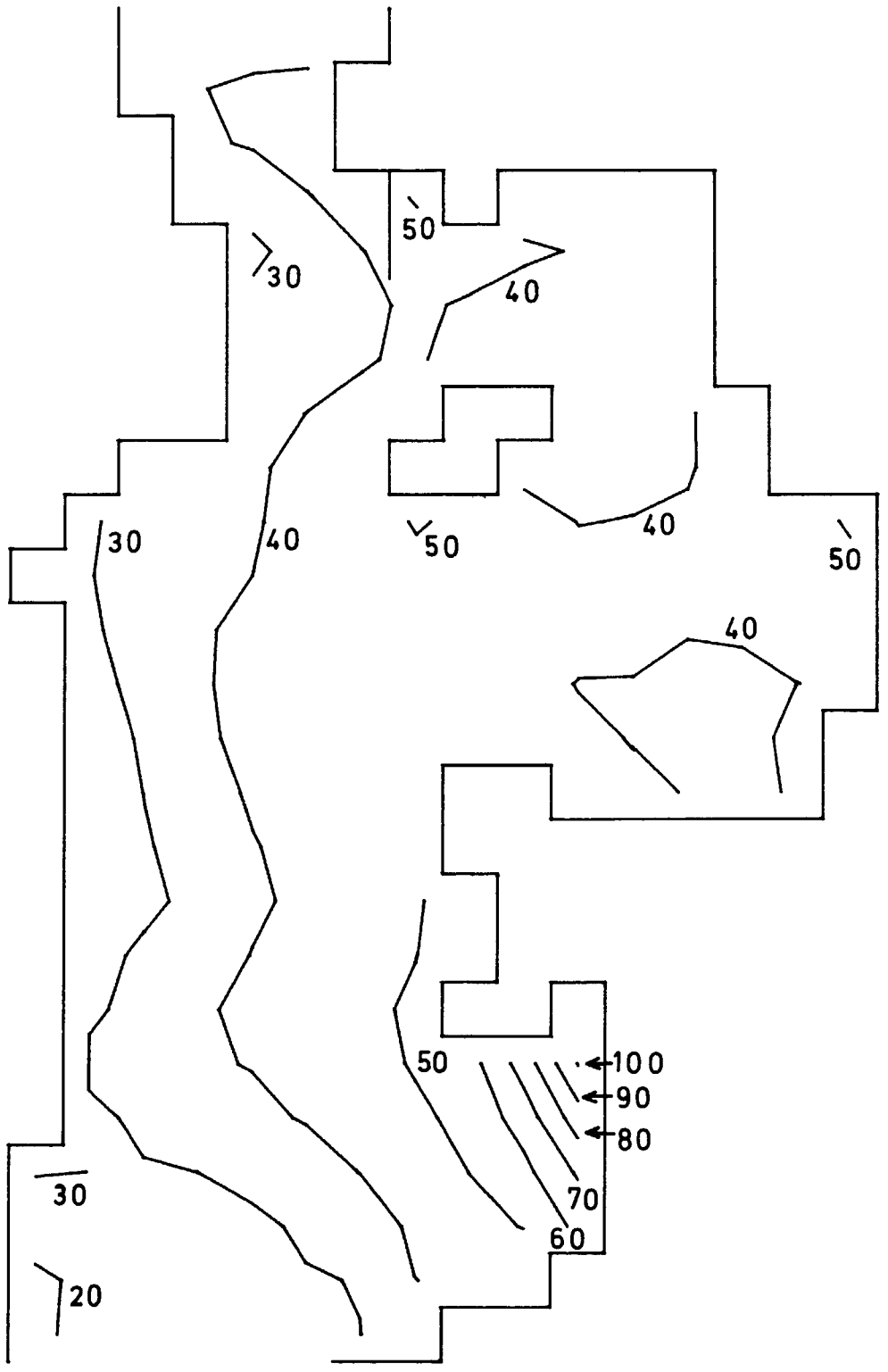

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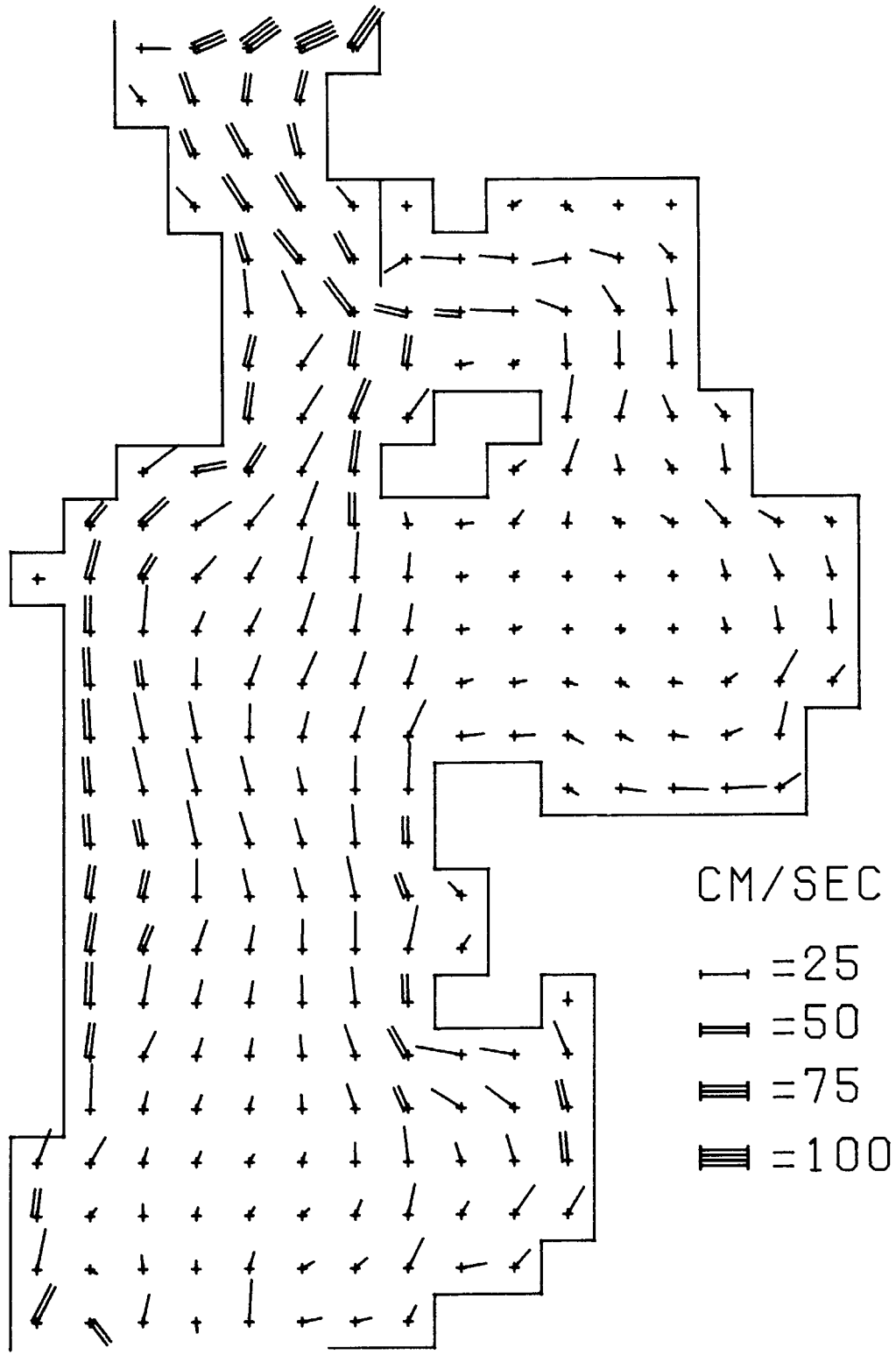

13 HRS 11TH

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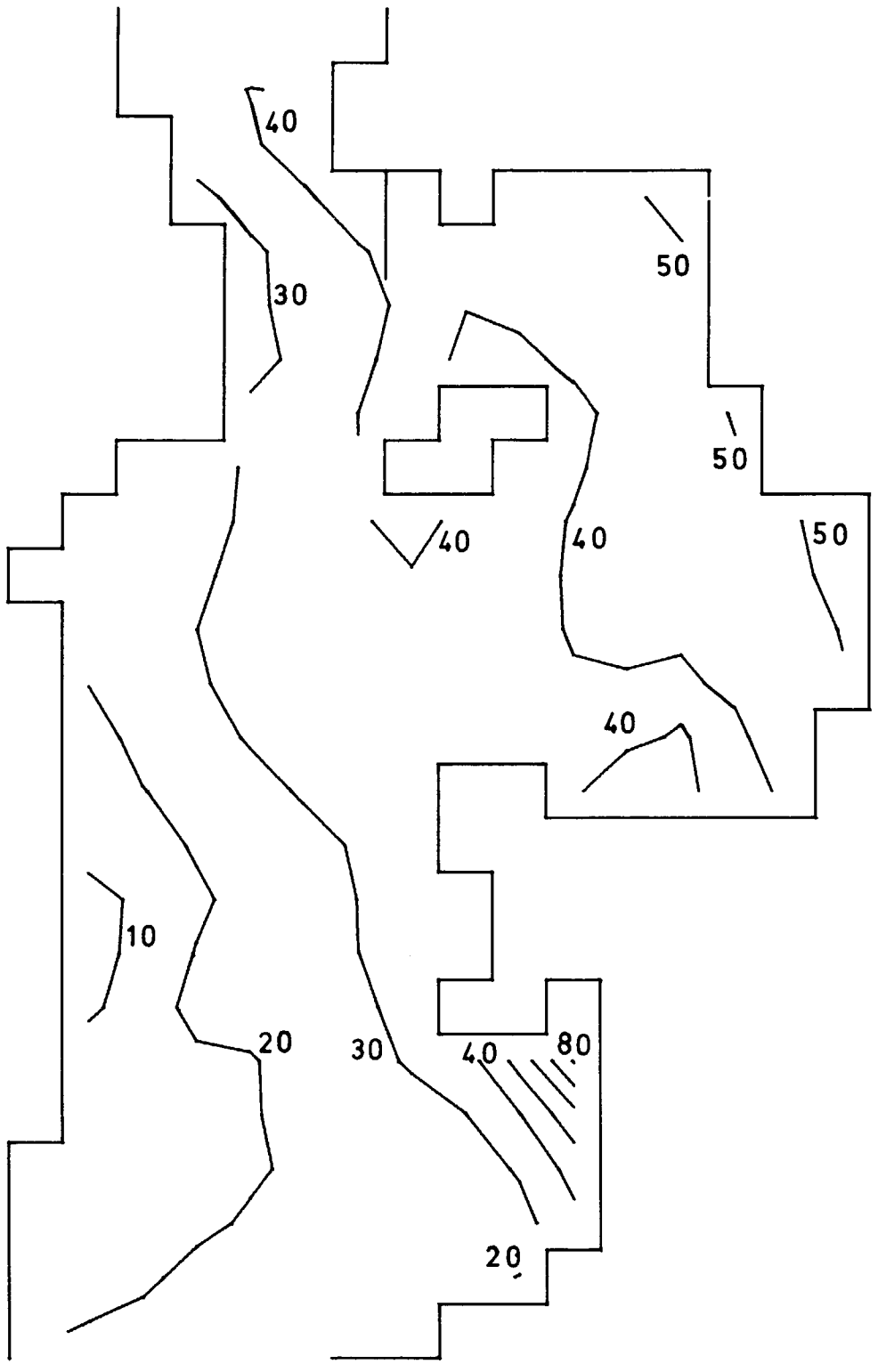

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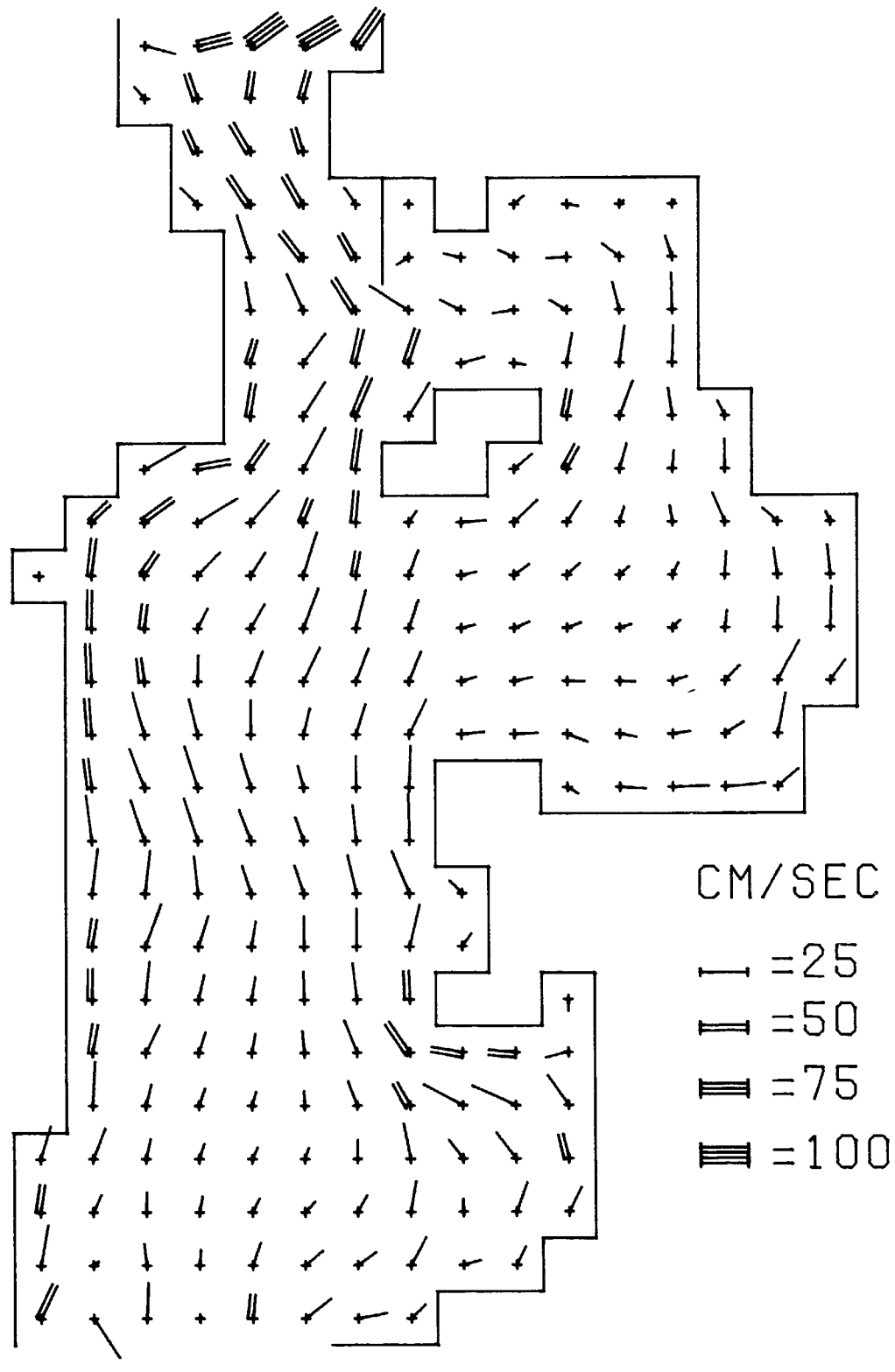

14 HRS 11TH

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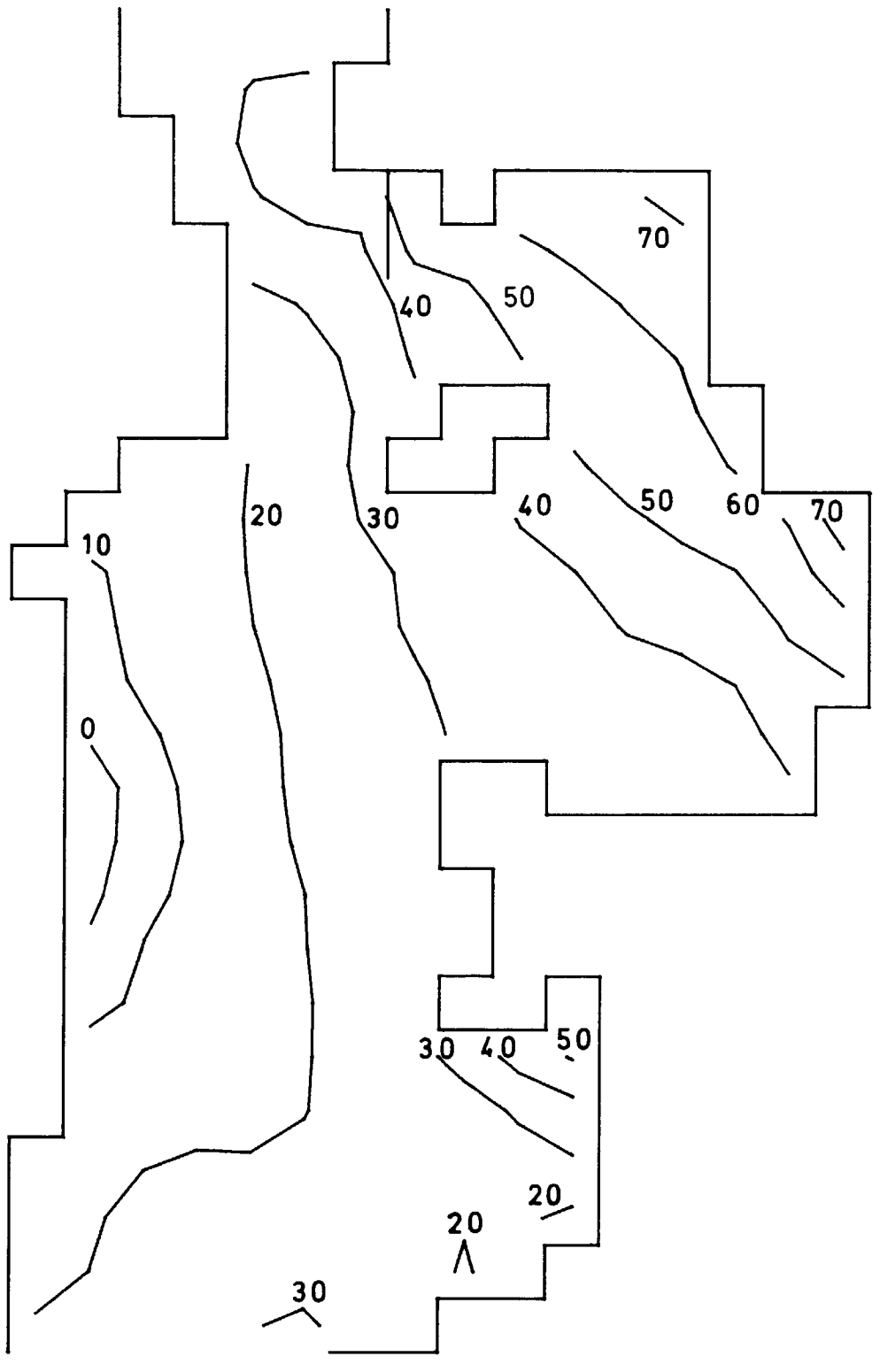

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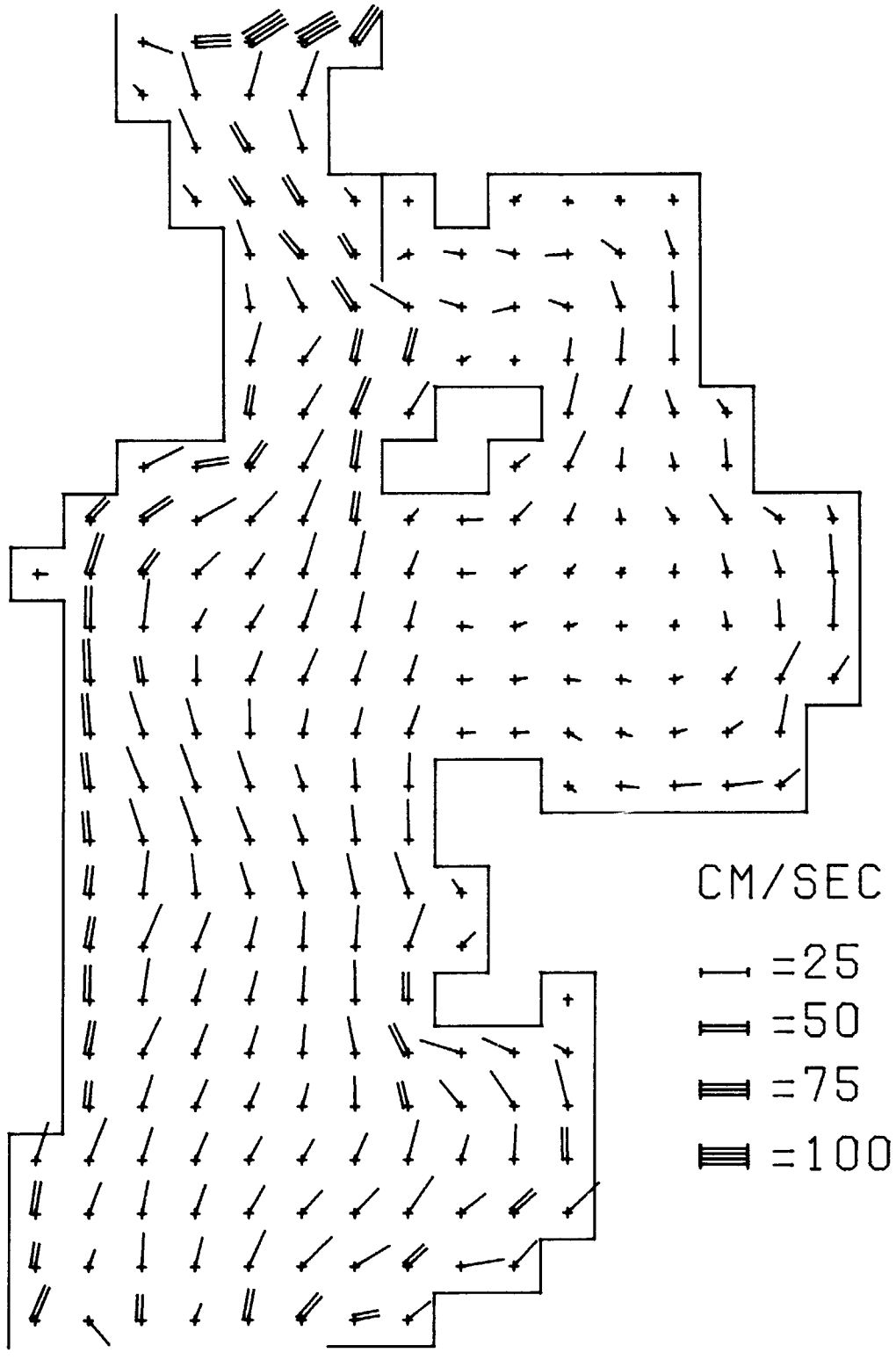

15 HRS 11TH

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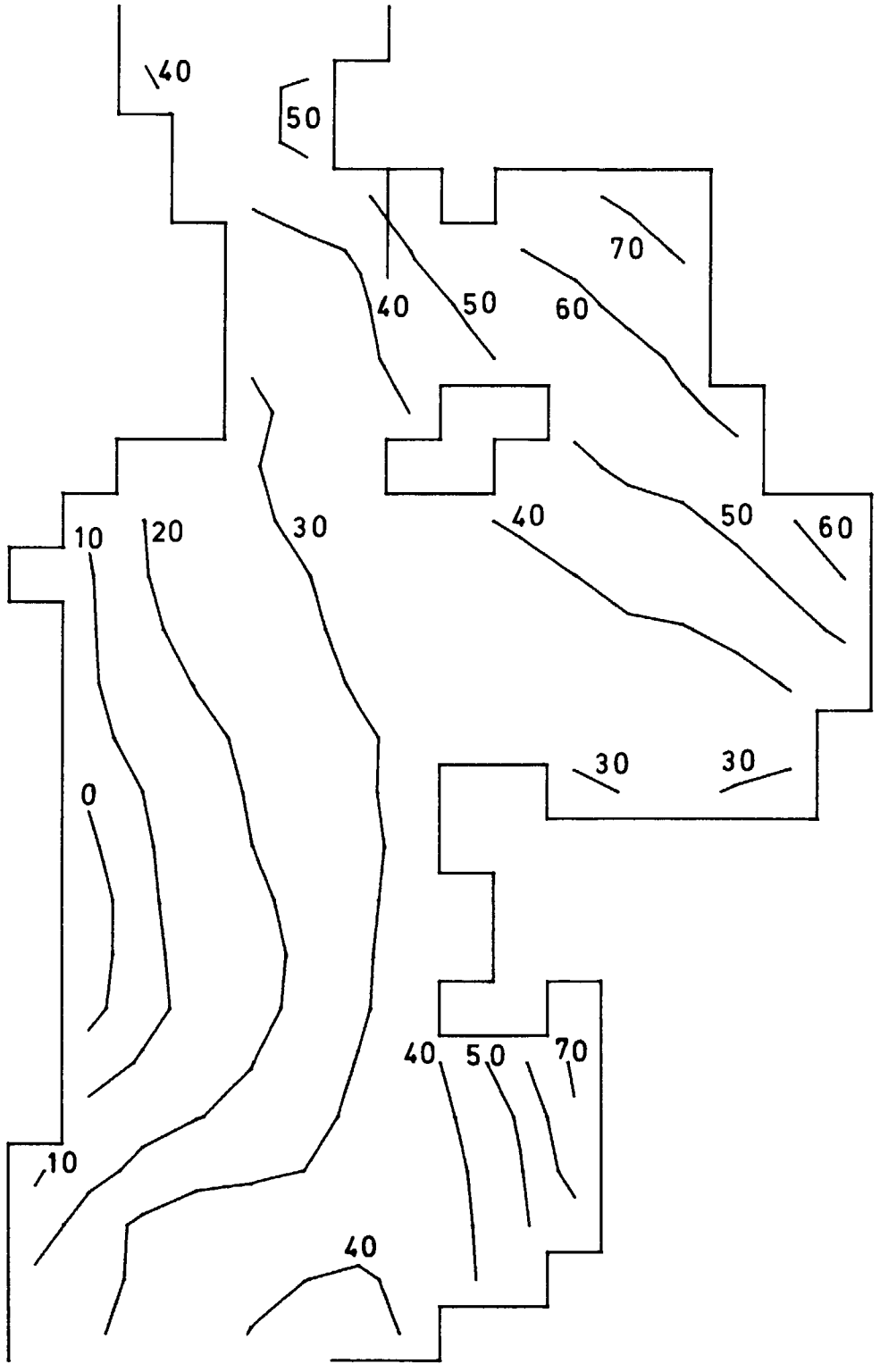

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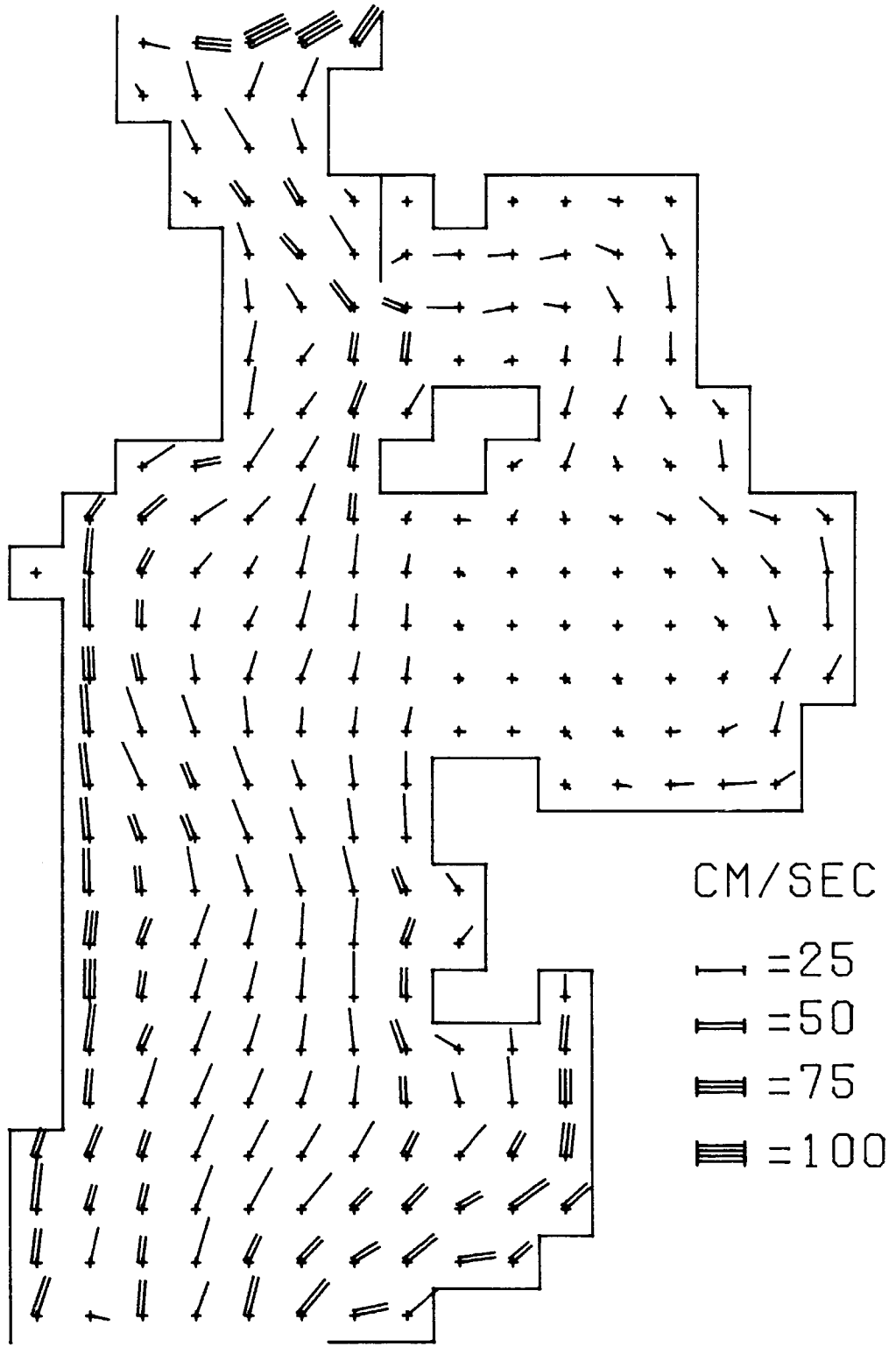

16 HRS 11TH

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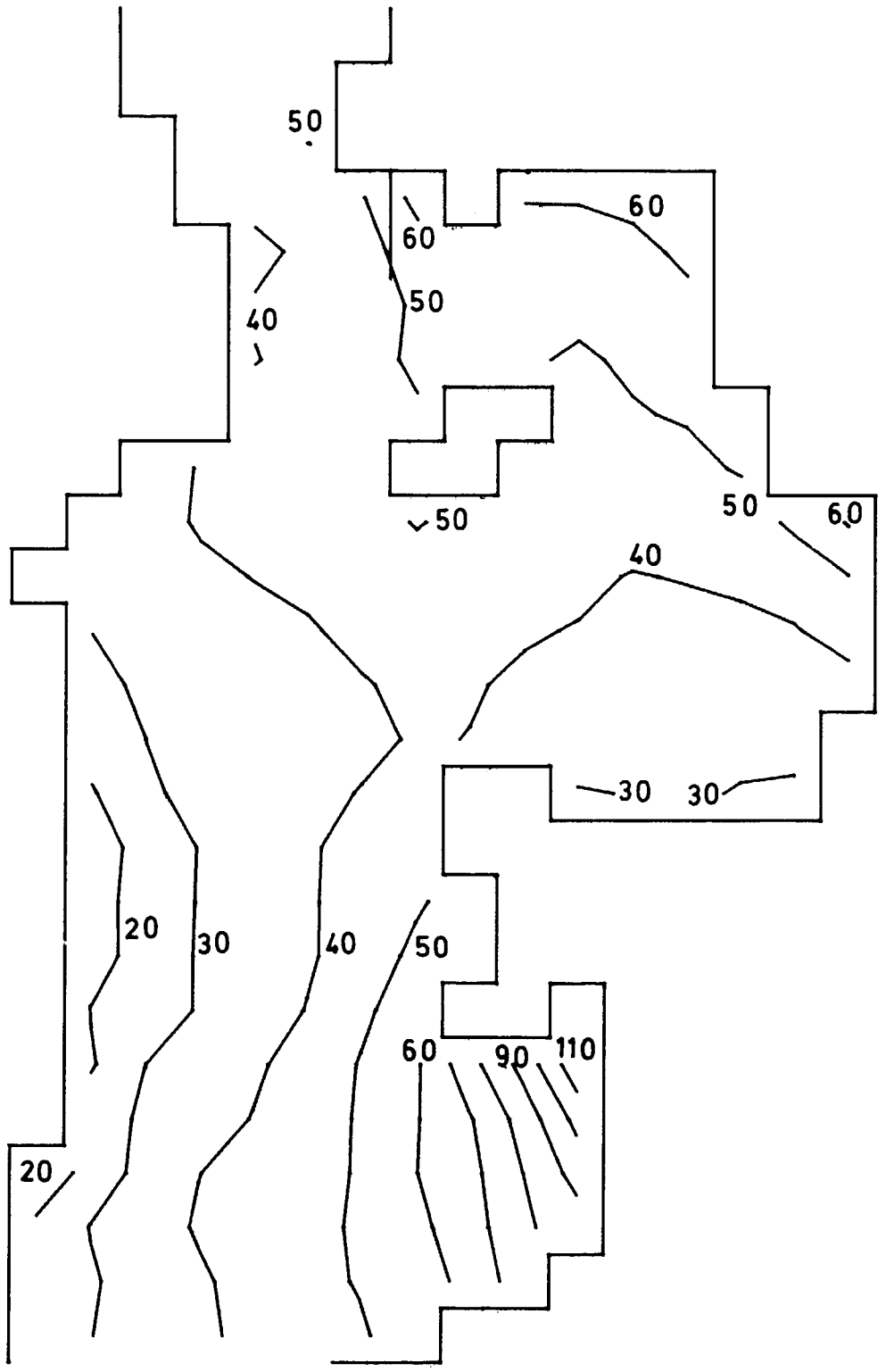

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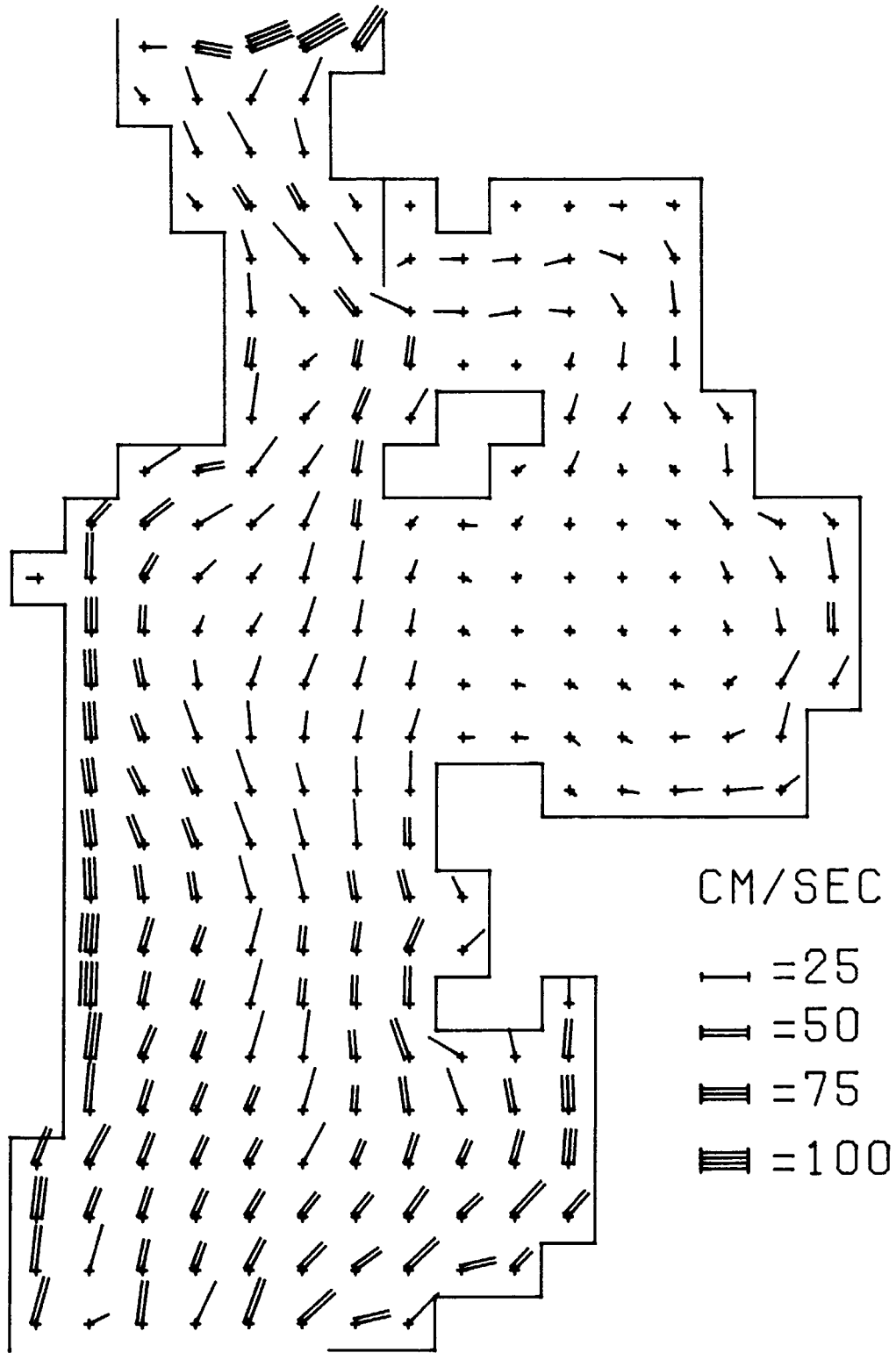

17 HRS 11TH

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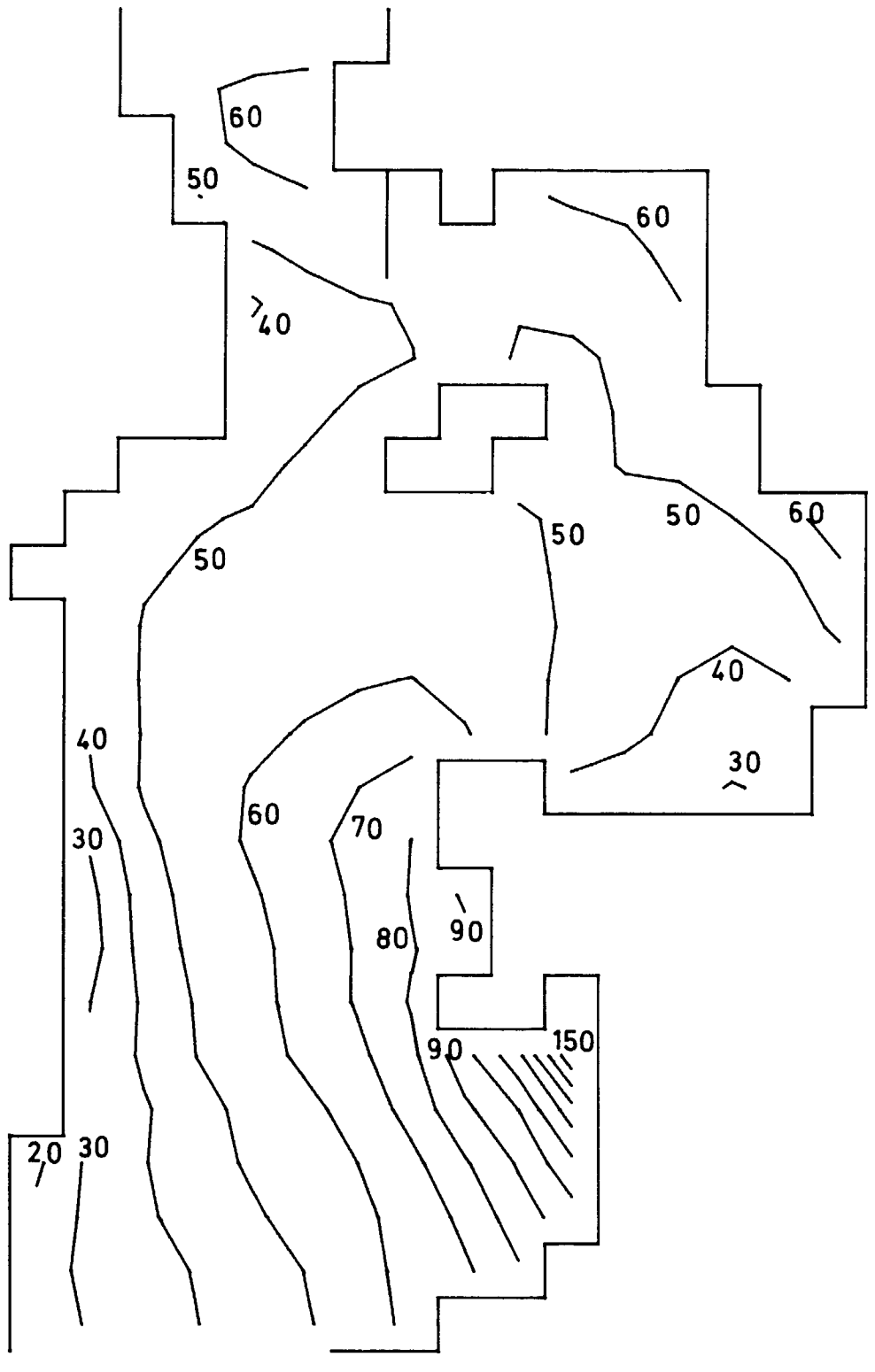

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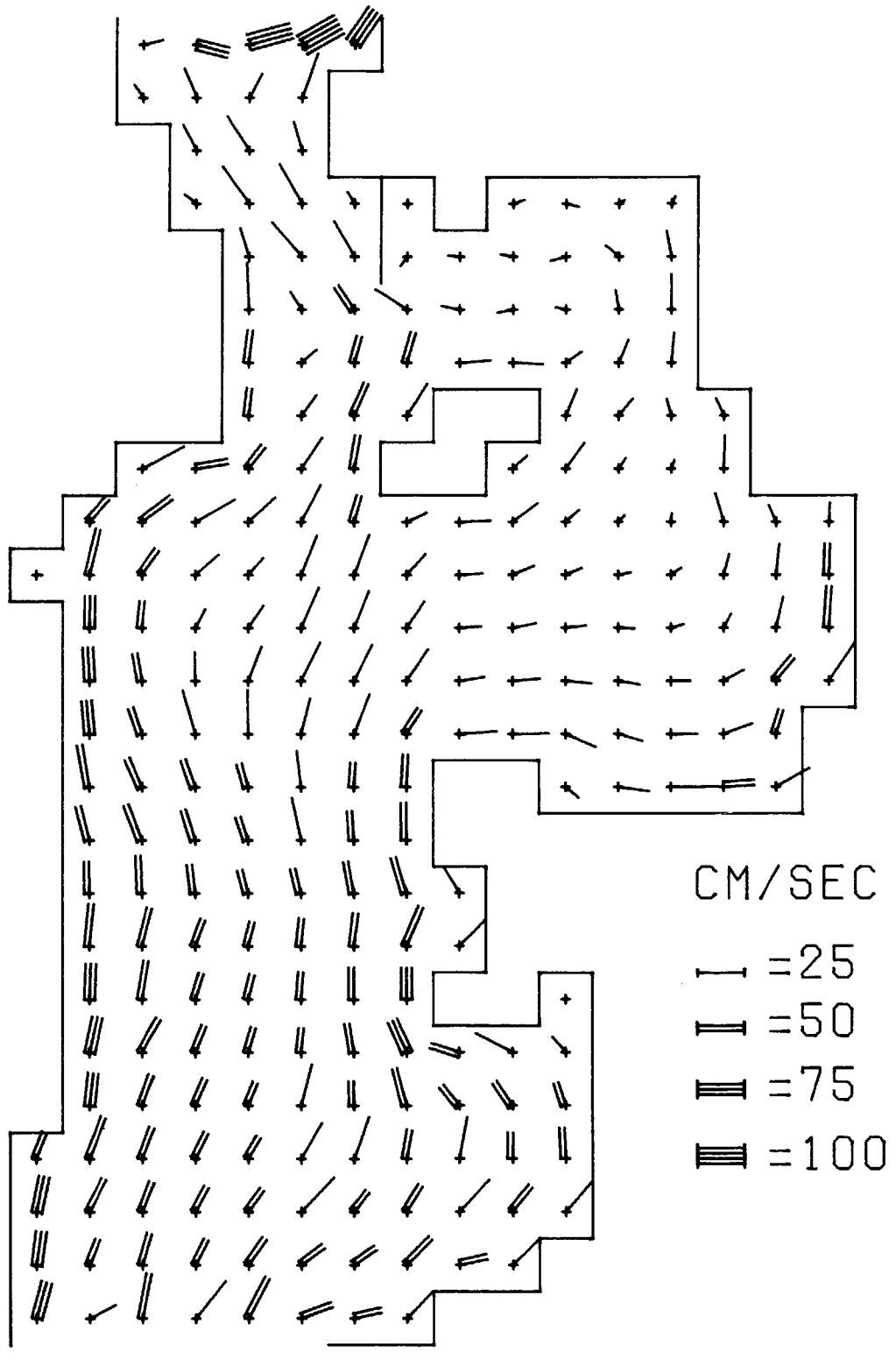

18 HRS 11TH

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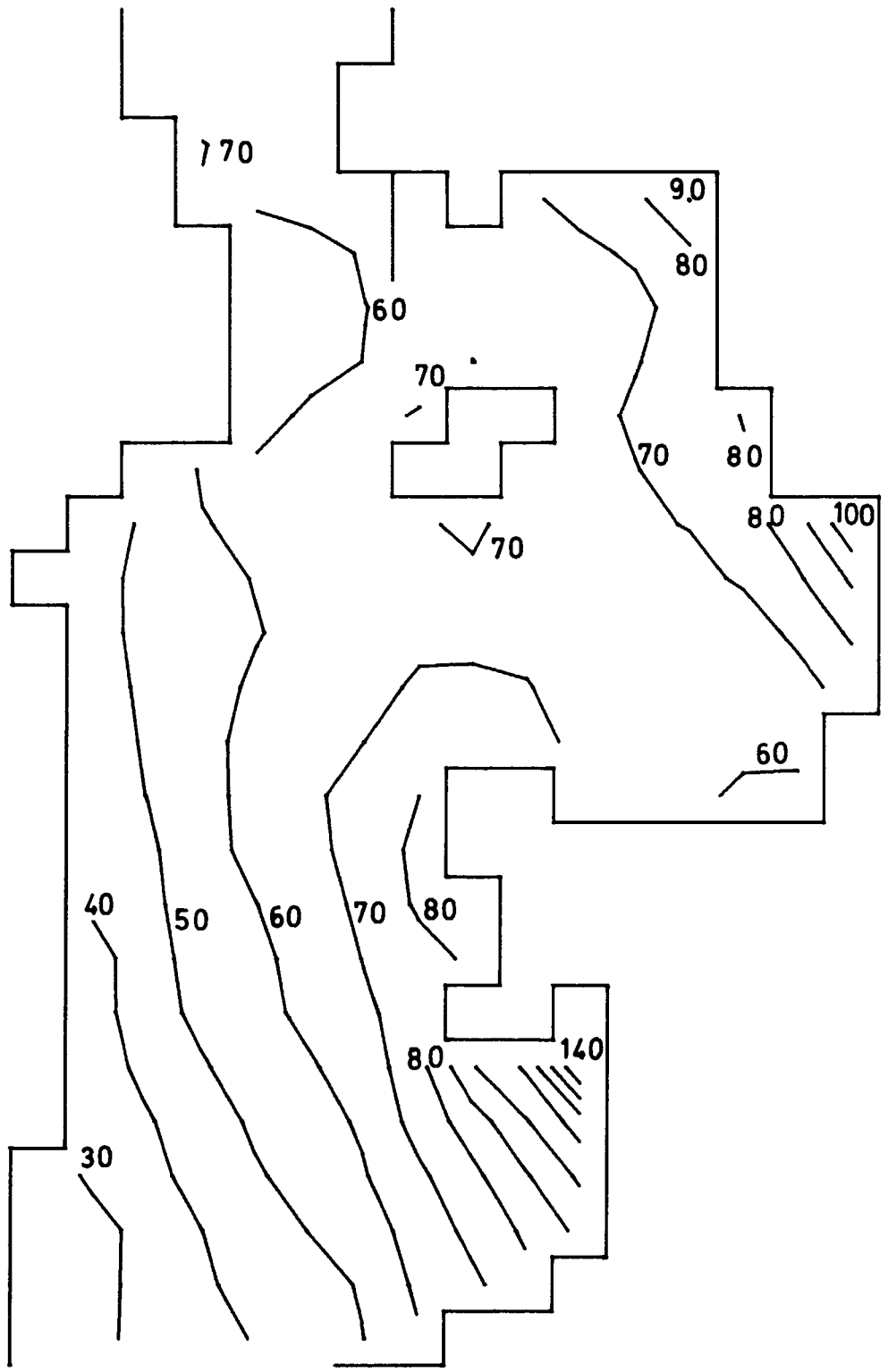

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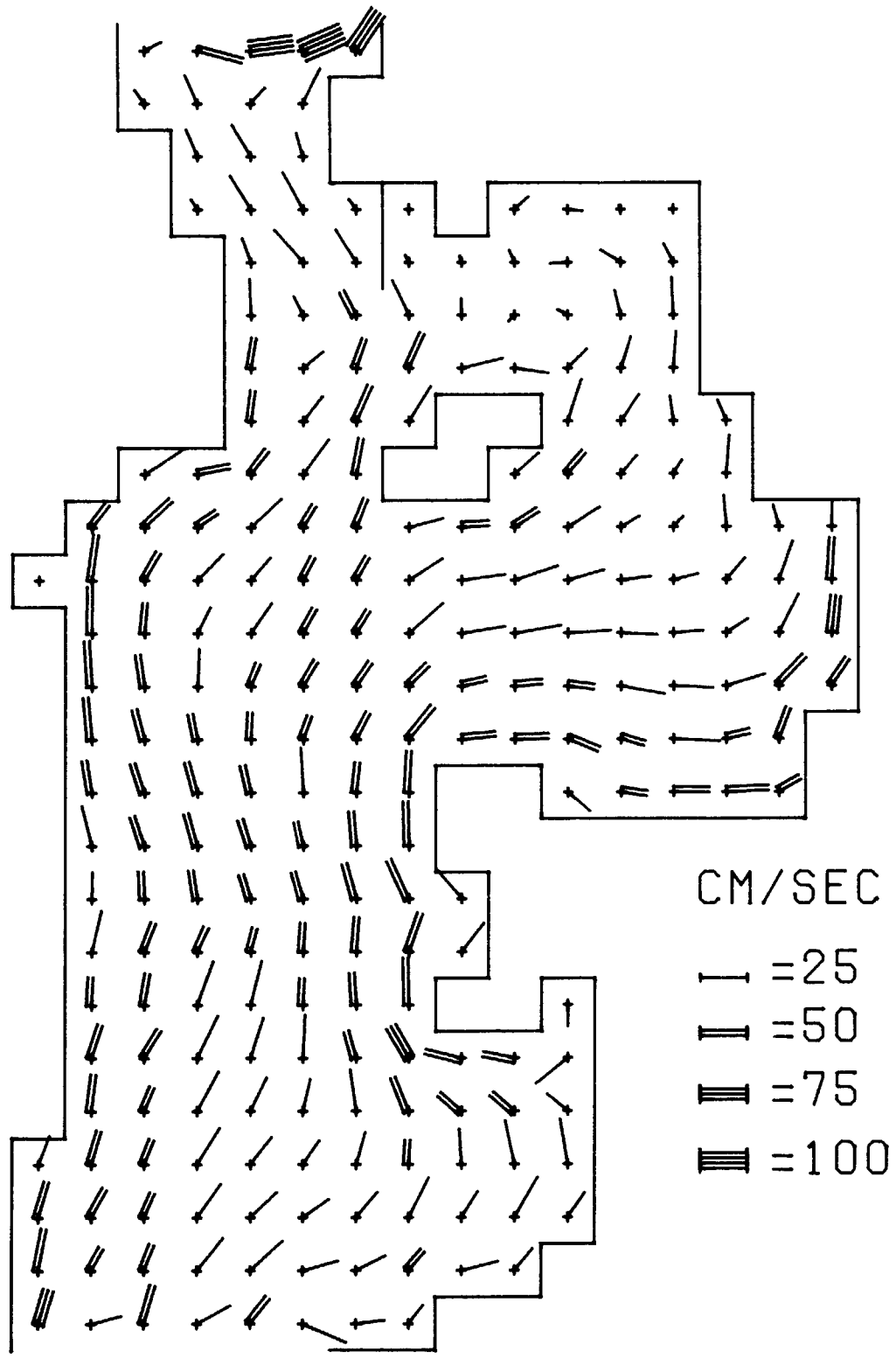

19 HRS 11TH

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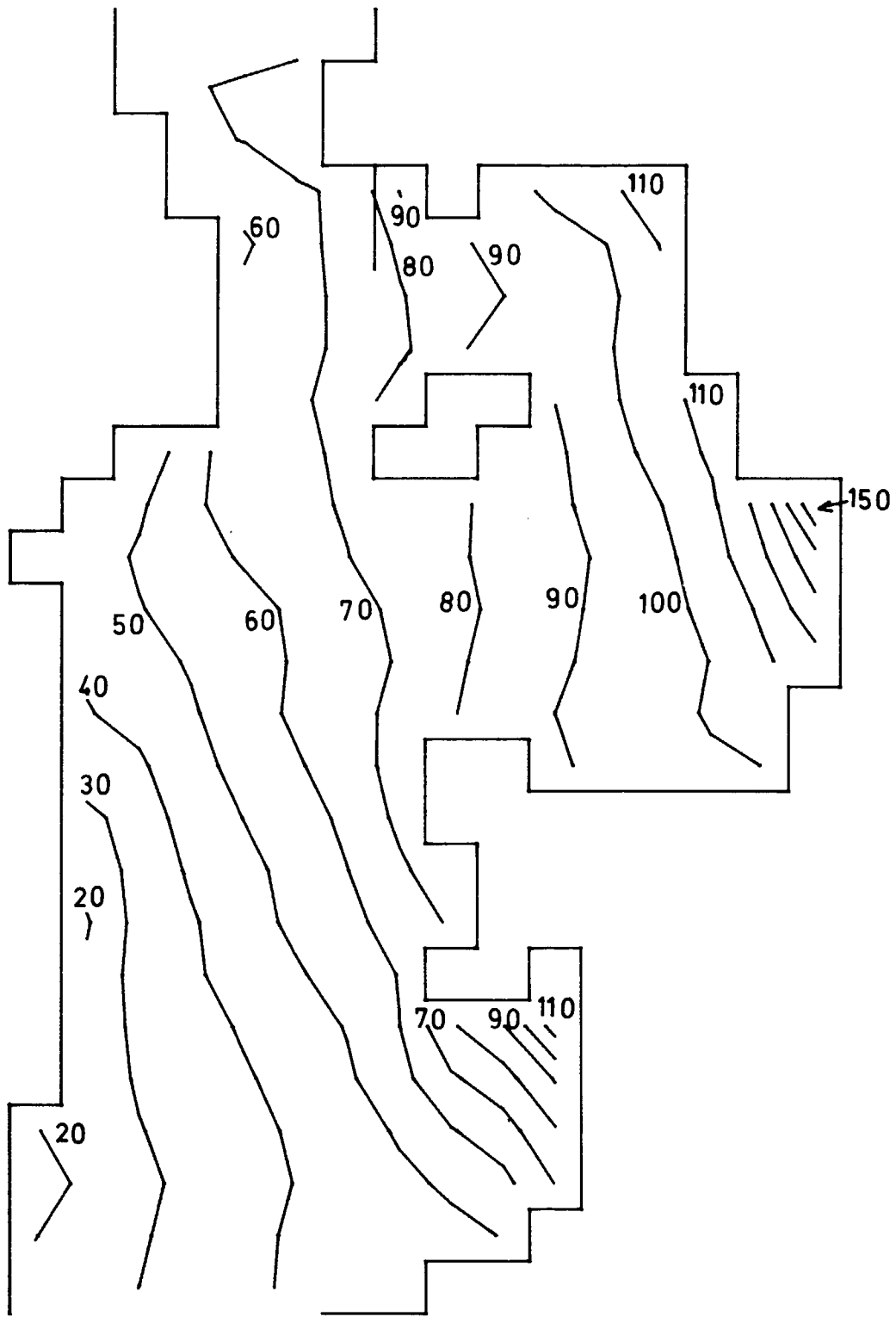

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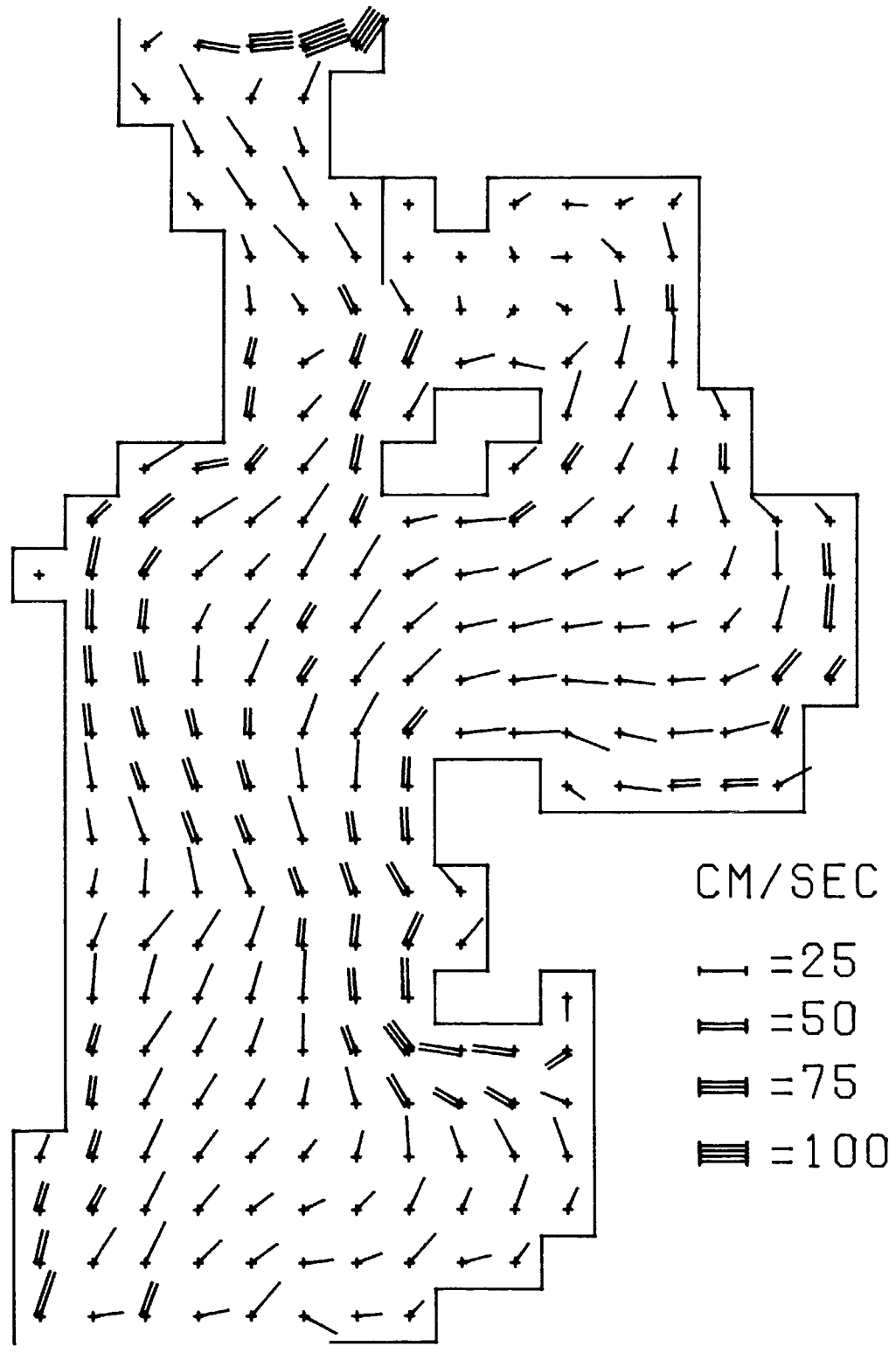

20 HRS 11TH

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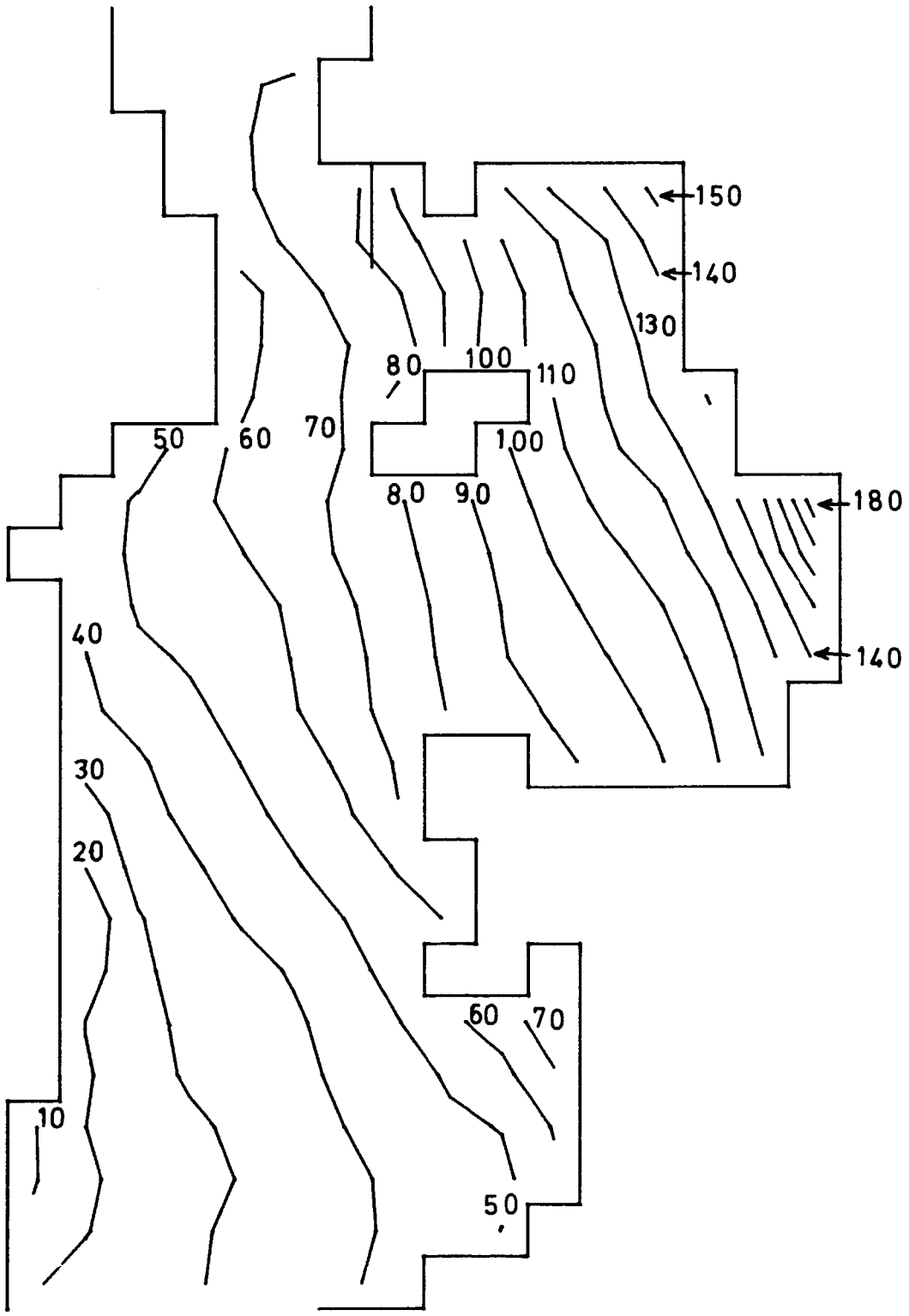

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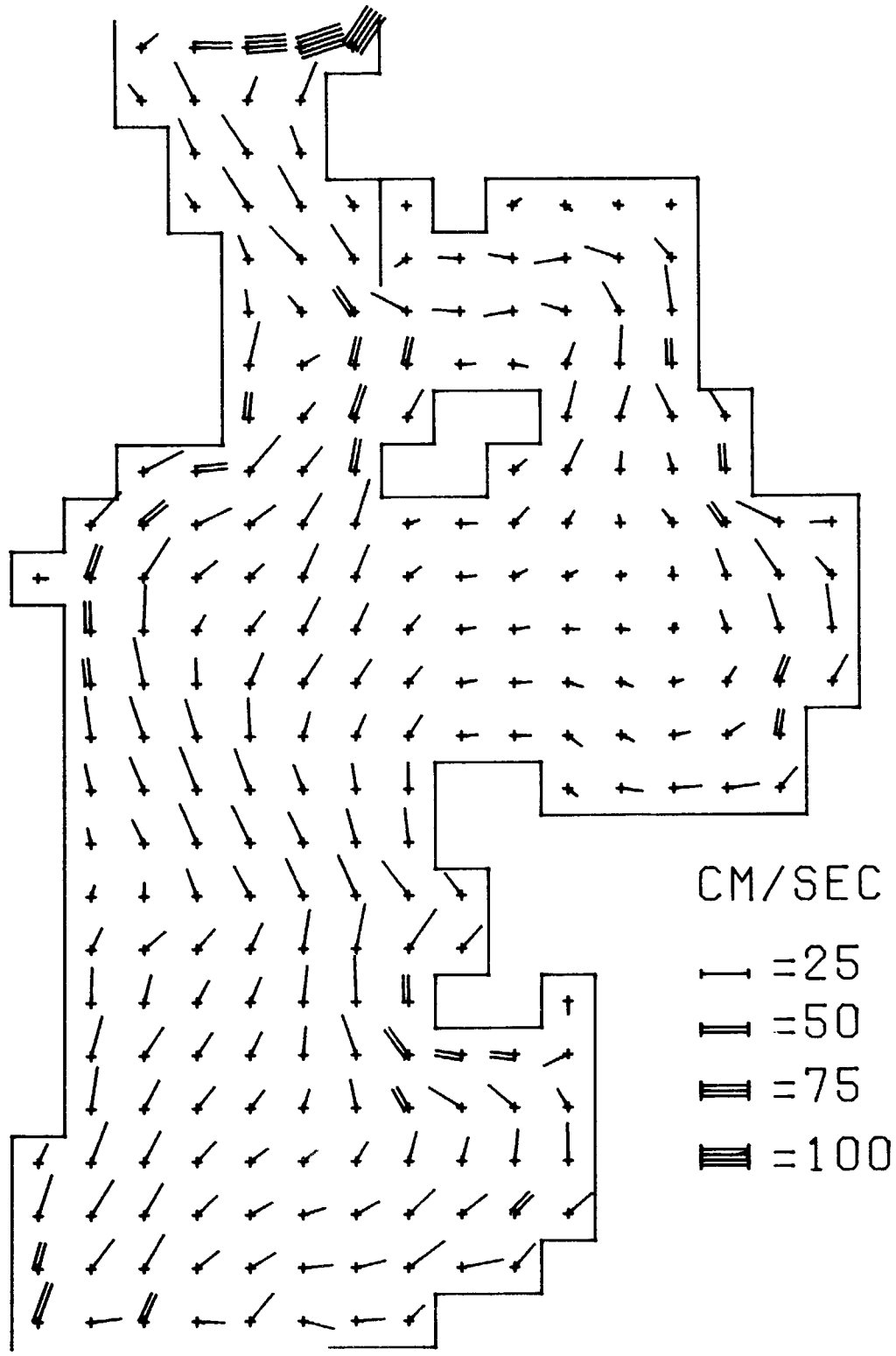

21 HRS 11TH

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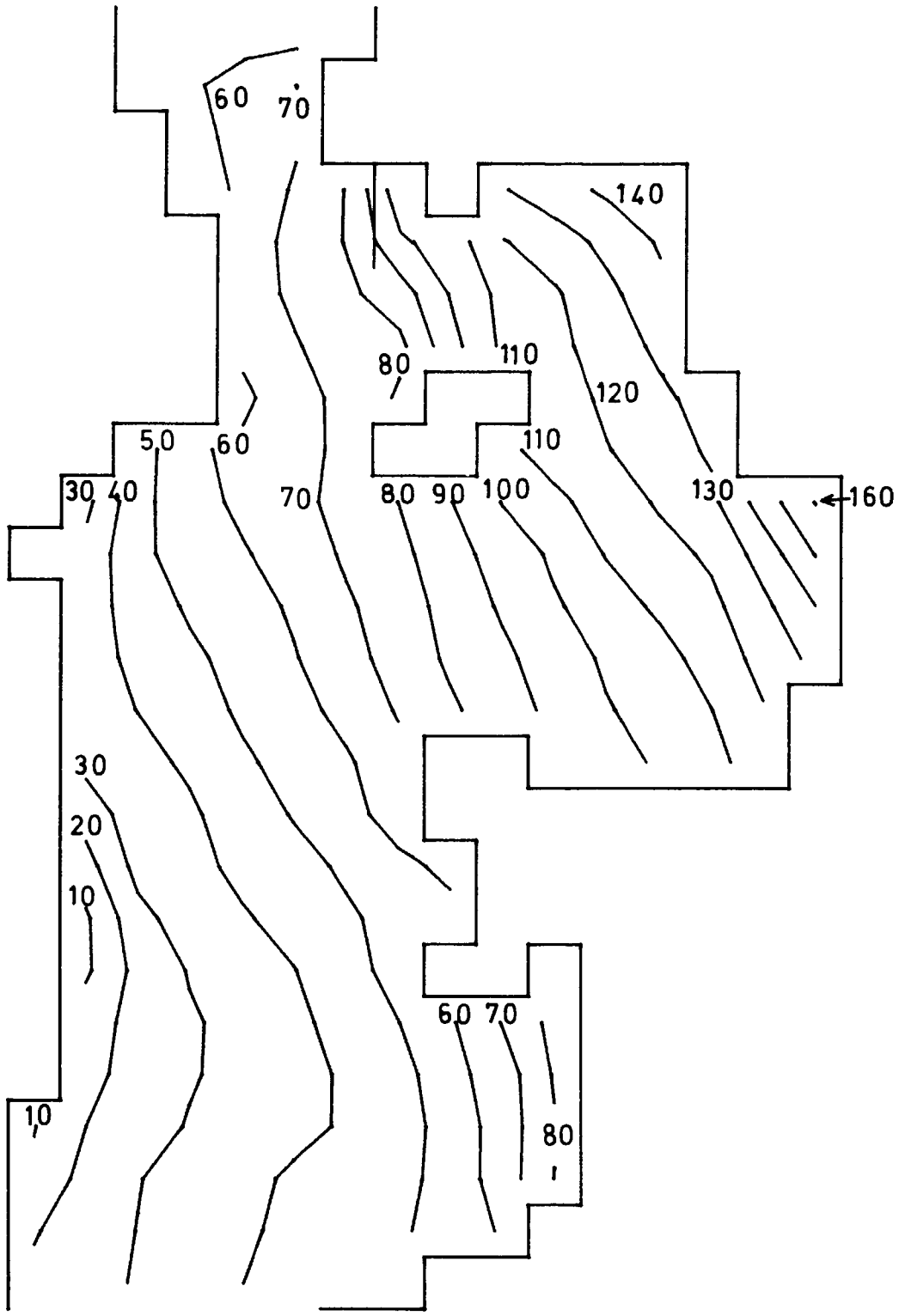

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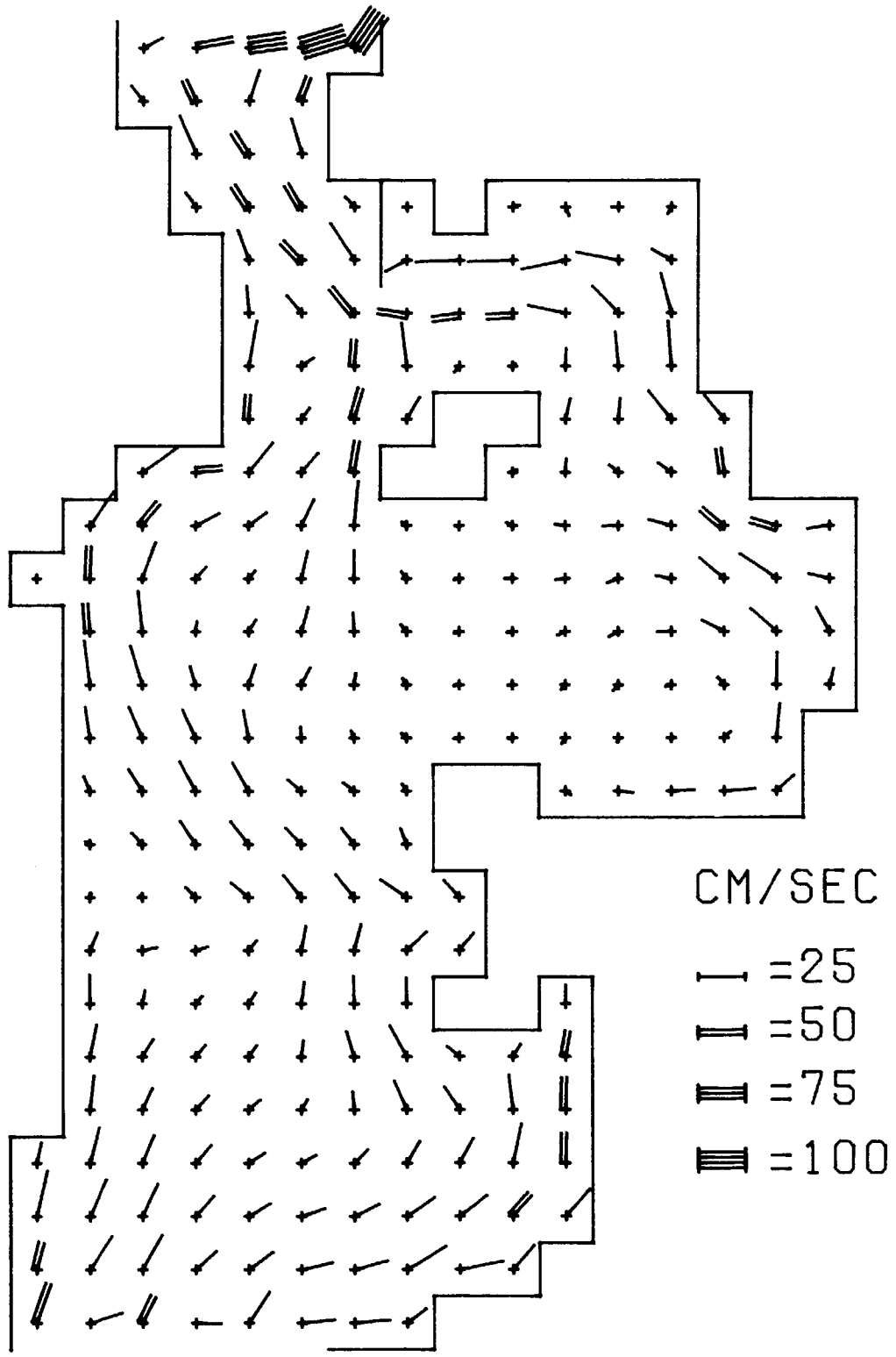

22 HRS 11TH

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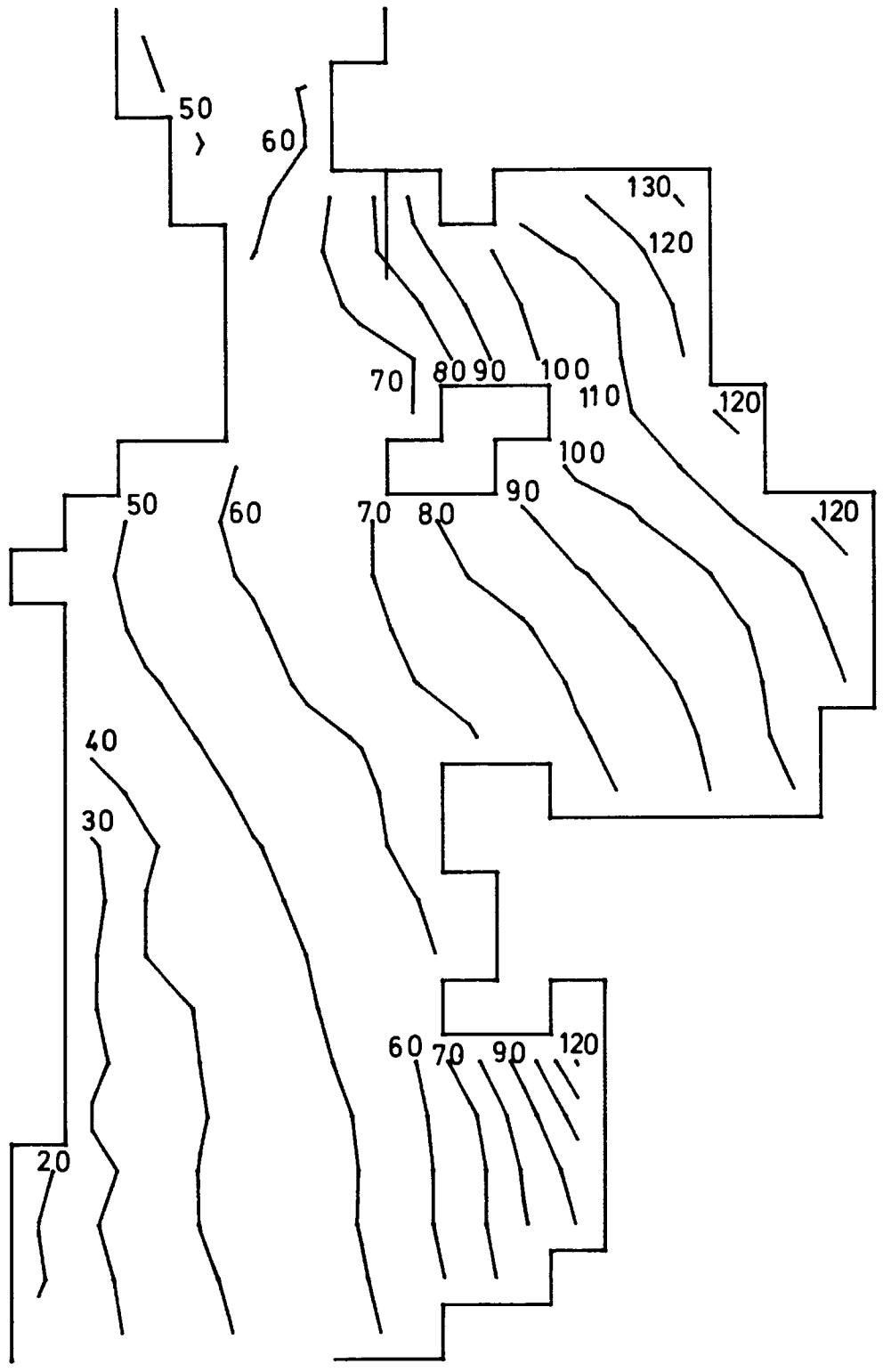

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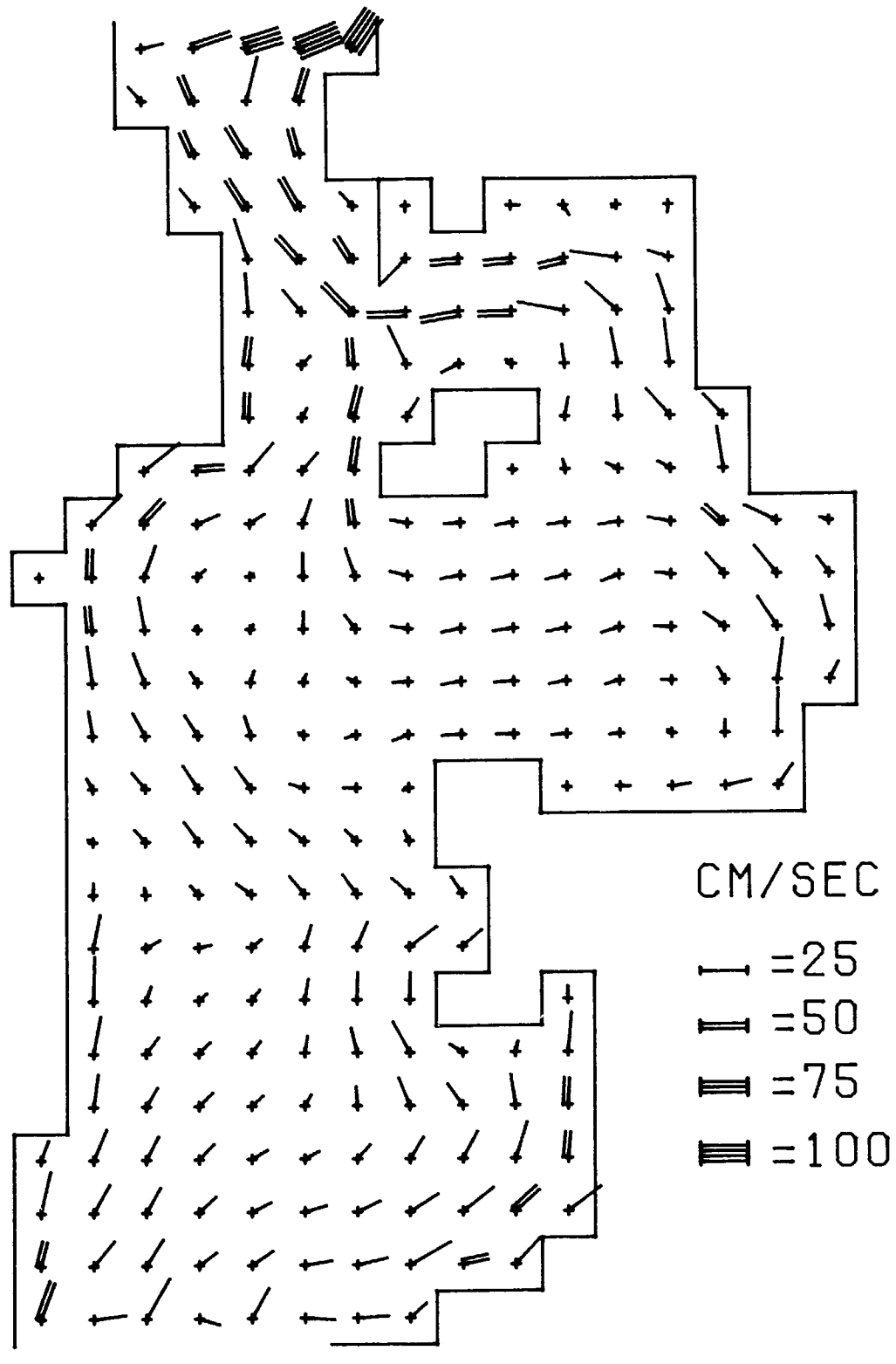

23 HRS 11TH

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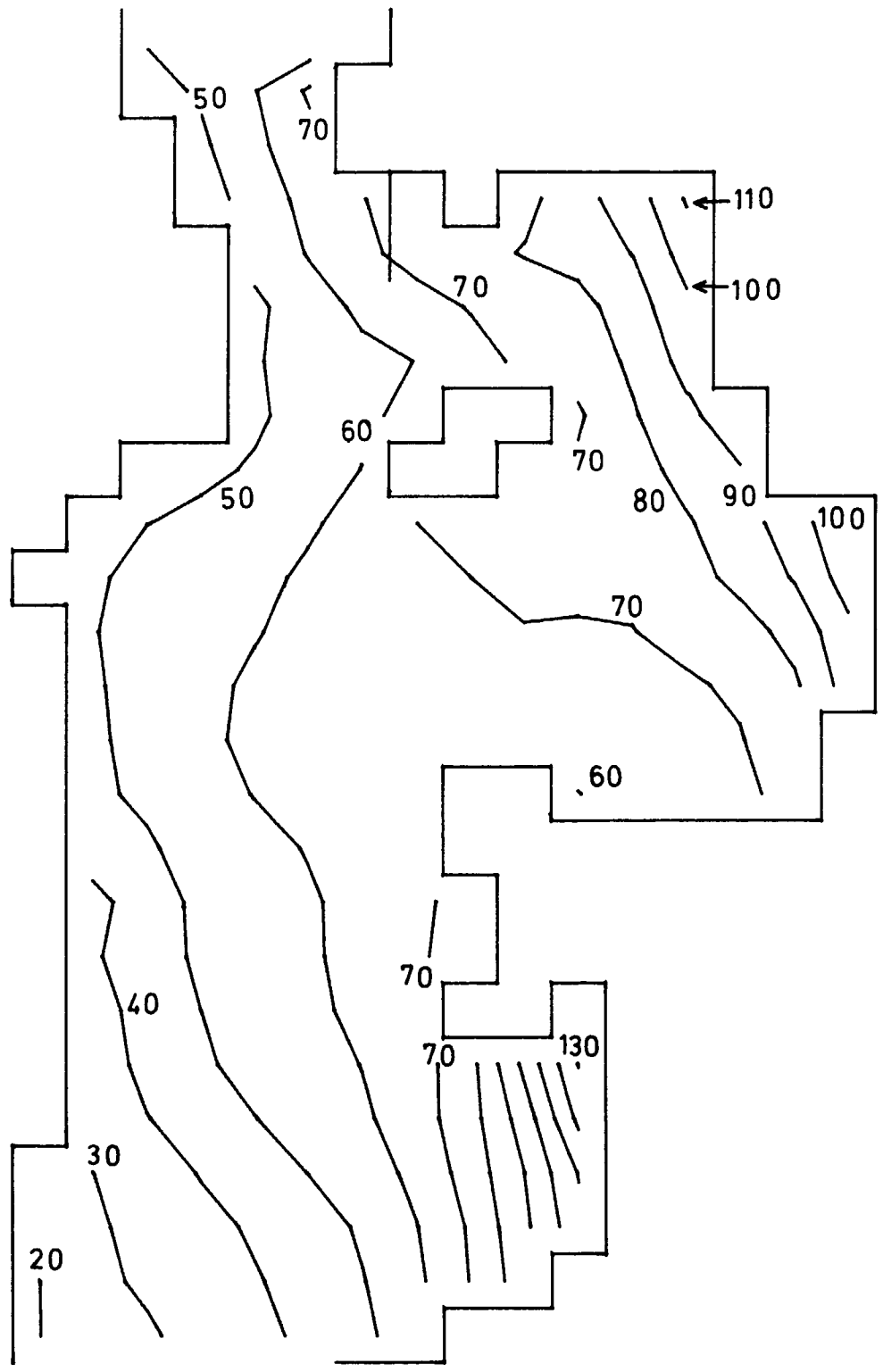

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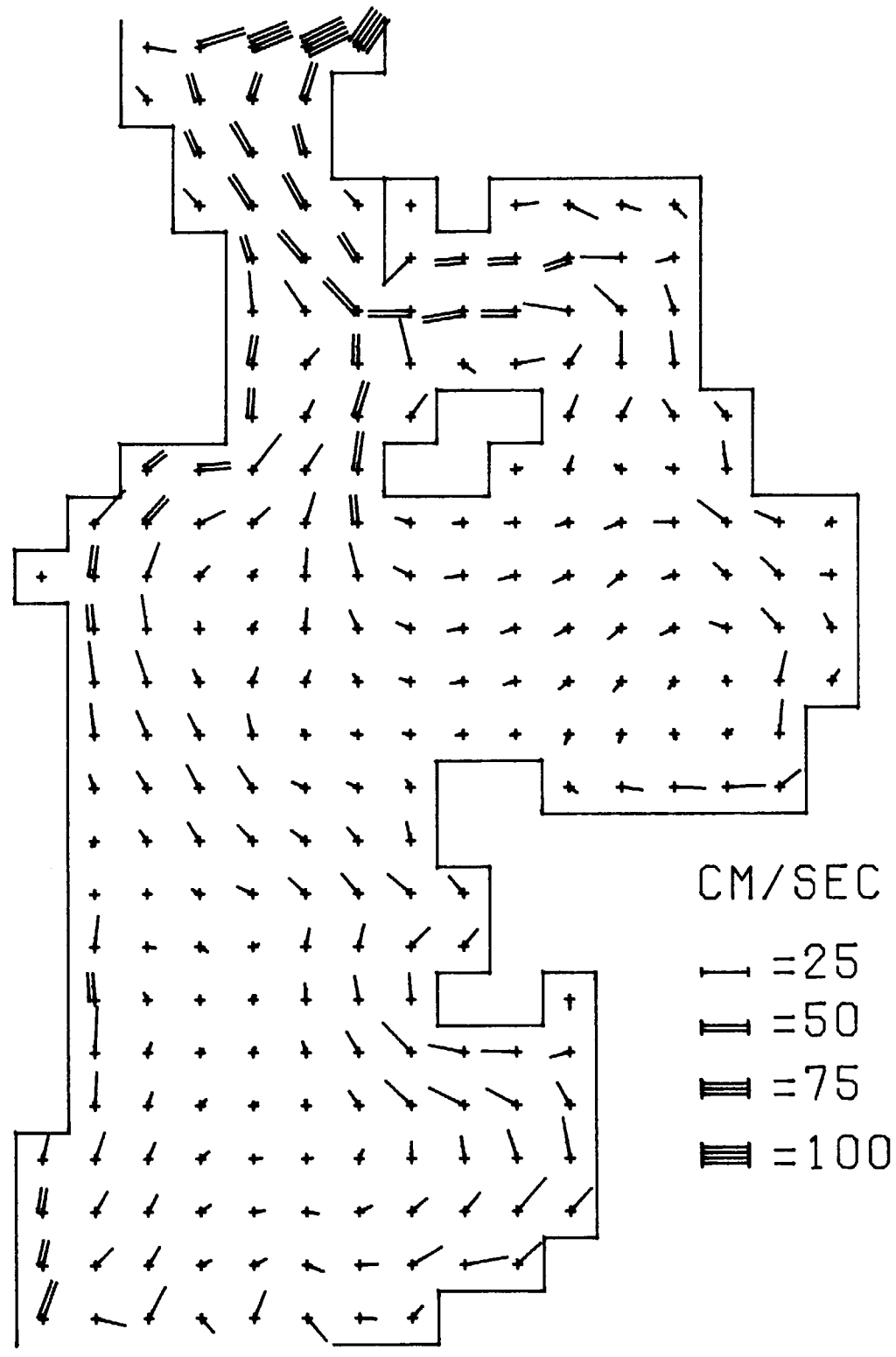

0 HRS 12TH

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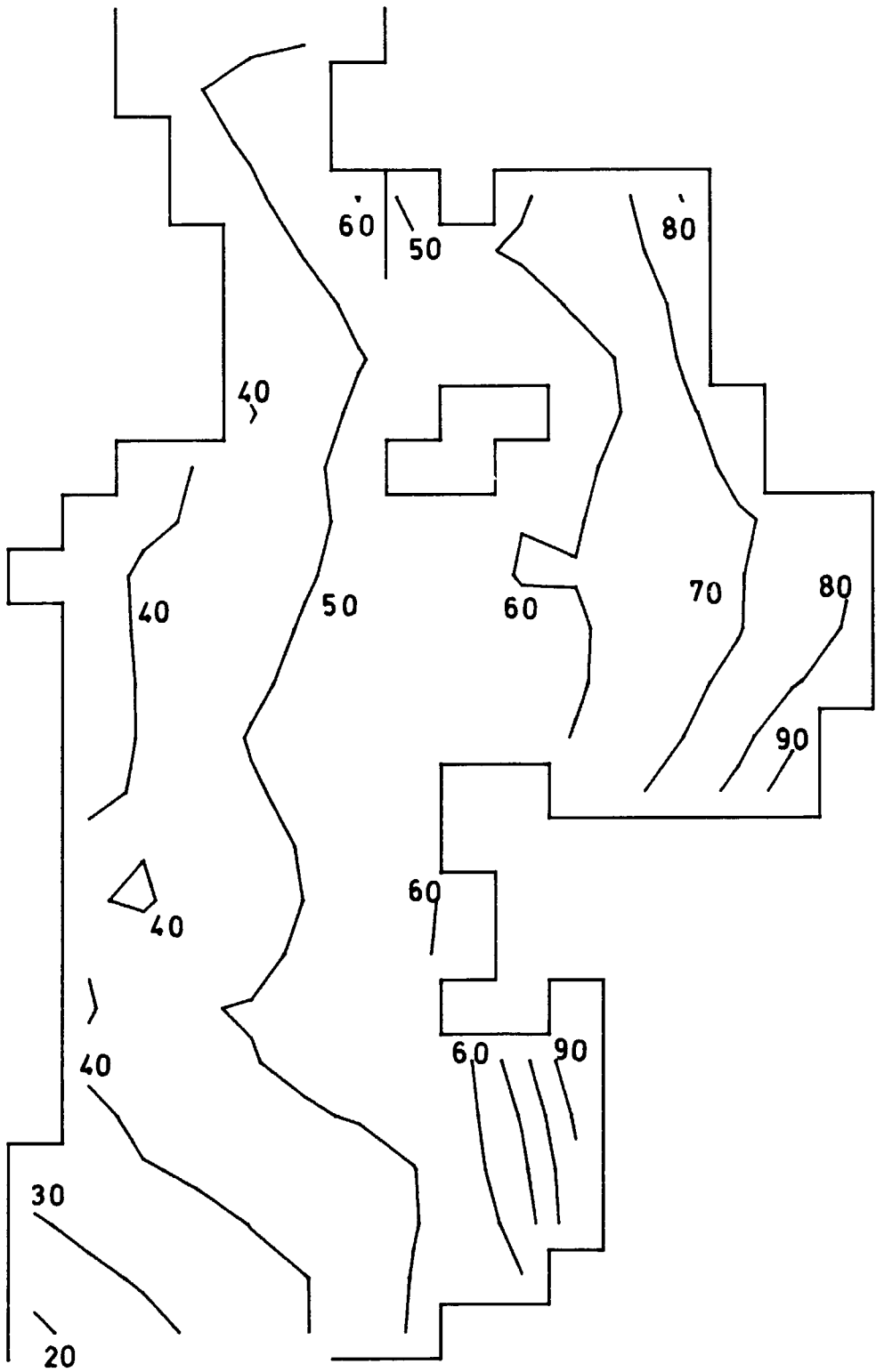

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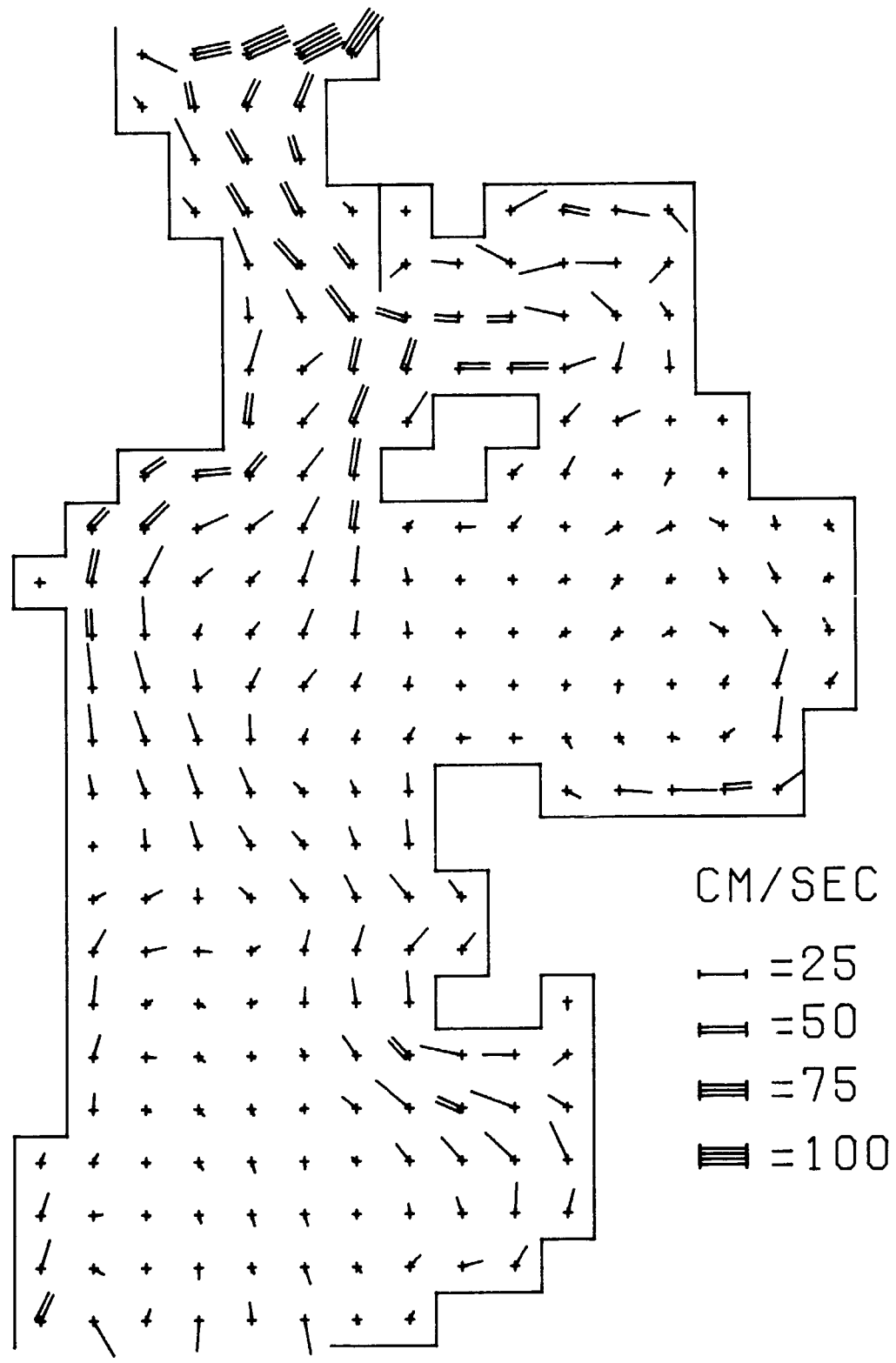

1 HRS 12TH

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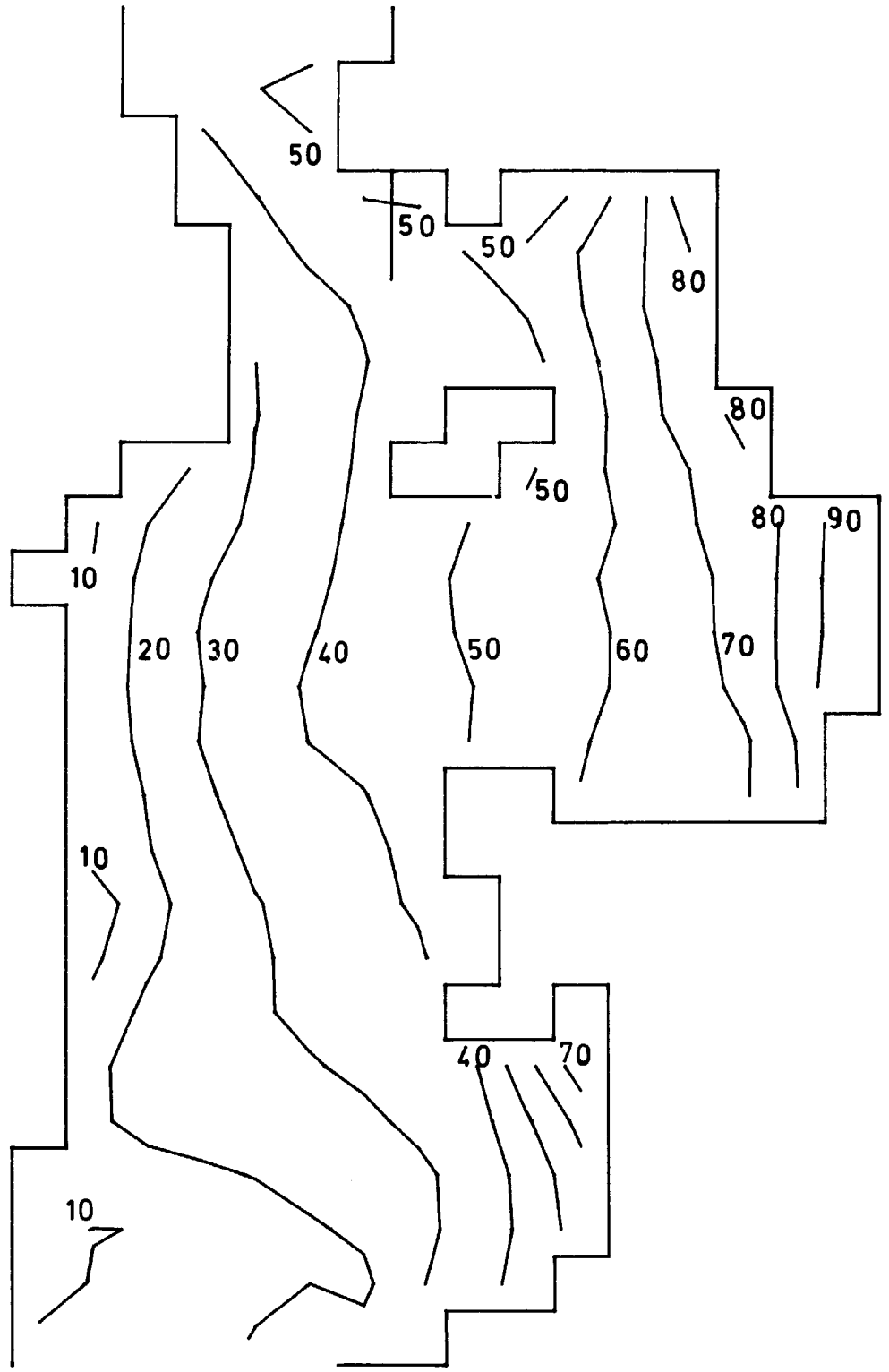

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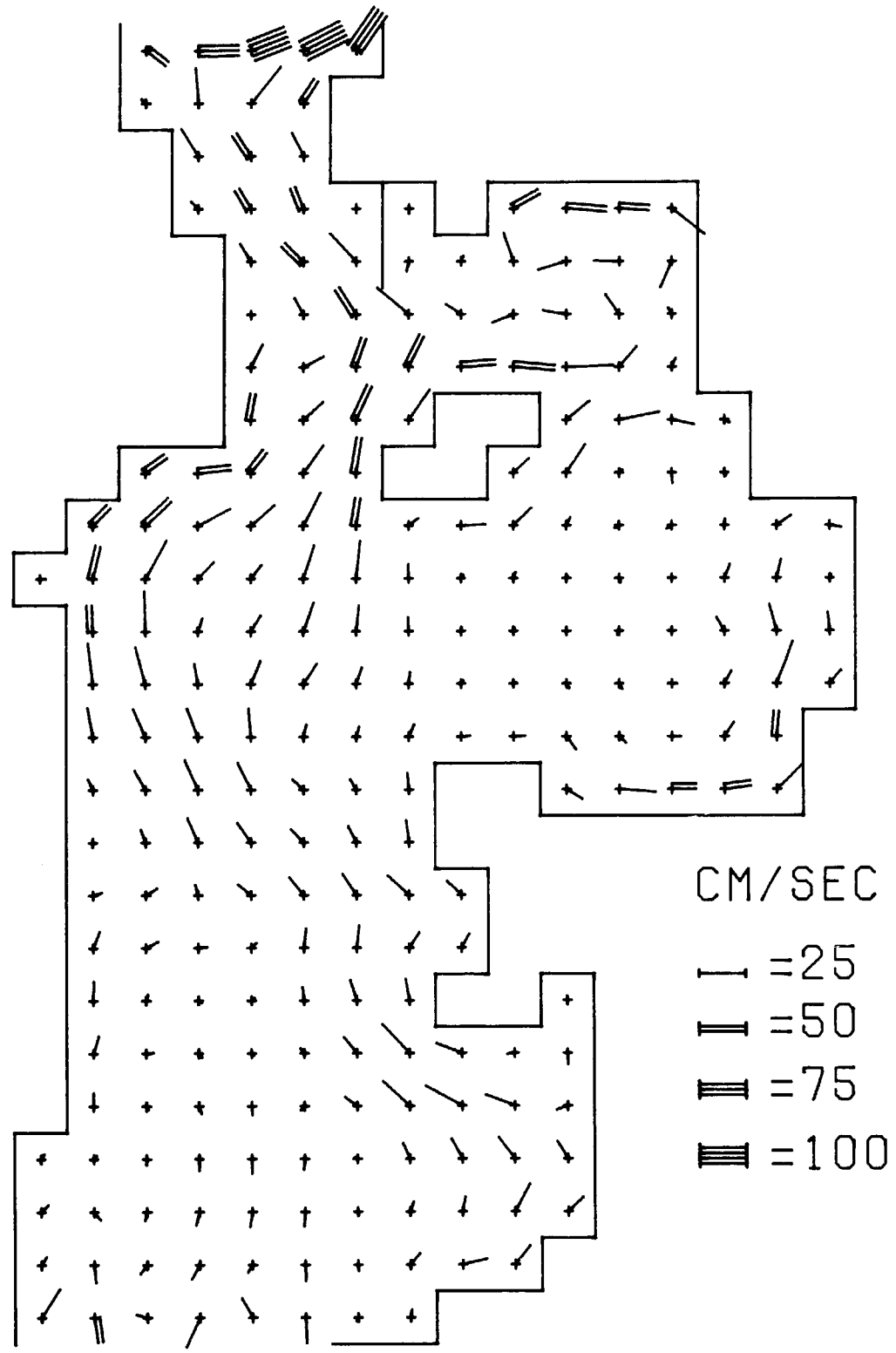
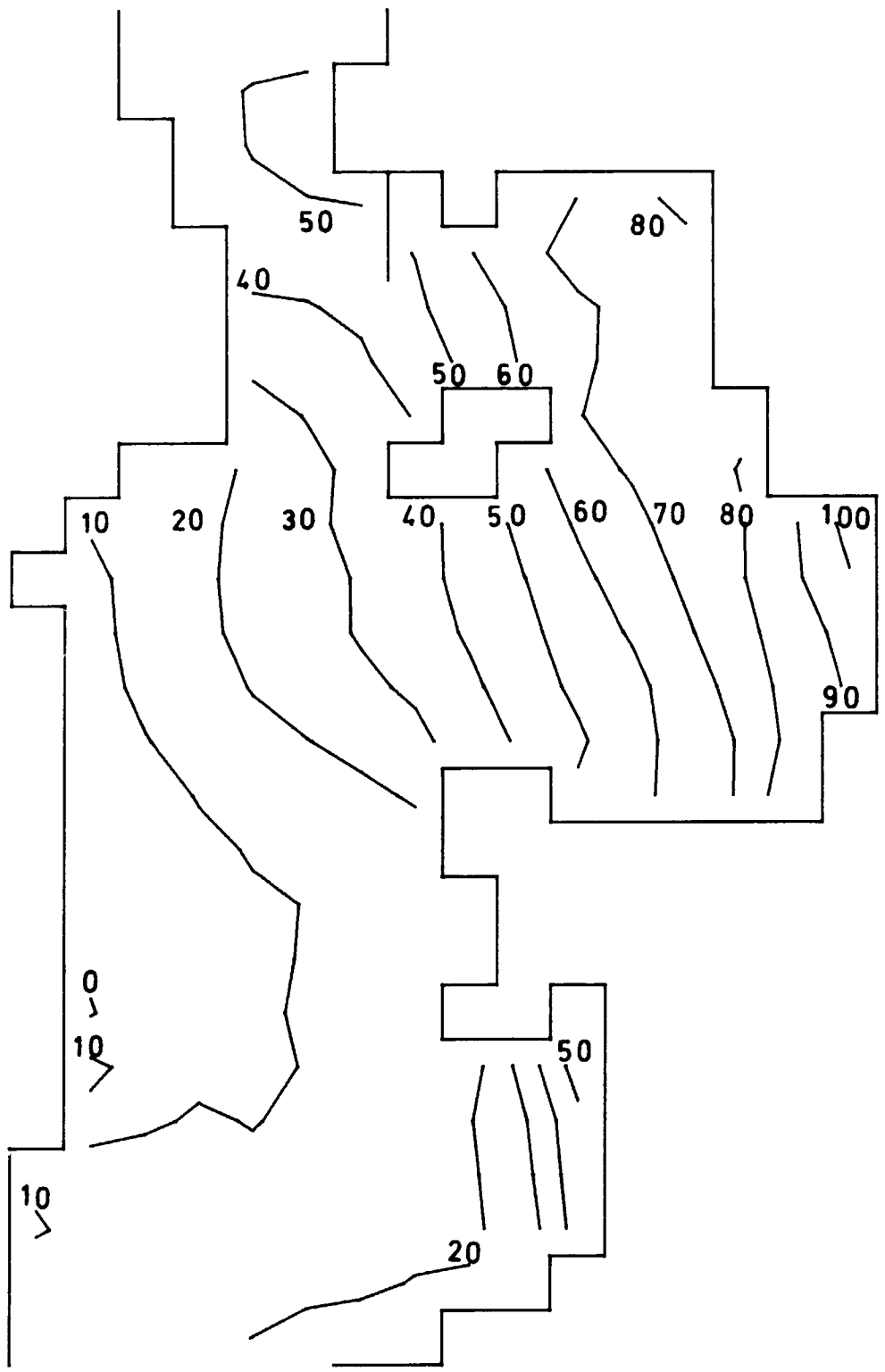


2 HRS 12TH

ELEVATIONS



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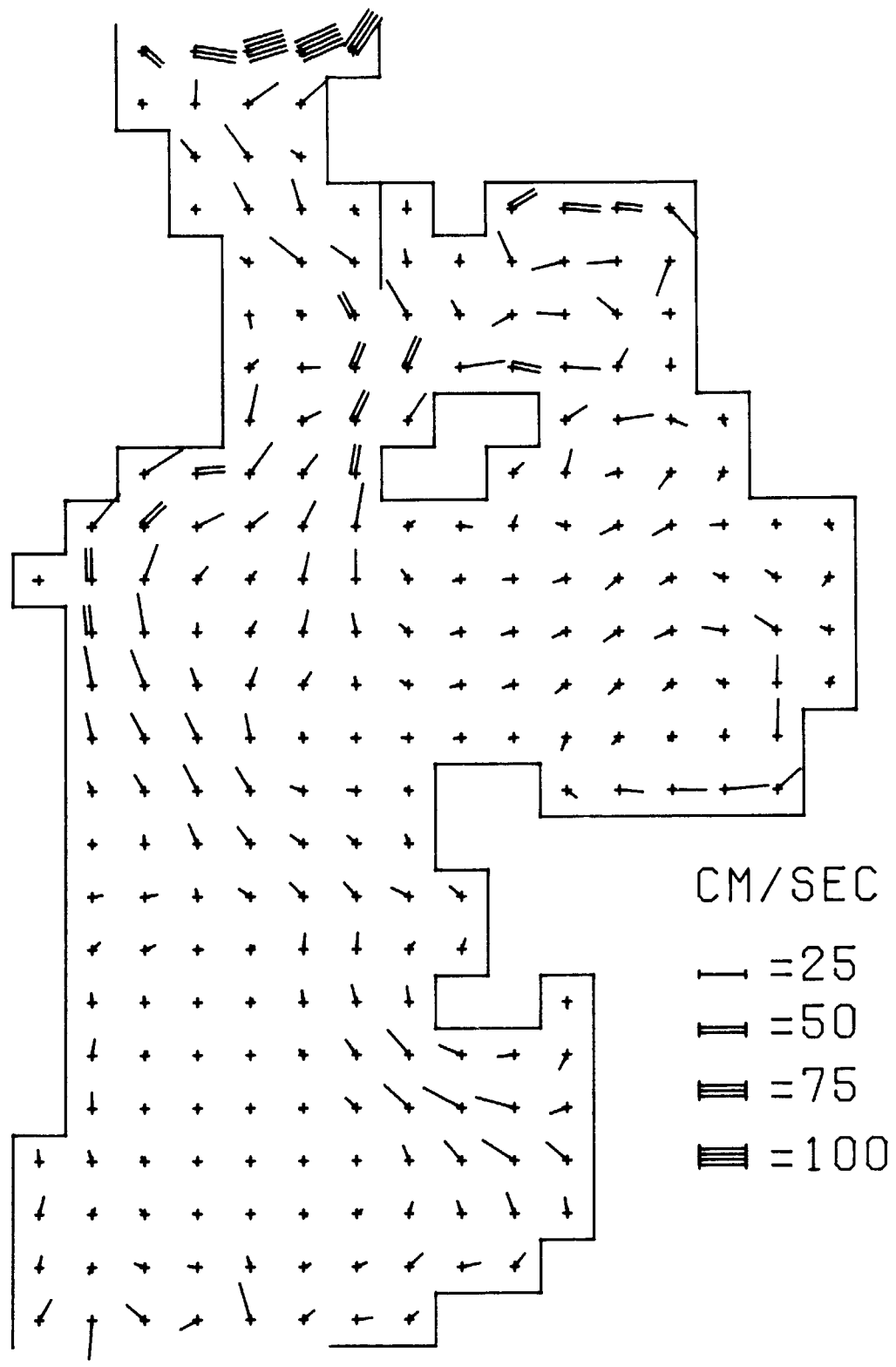

3 HRS 12TH

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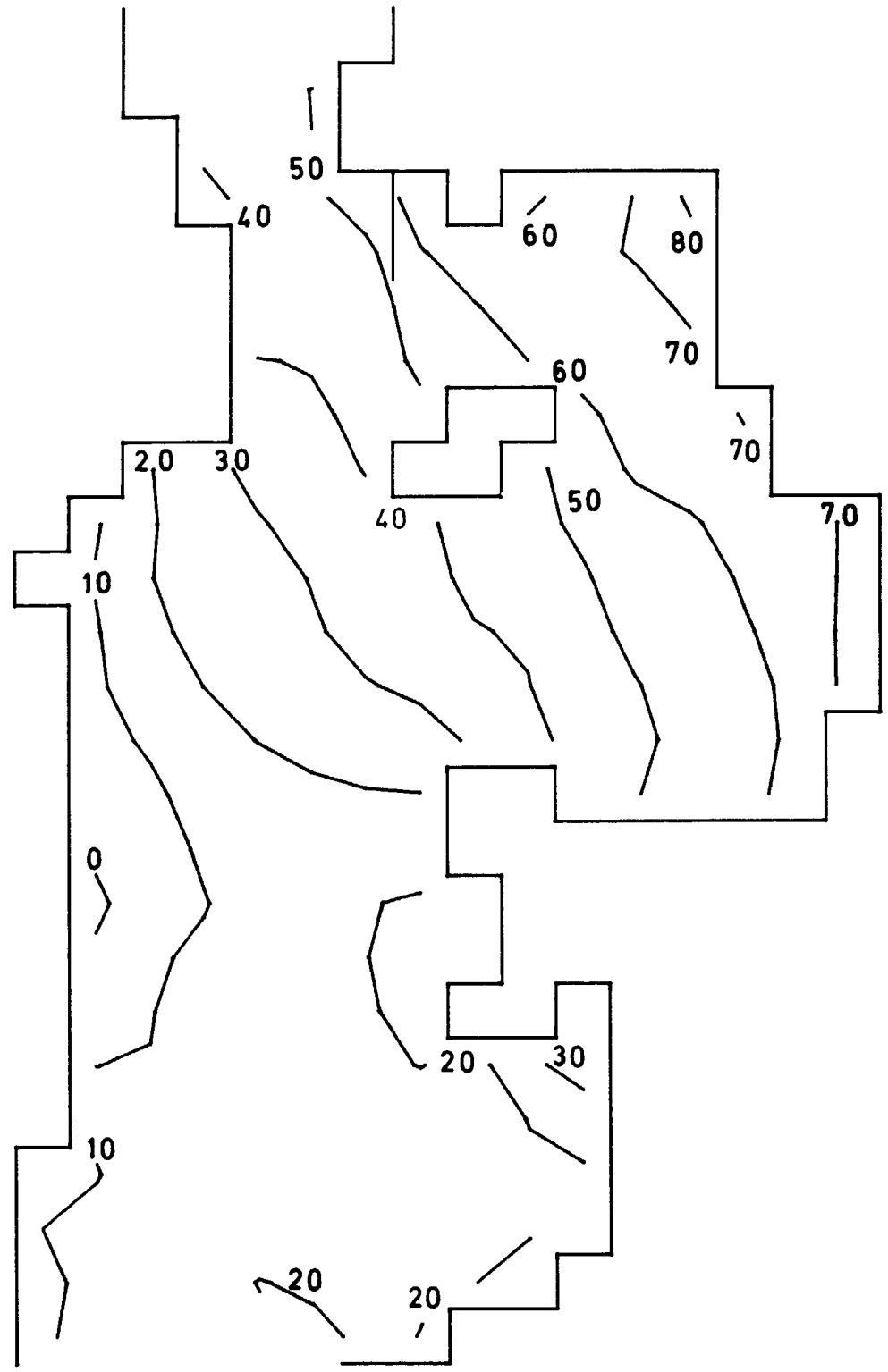

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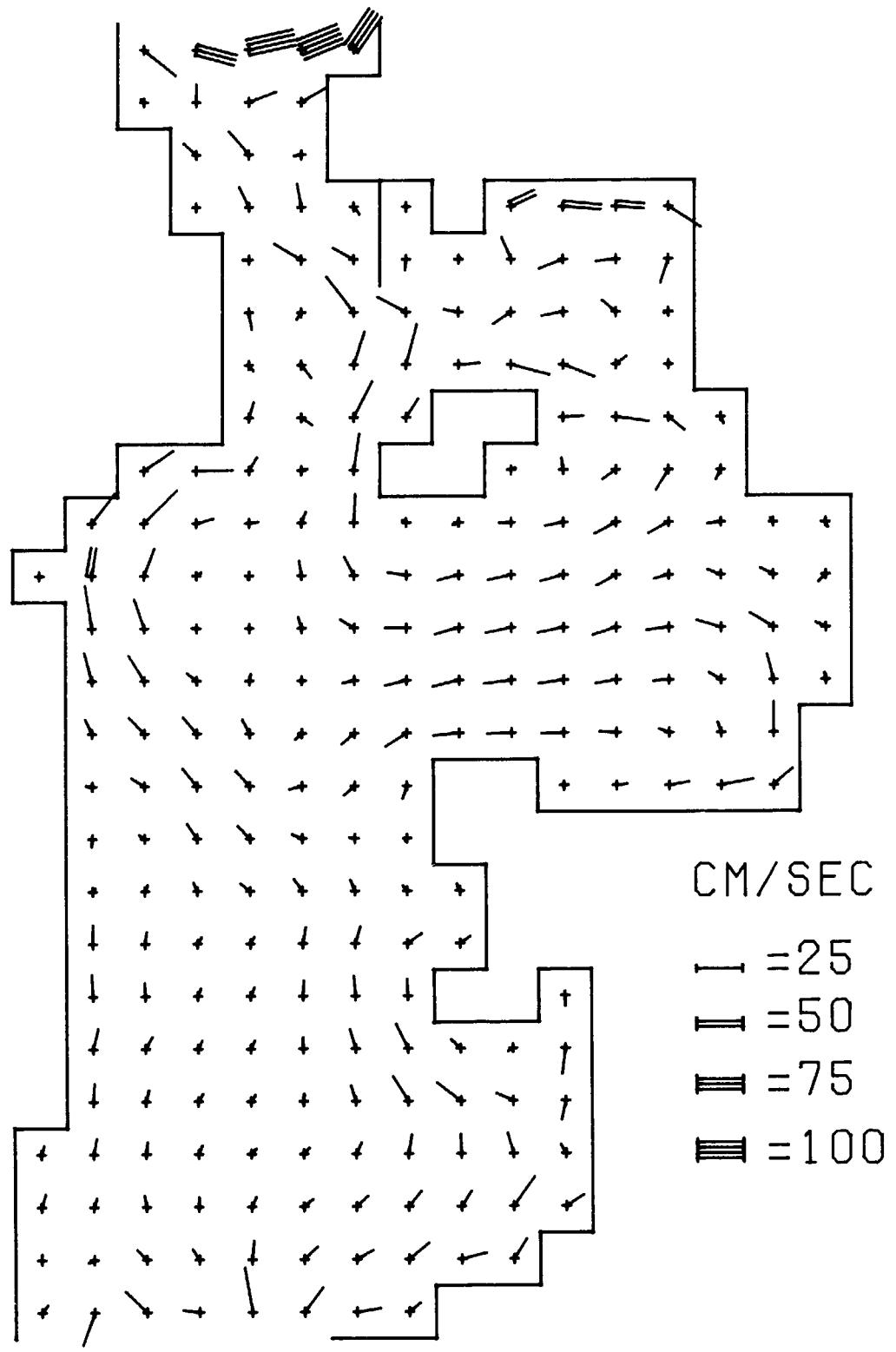

4 HRS 12TH

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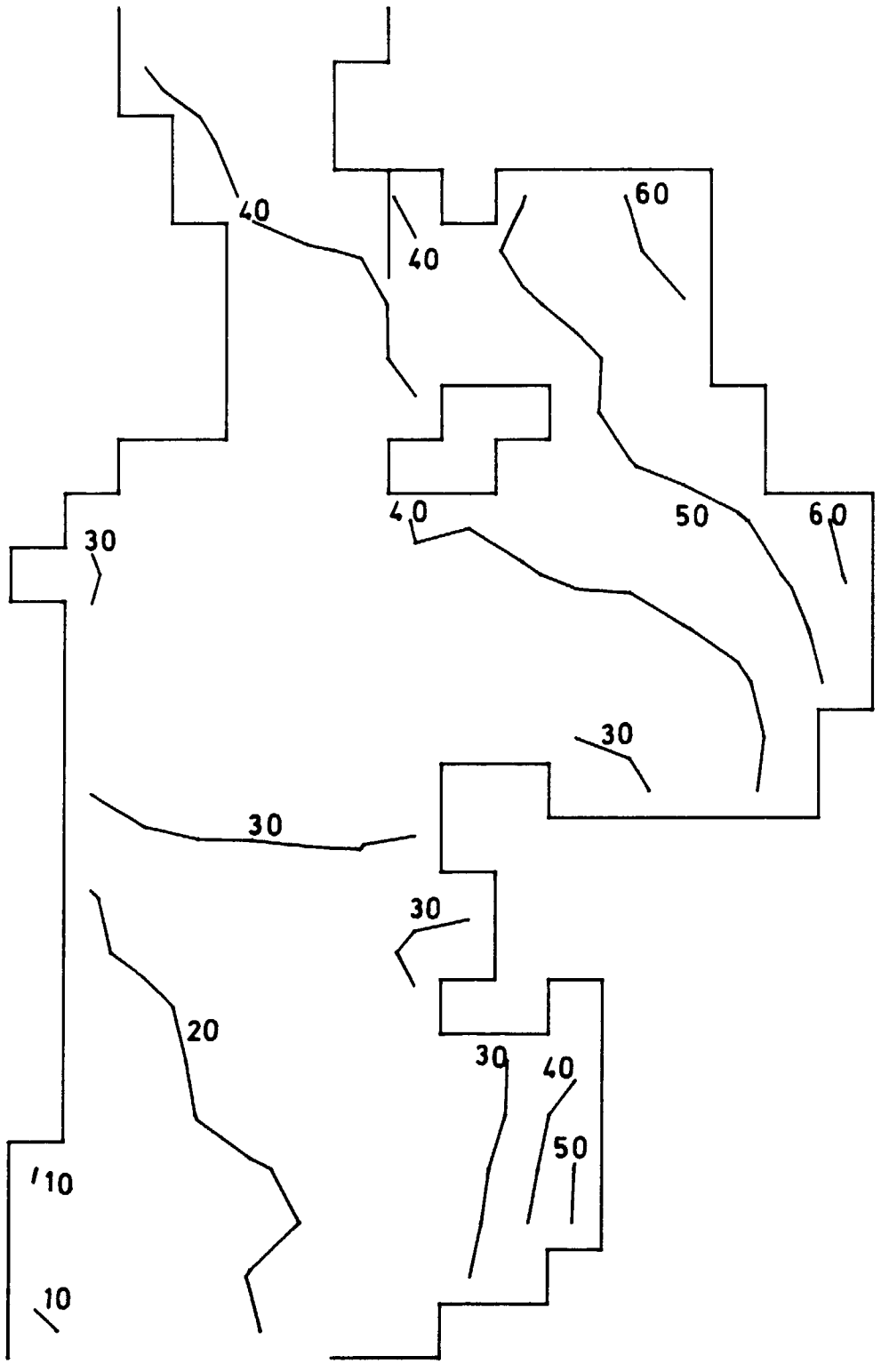

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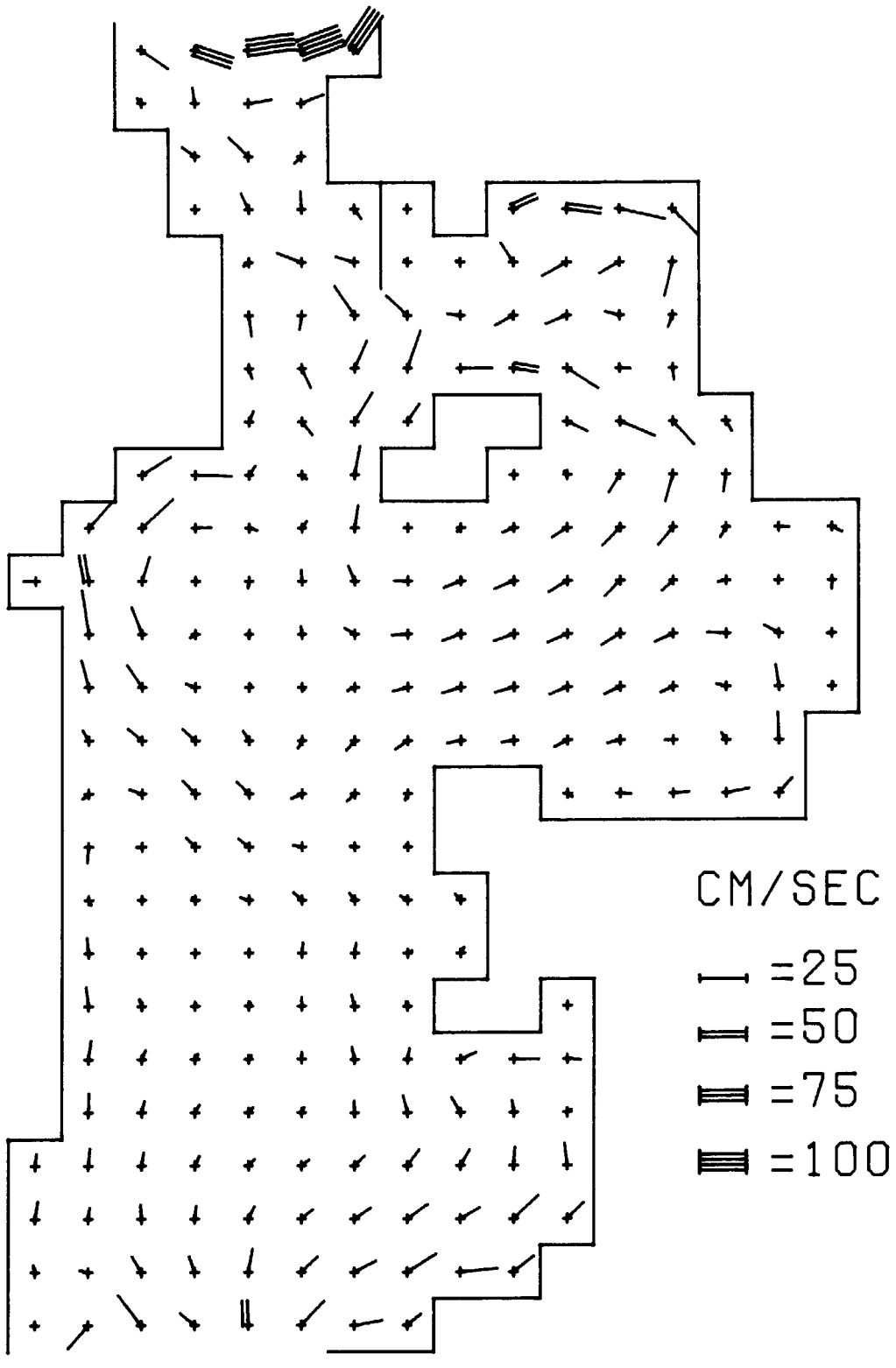

5 HRS 12TH

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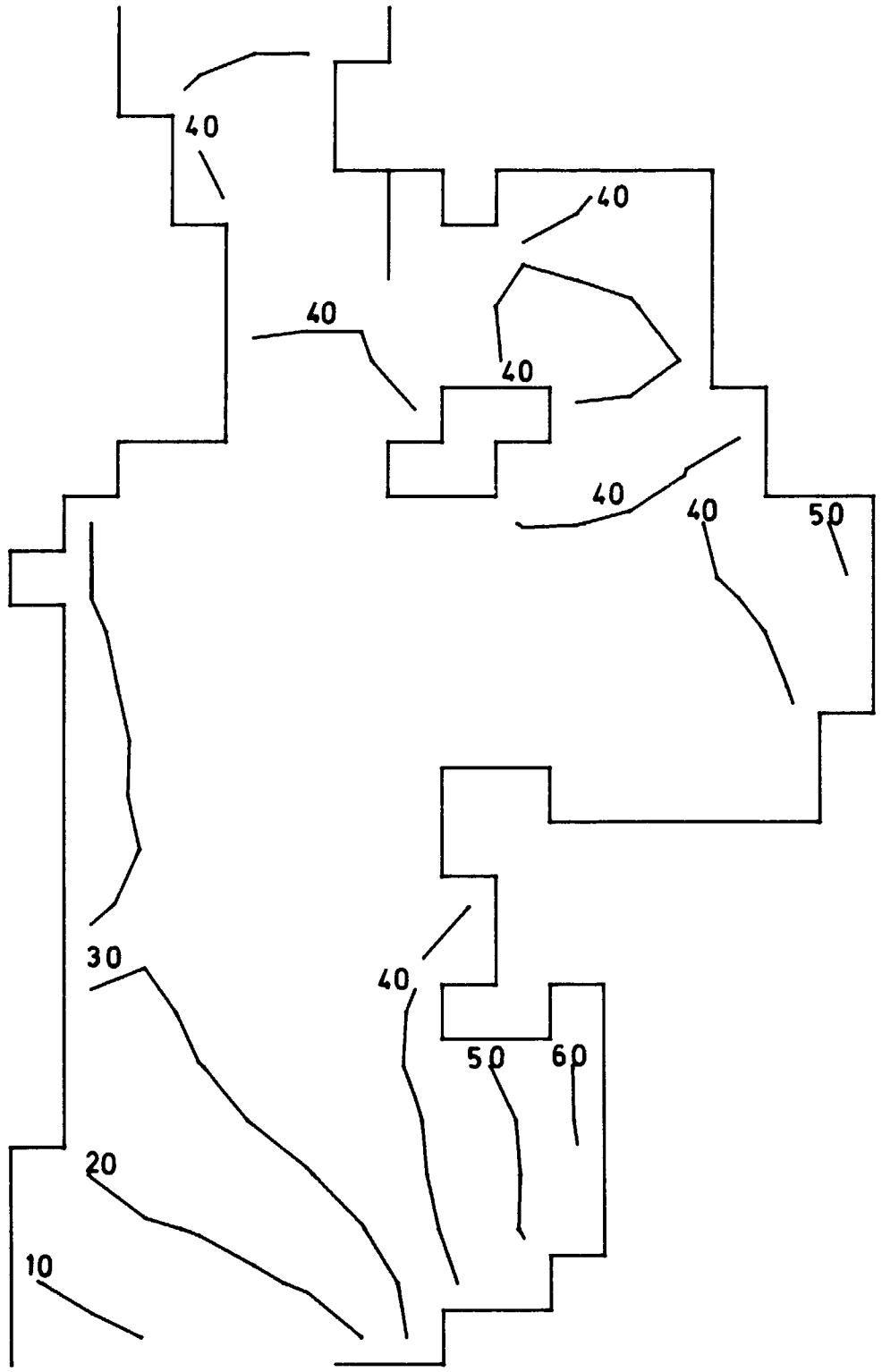

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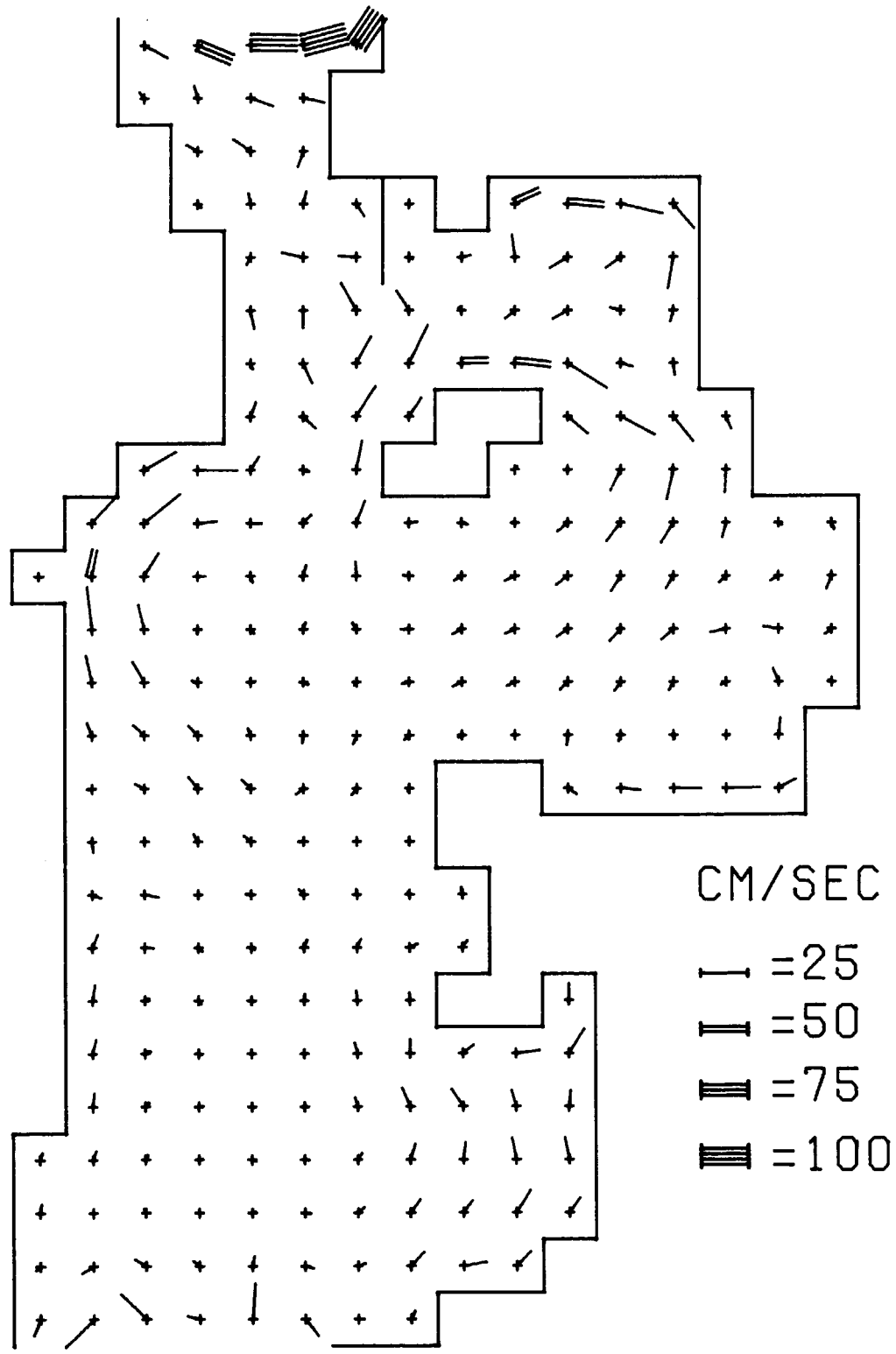

6 HRS 12TH

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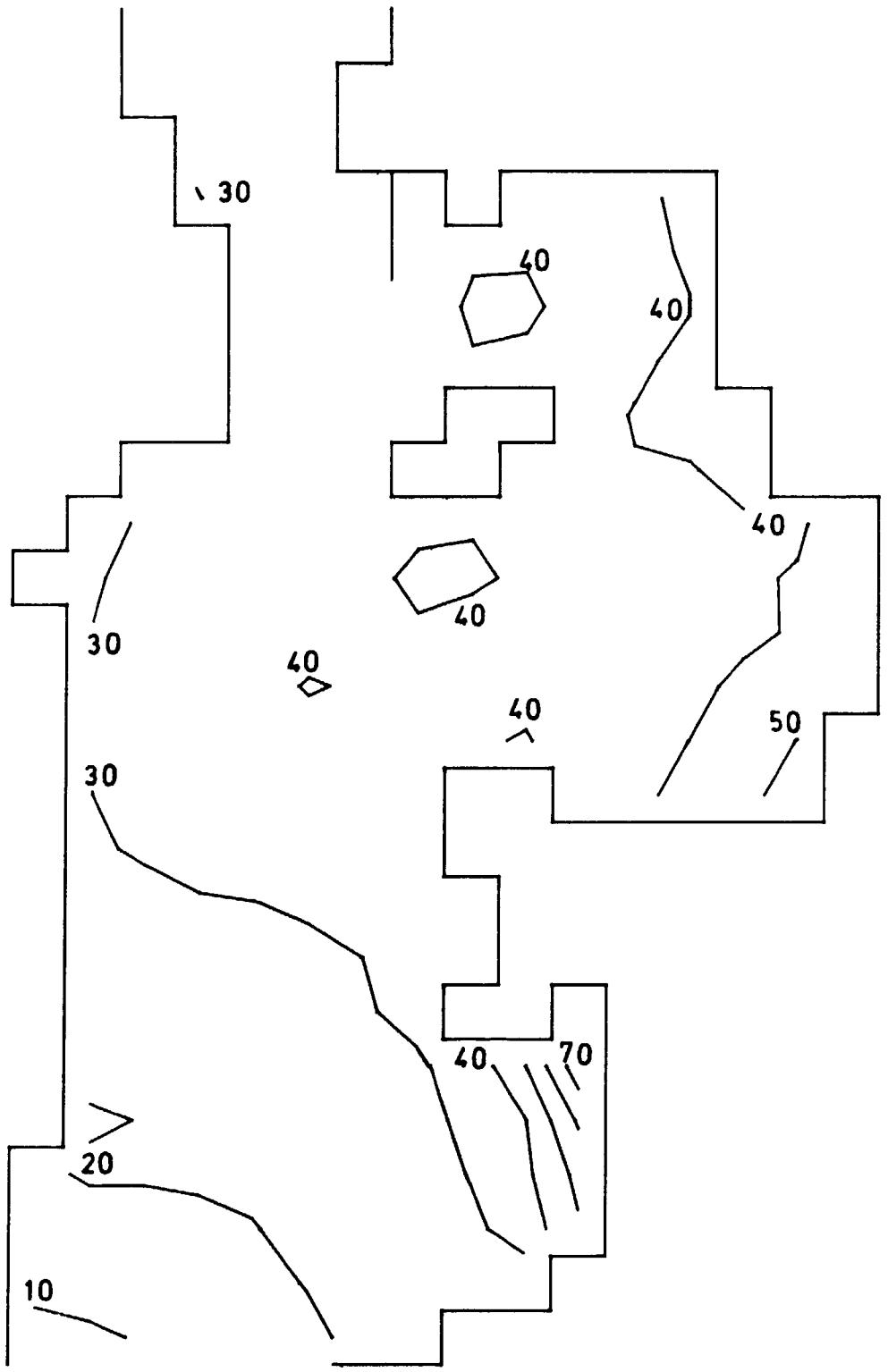

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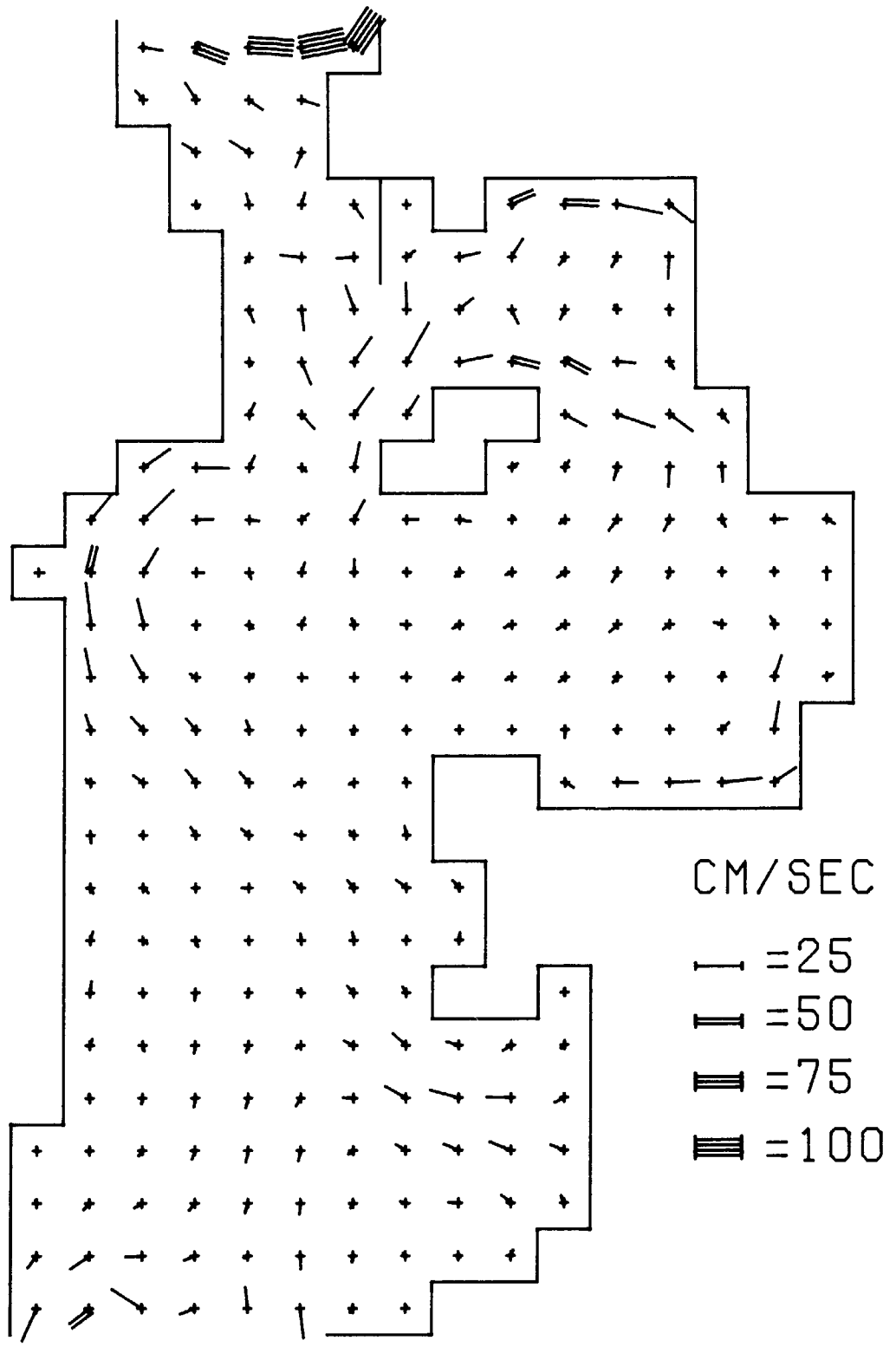
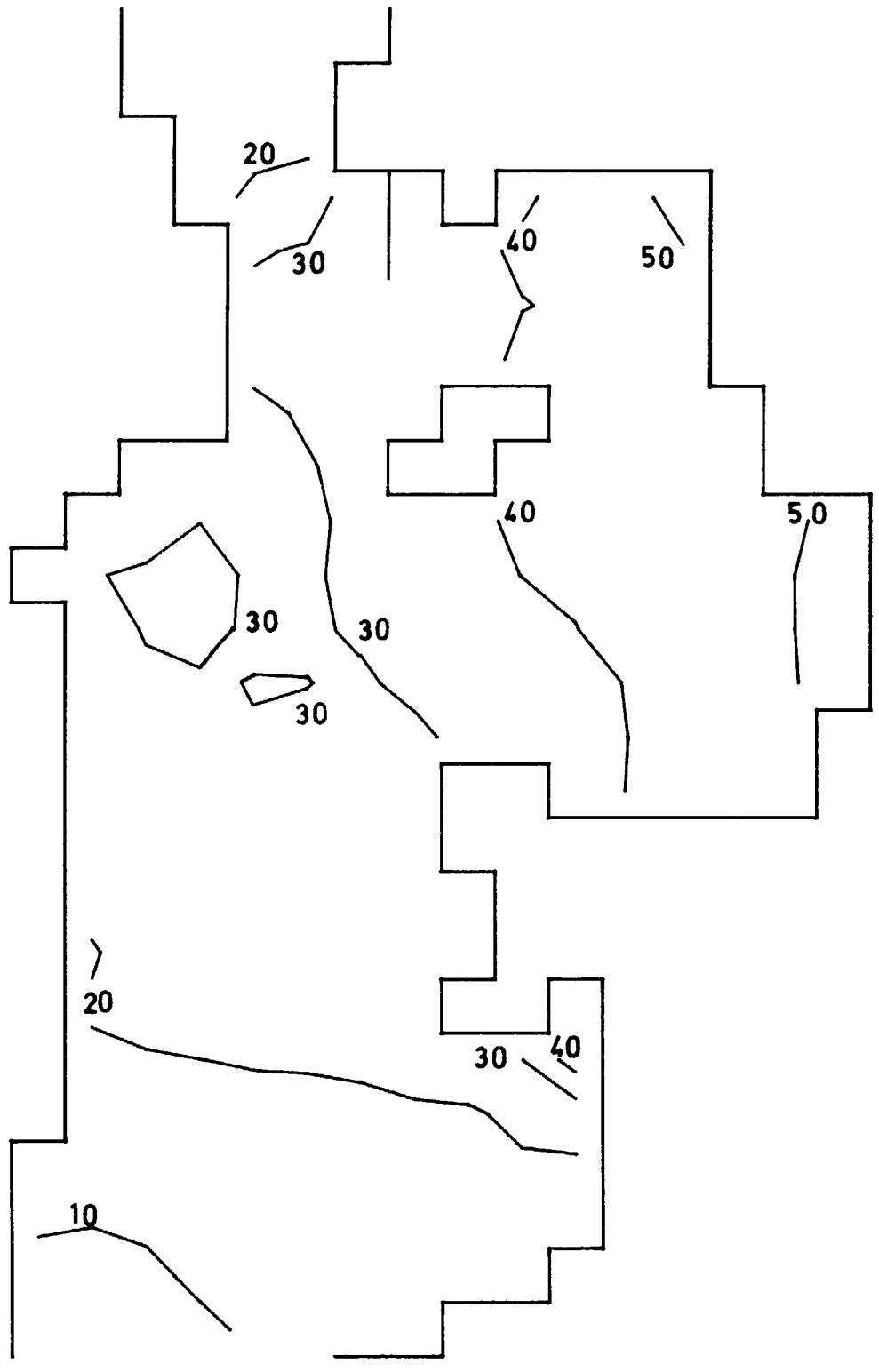


7 HRS 12TH

ELEVATIONS



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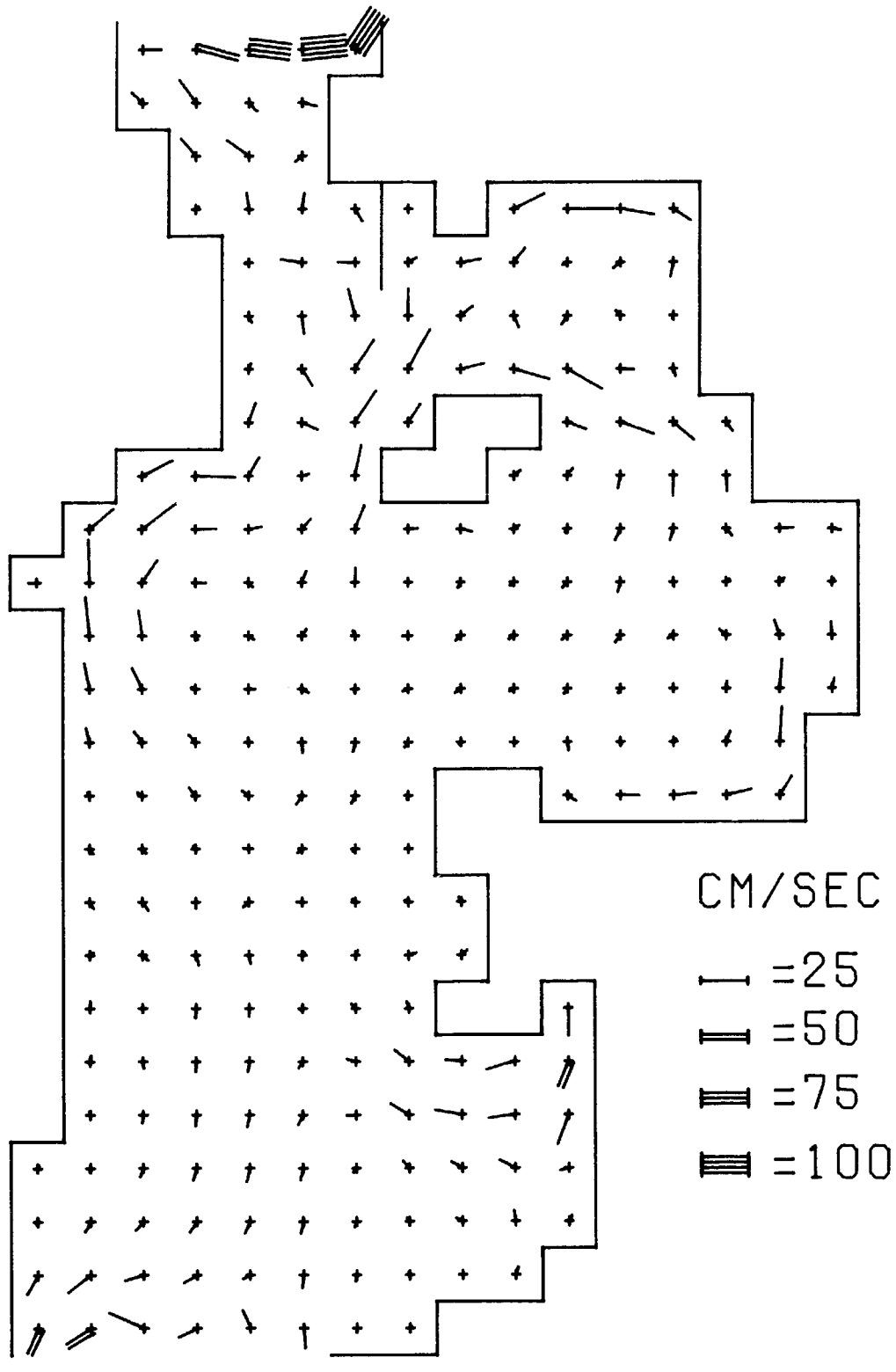

8 HRS 12TH

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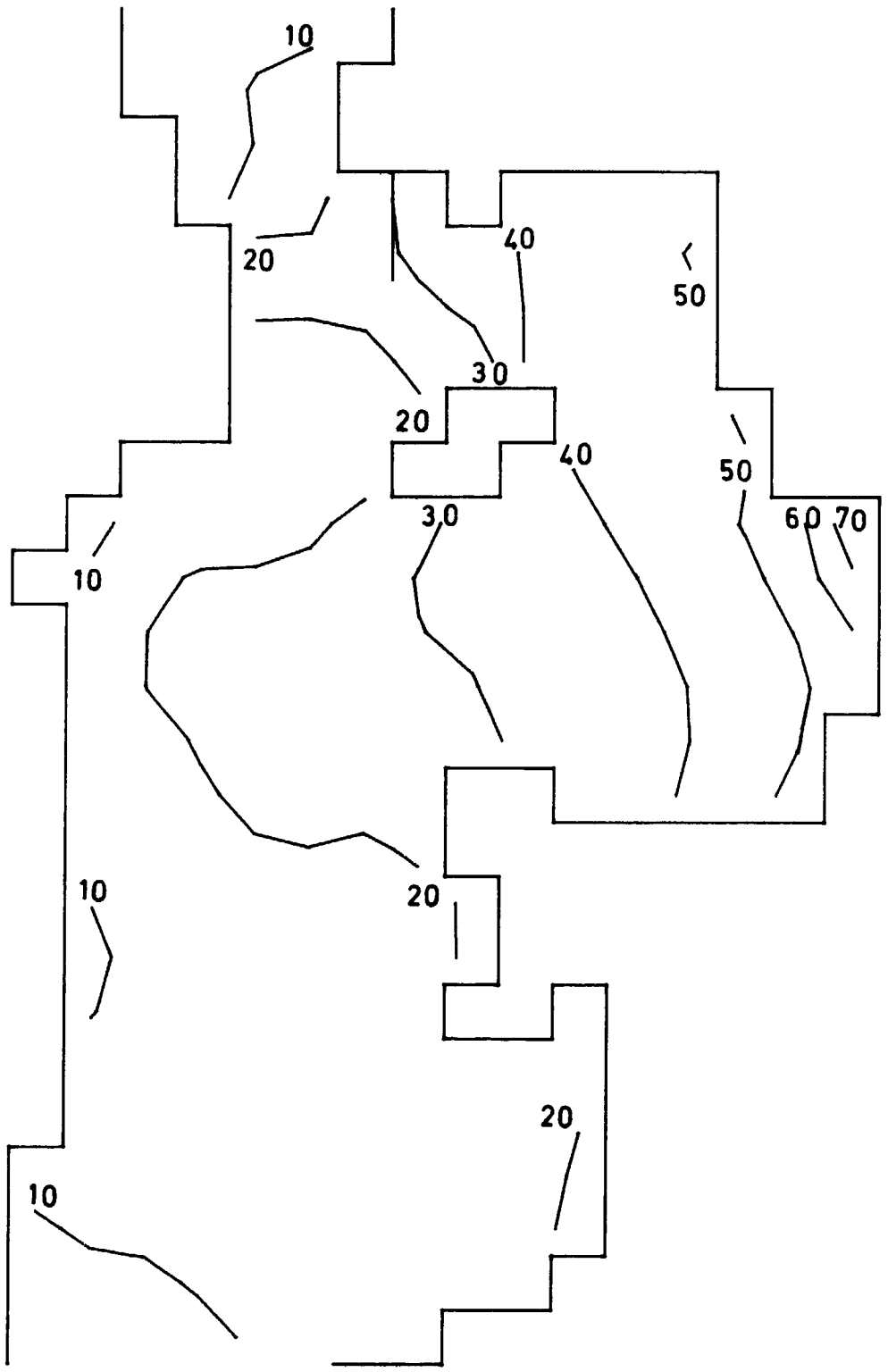

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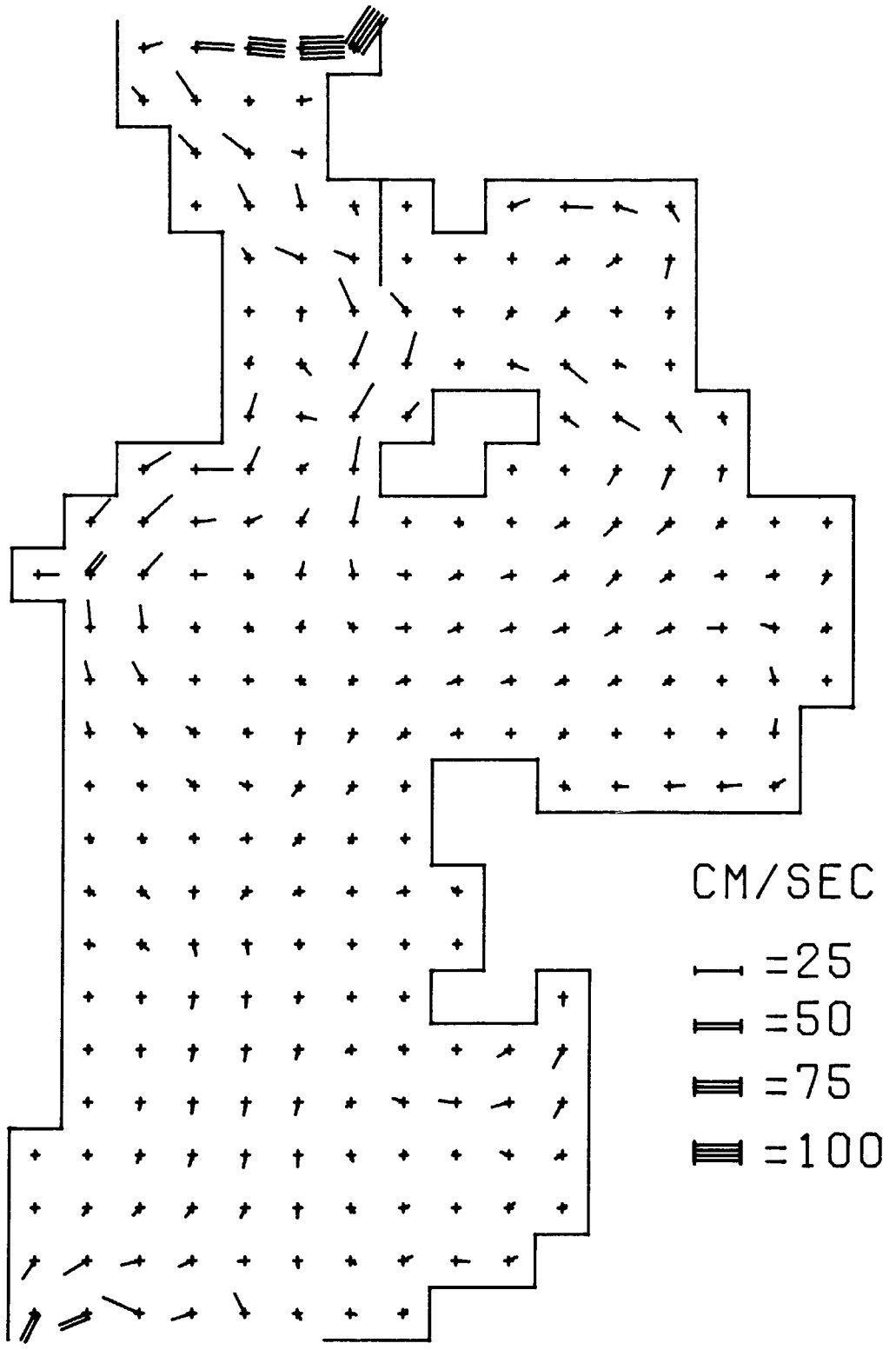

9 HRS 12TH

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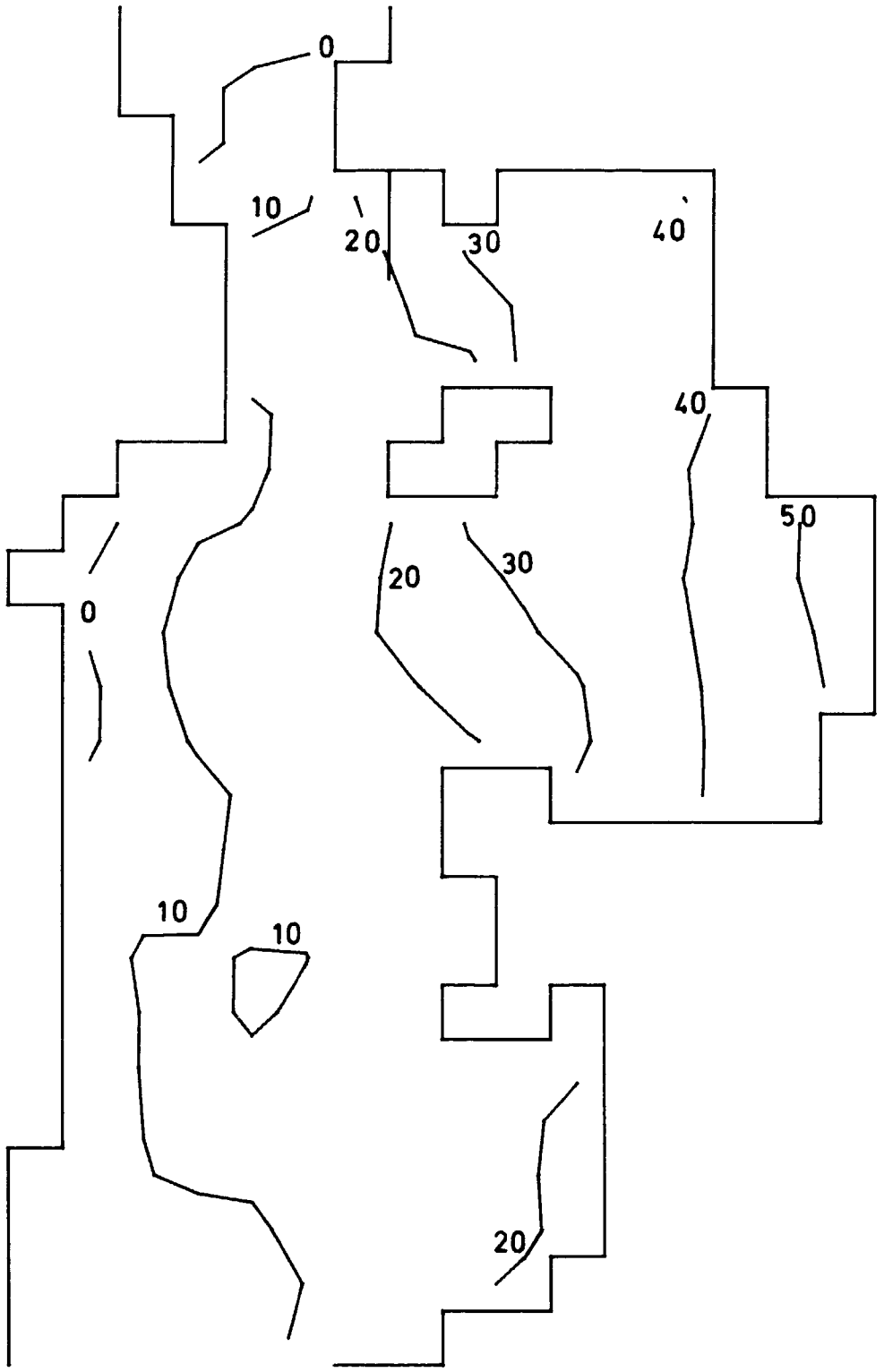

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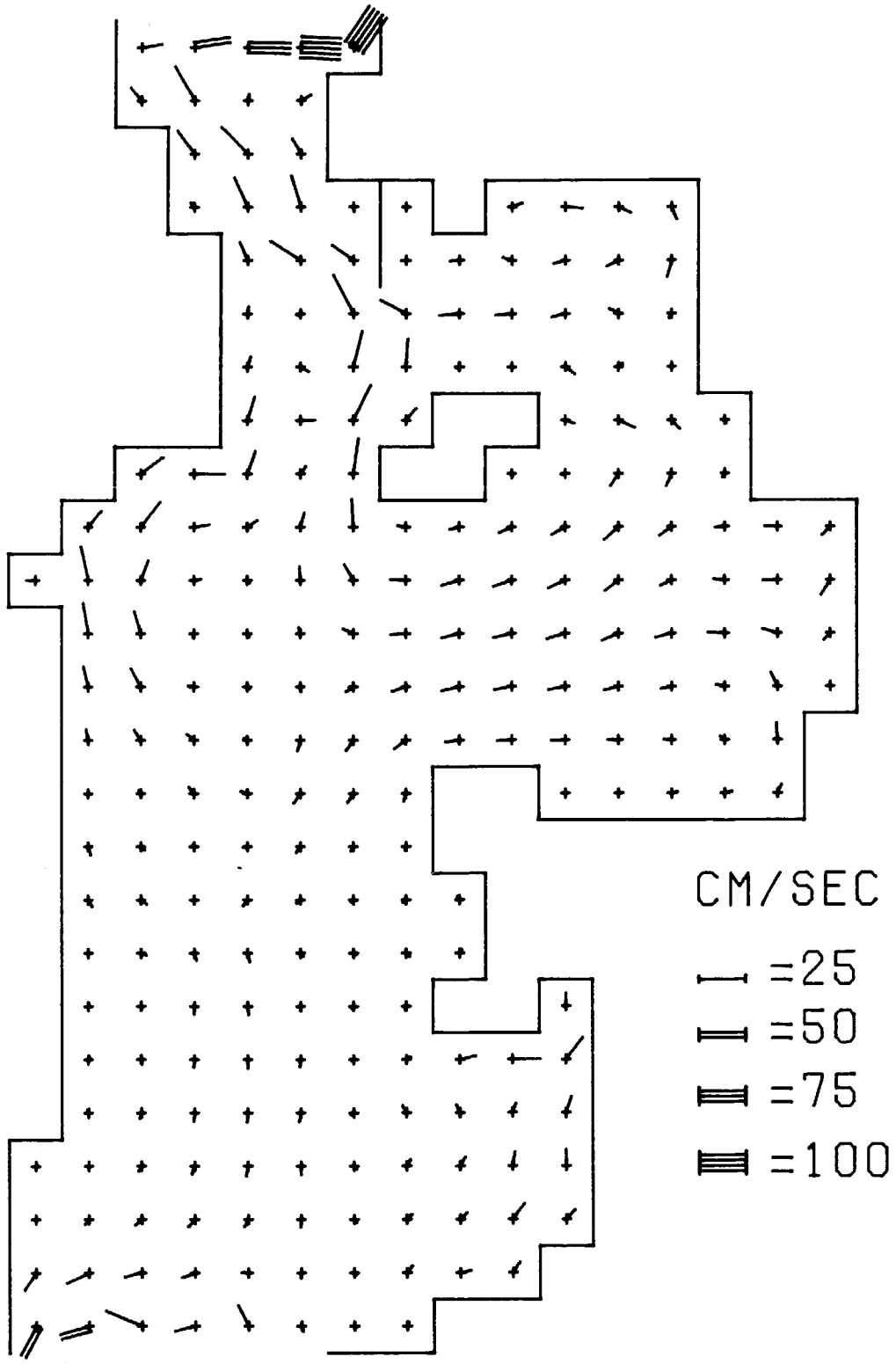

10 HRS 12TH

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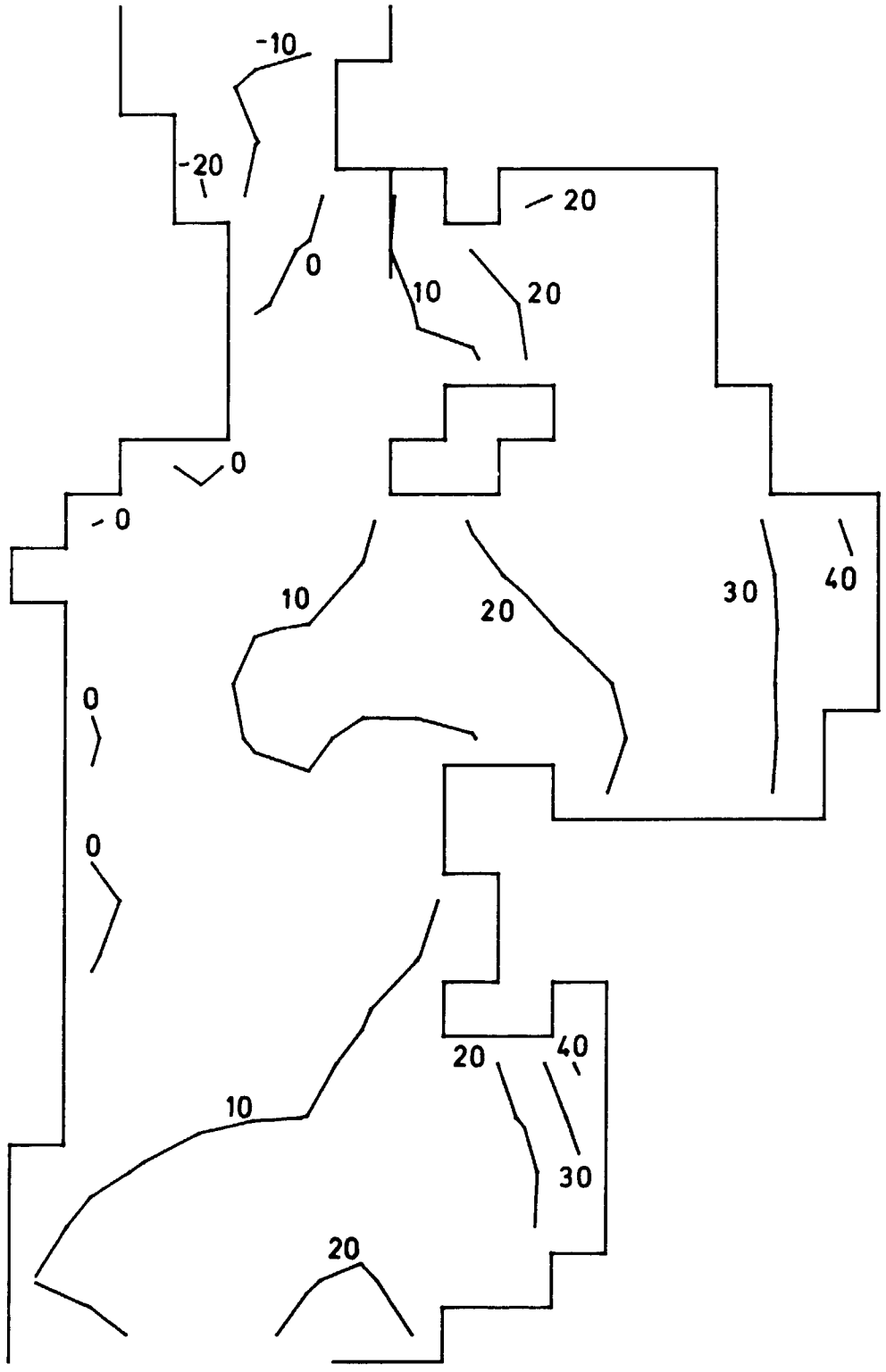

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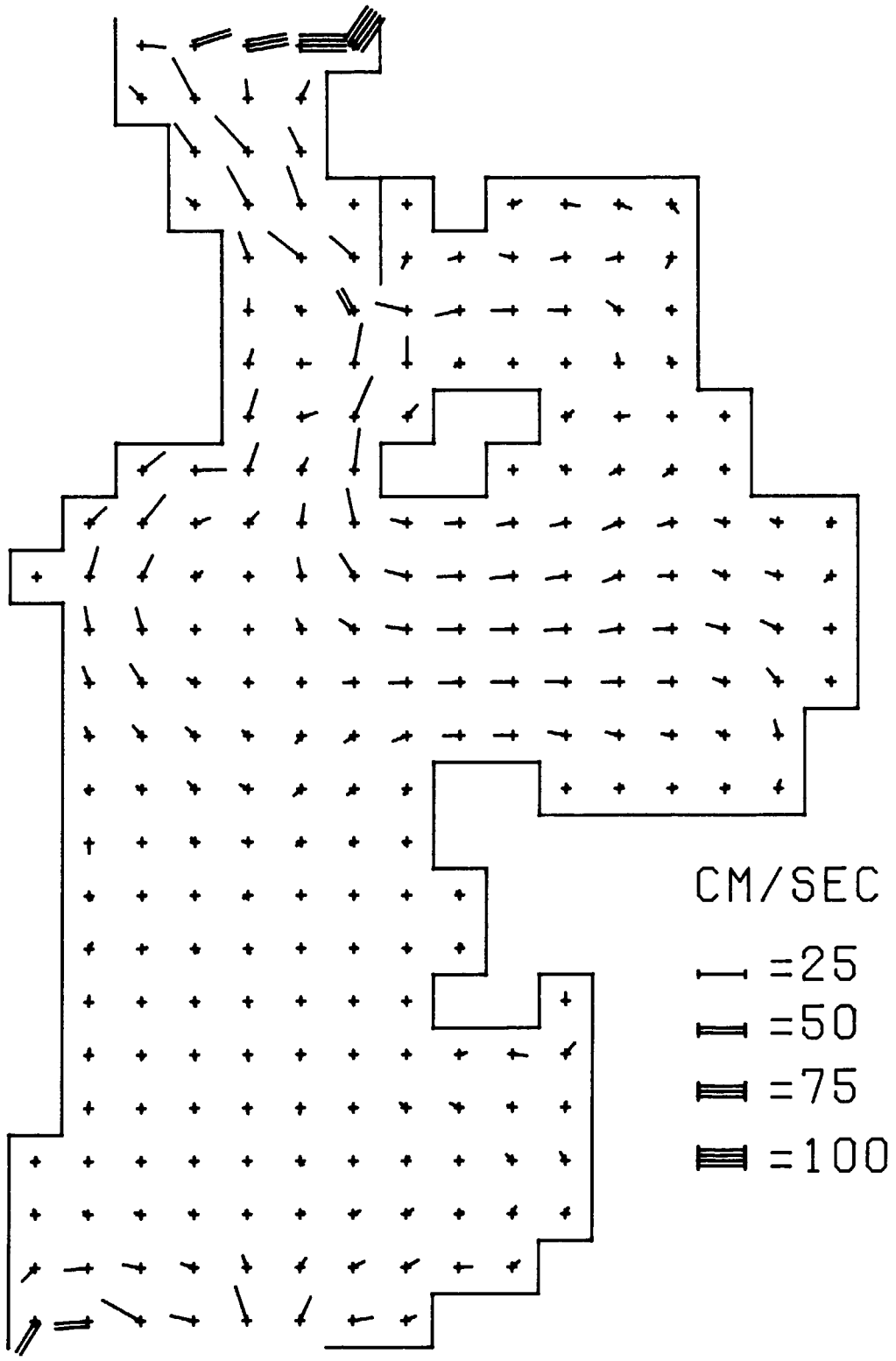

11 HRS 12TH

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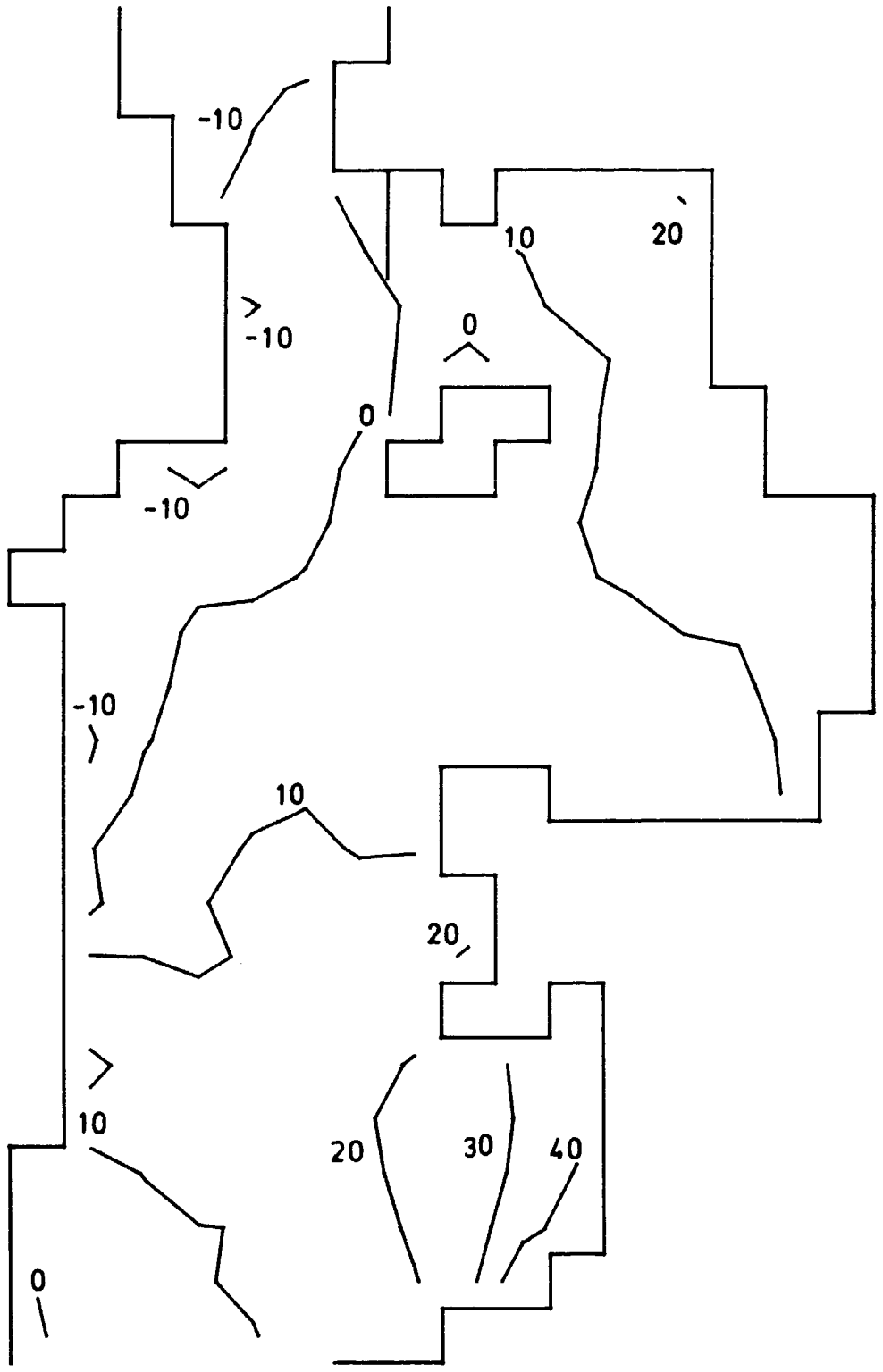

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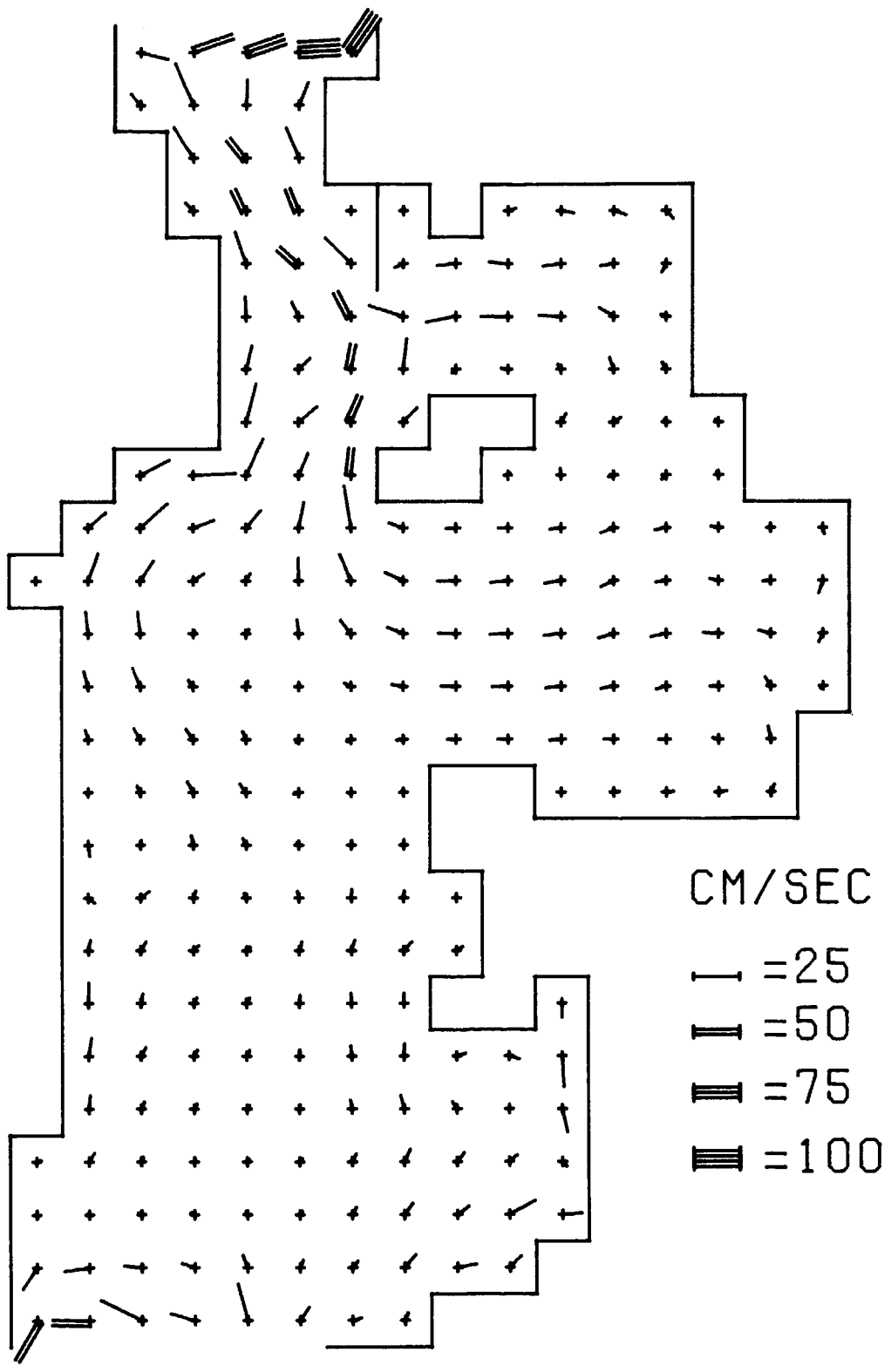

12 HRS 12TH

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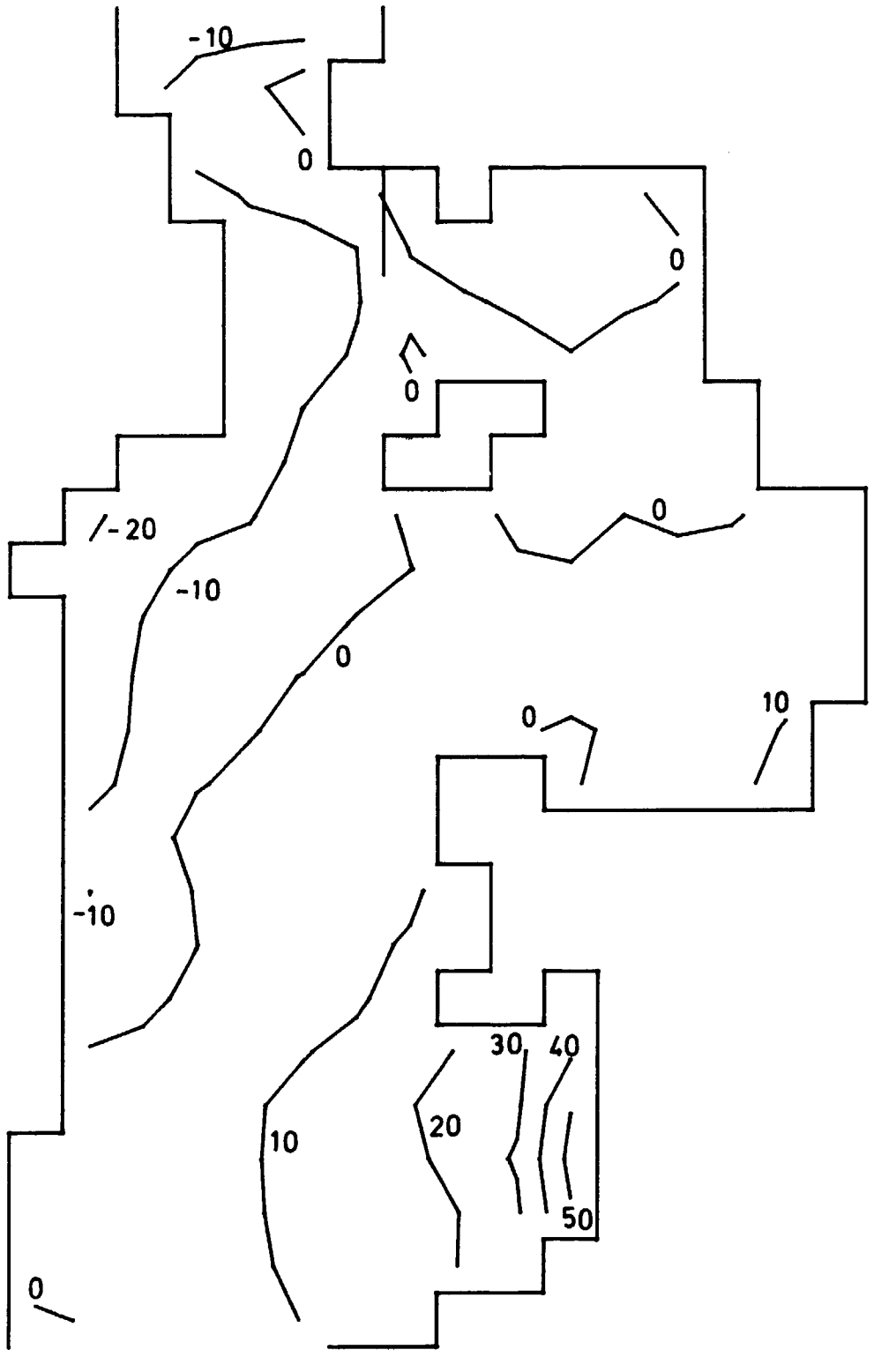

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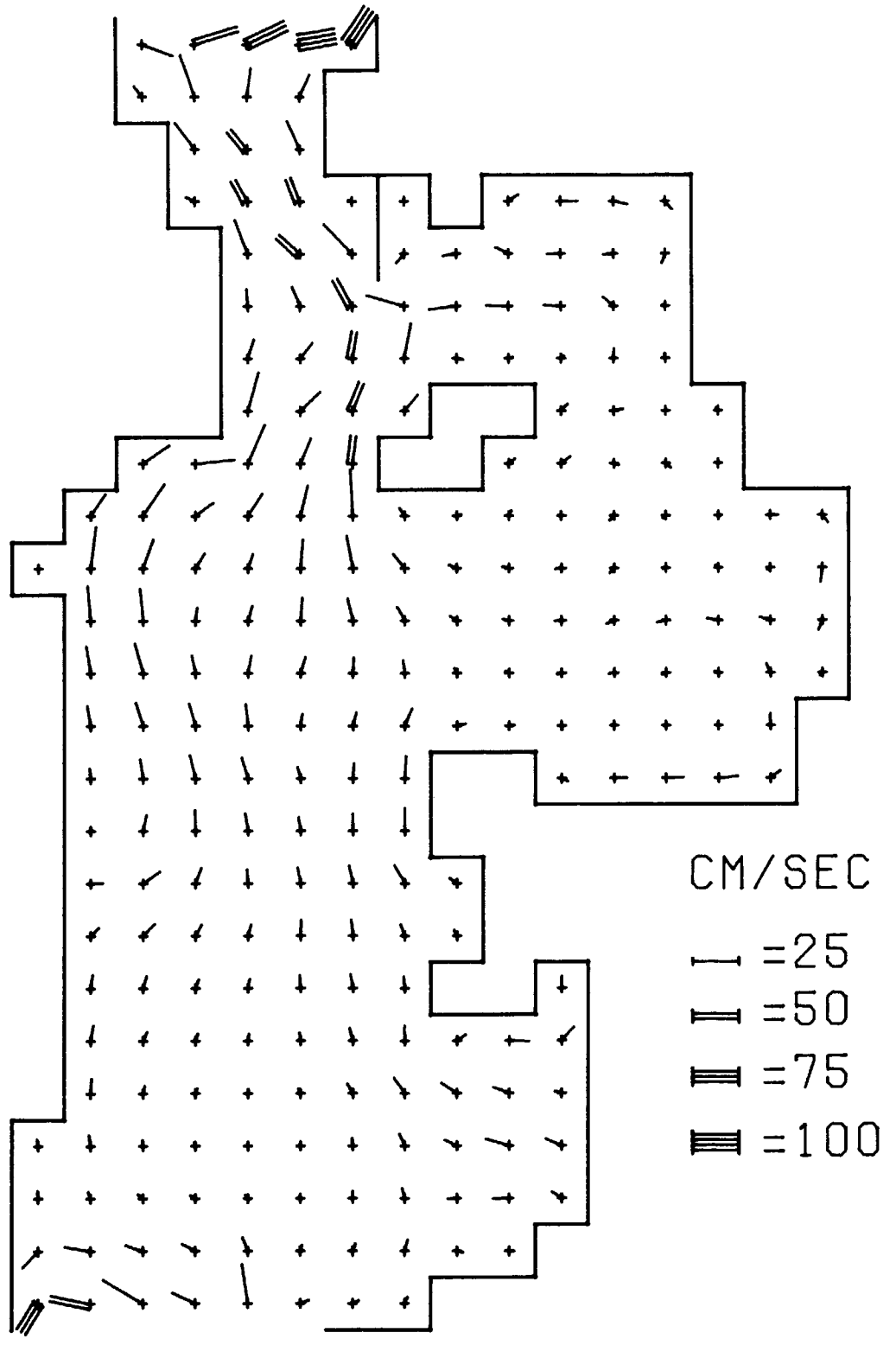

13 HRS 12TH

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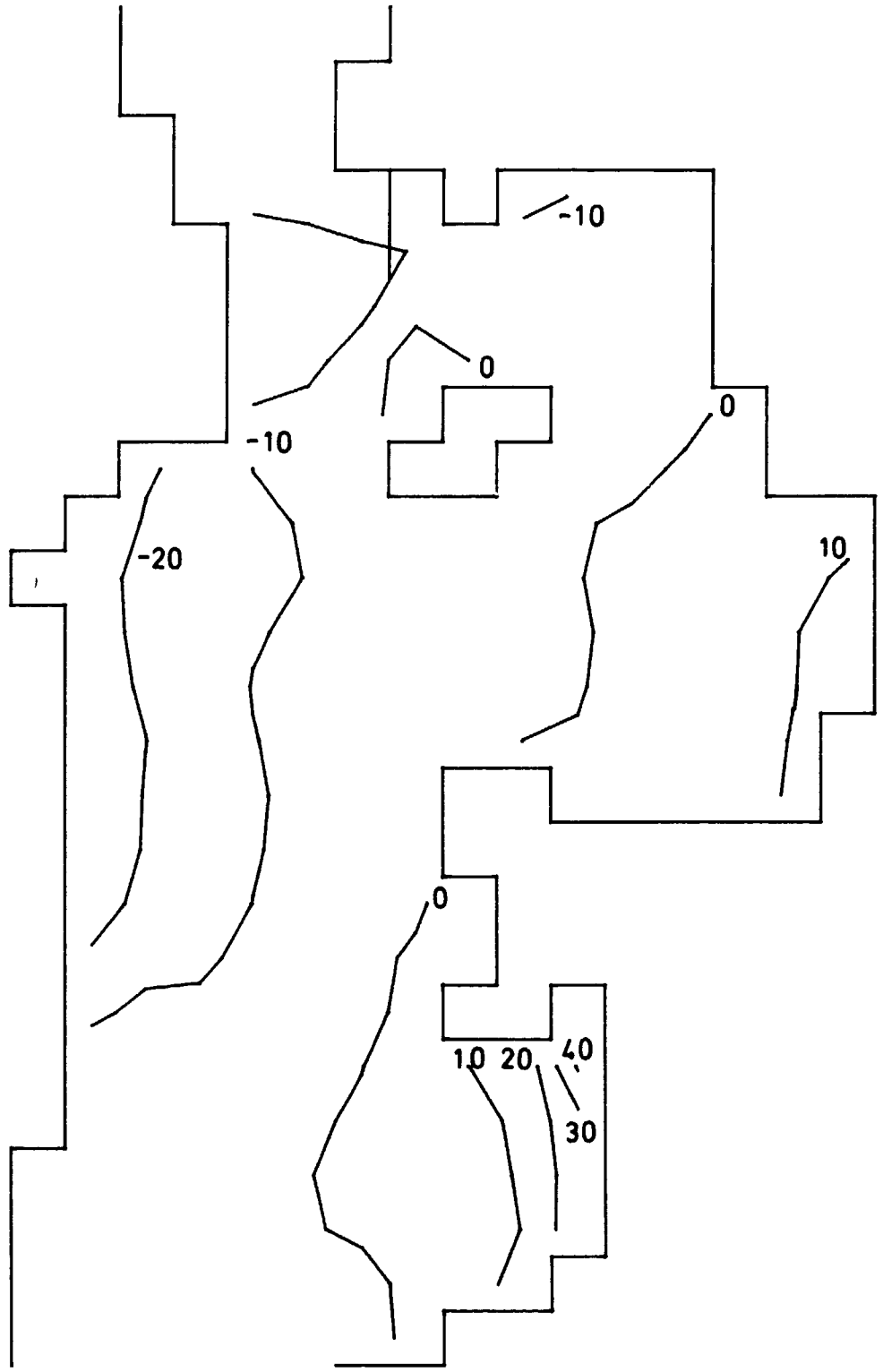

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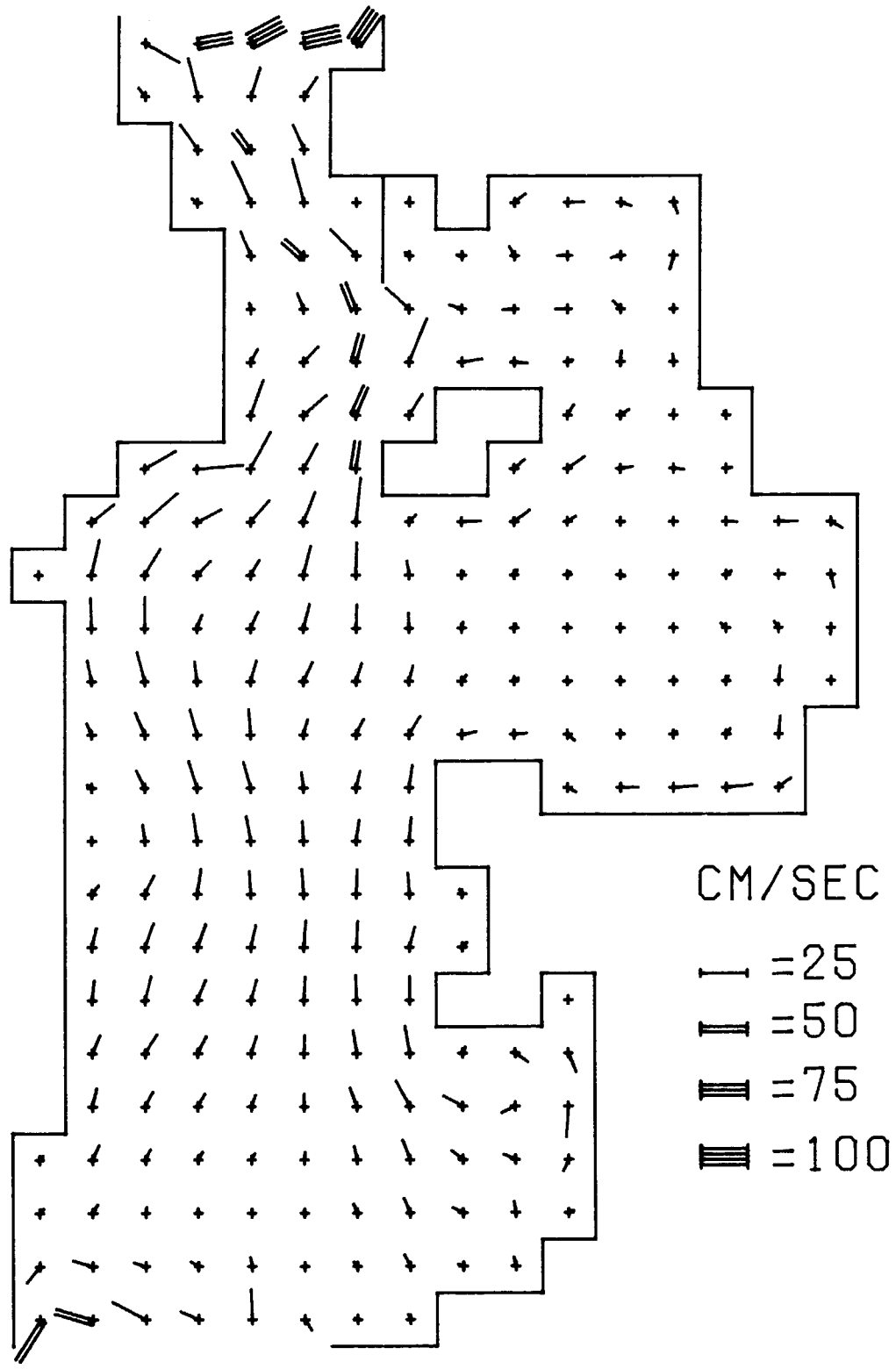

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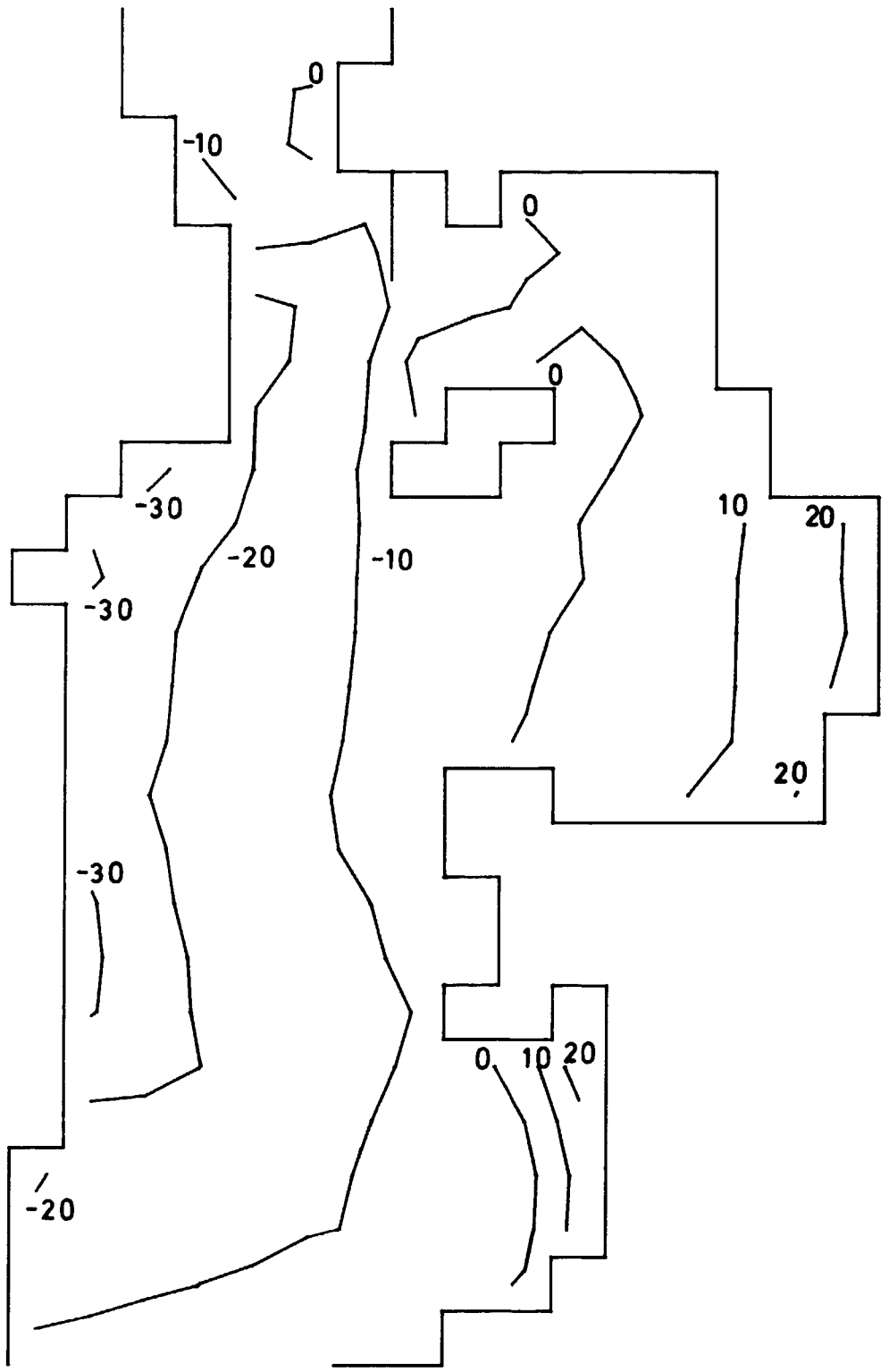

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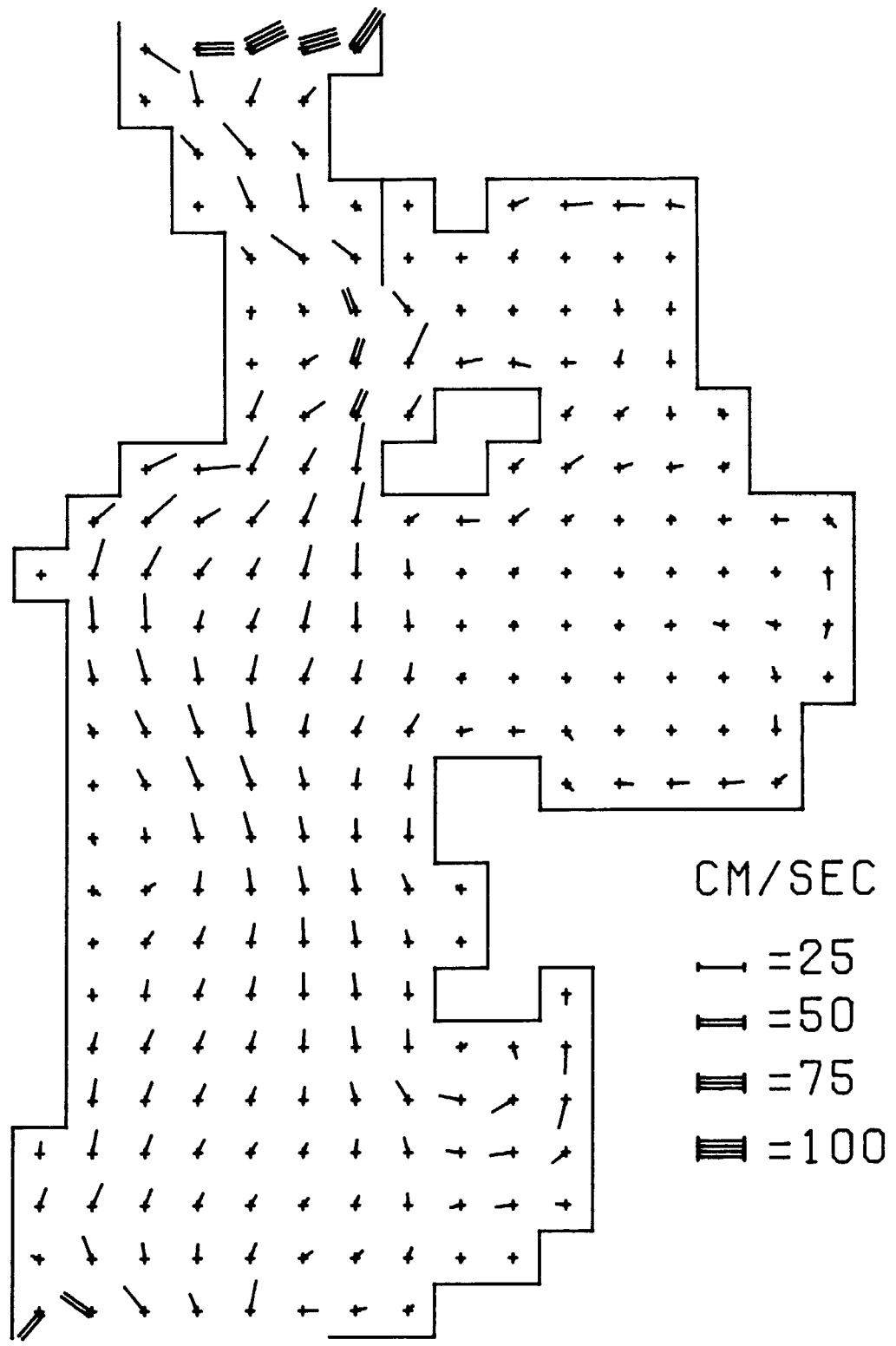

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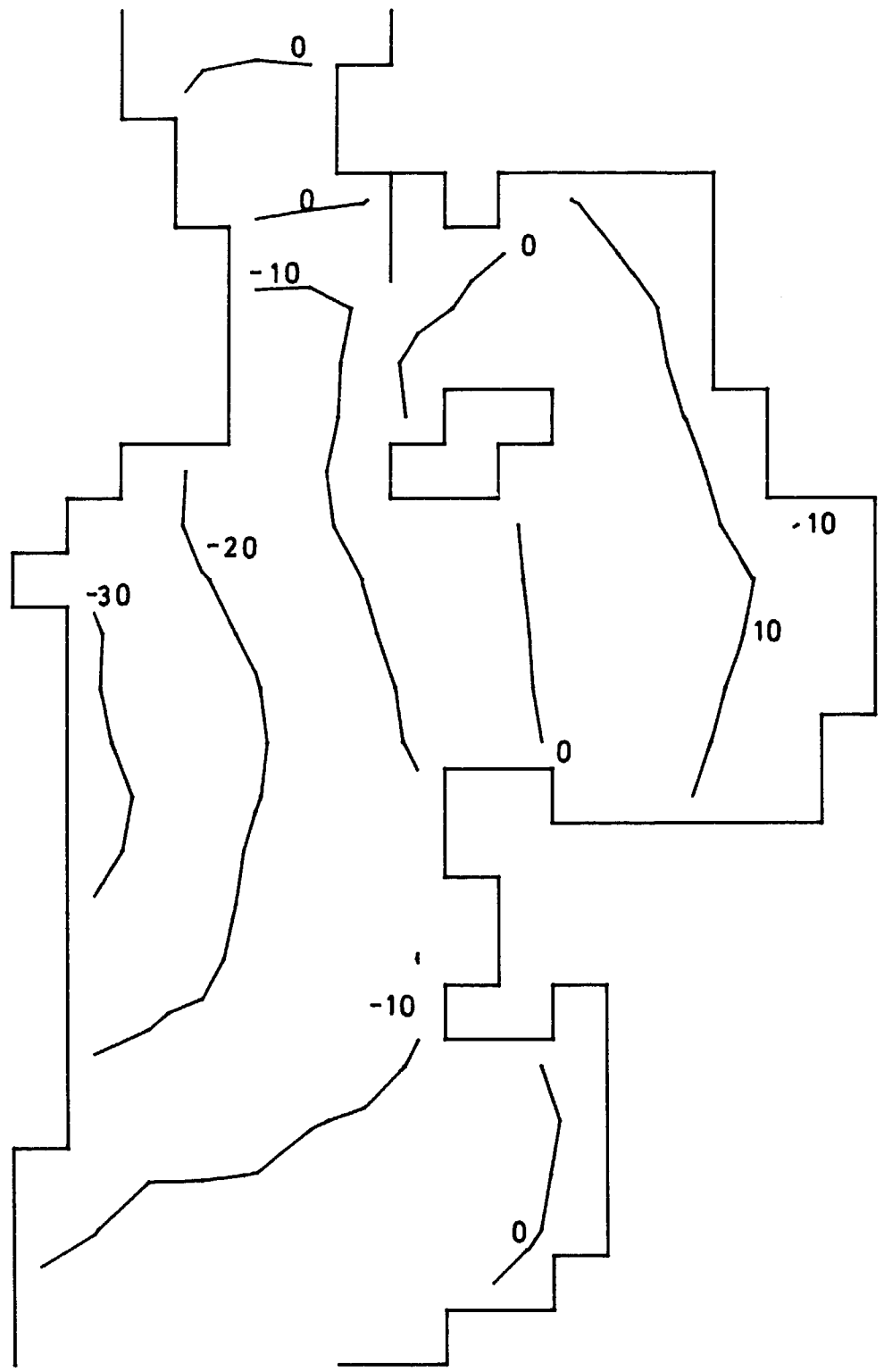

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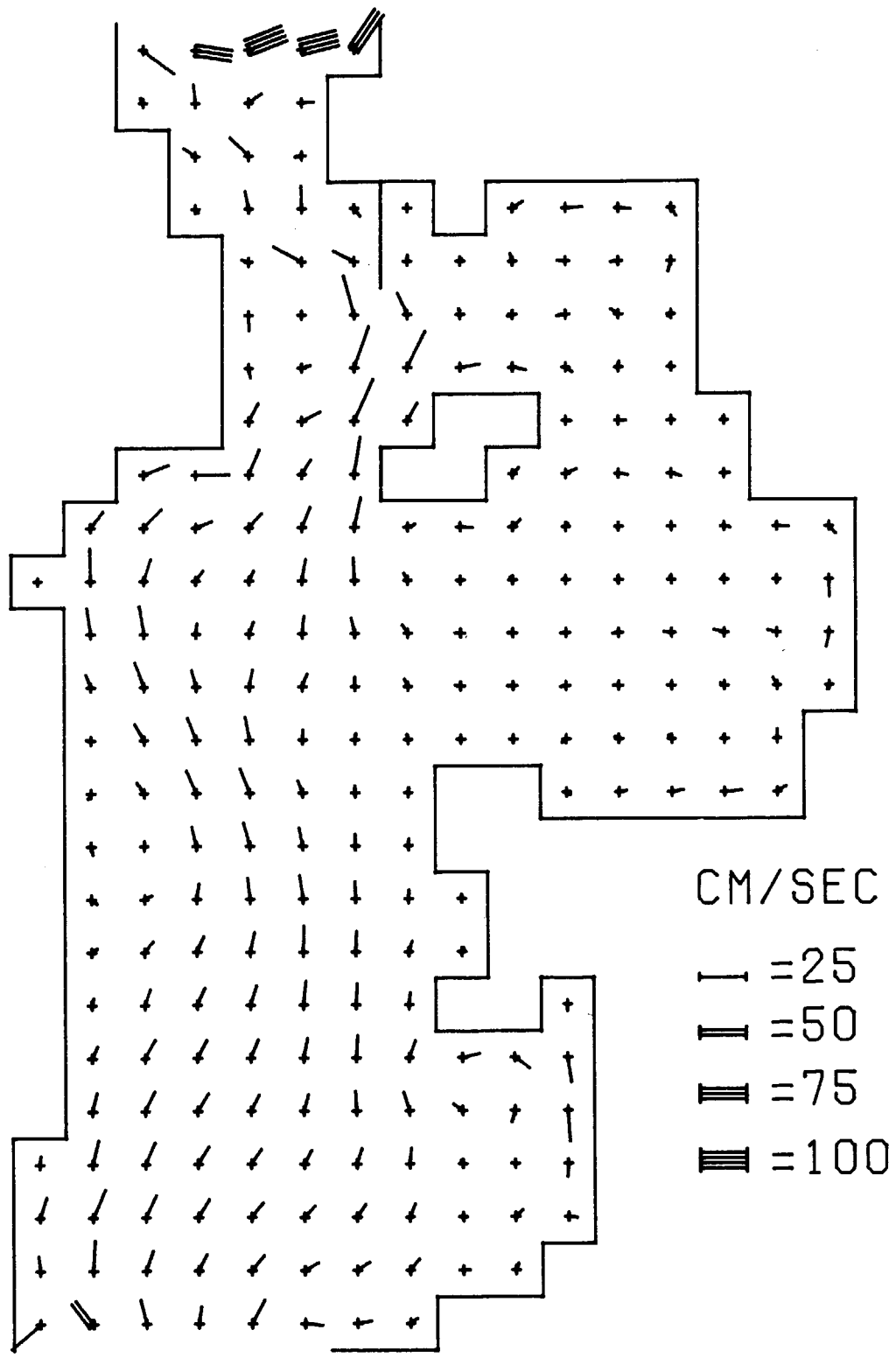

16 HRS 12TH

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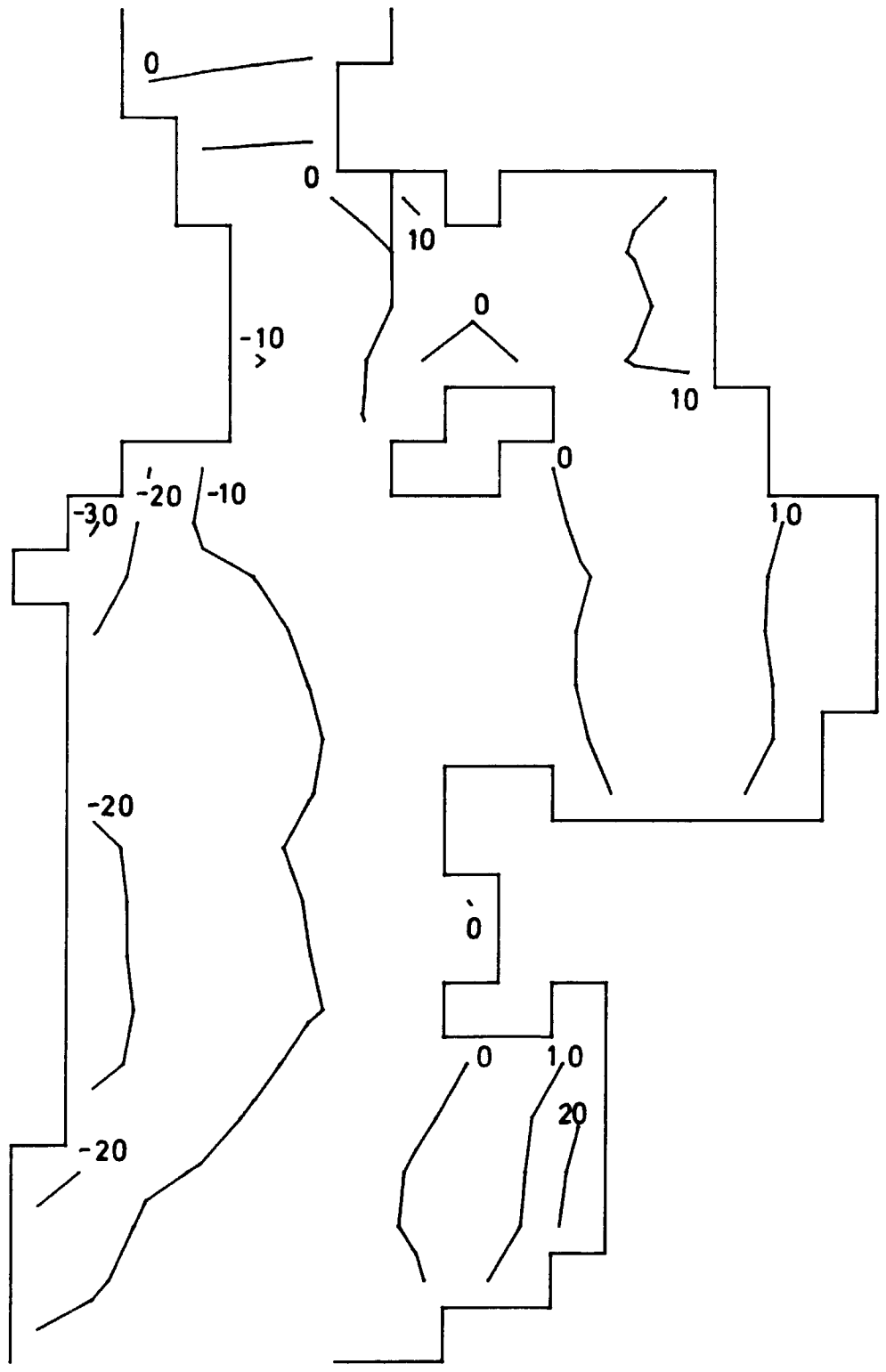

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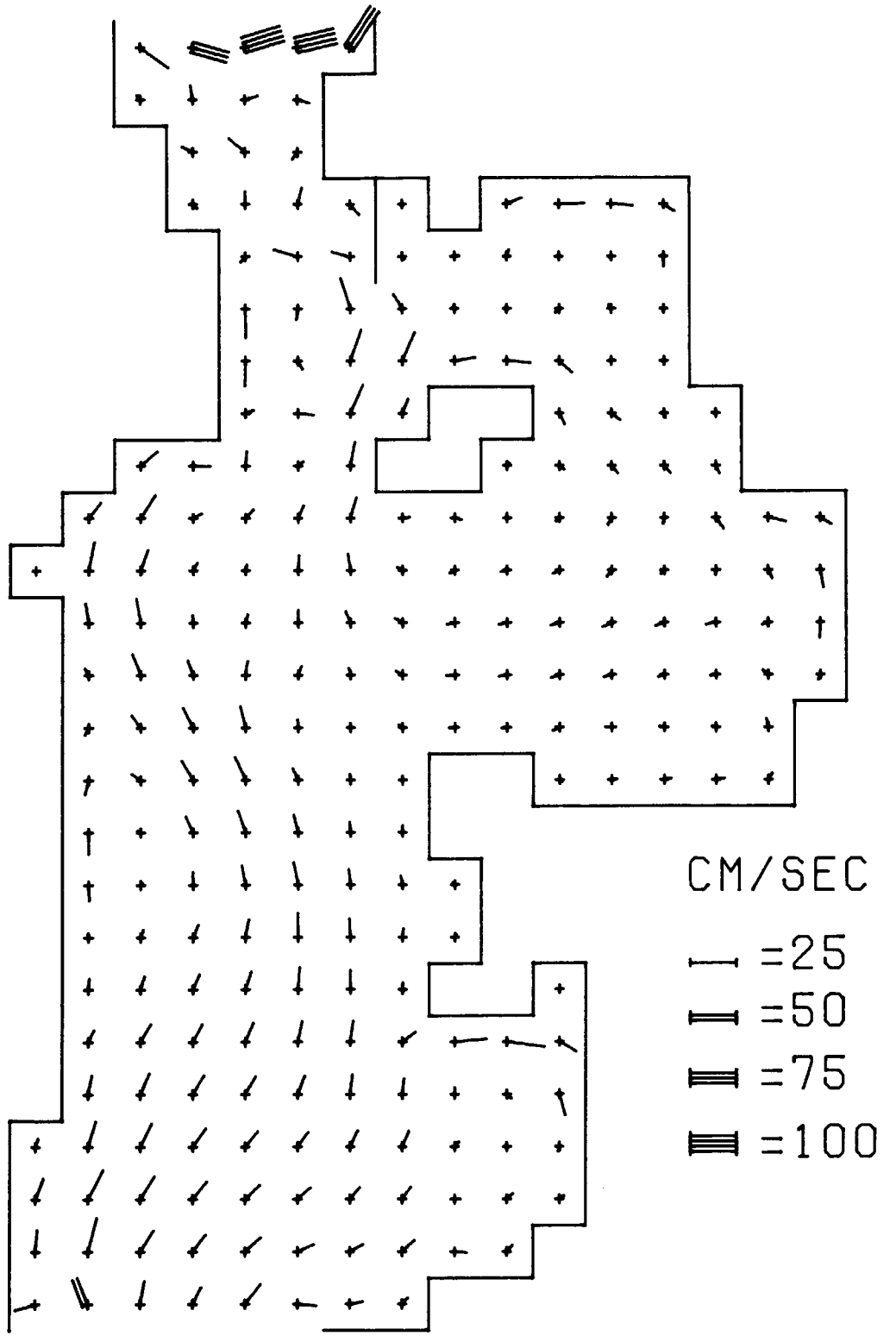

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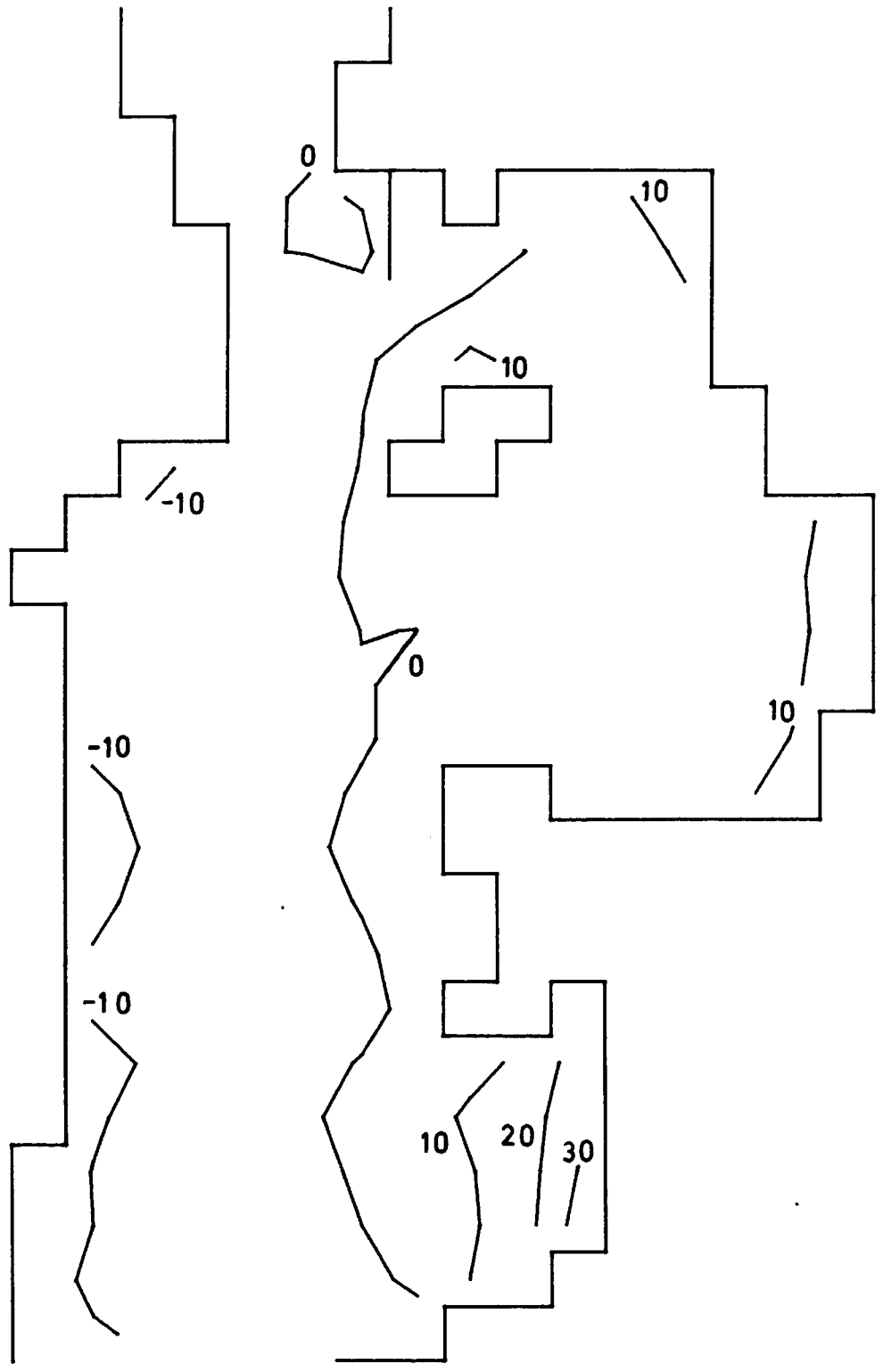

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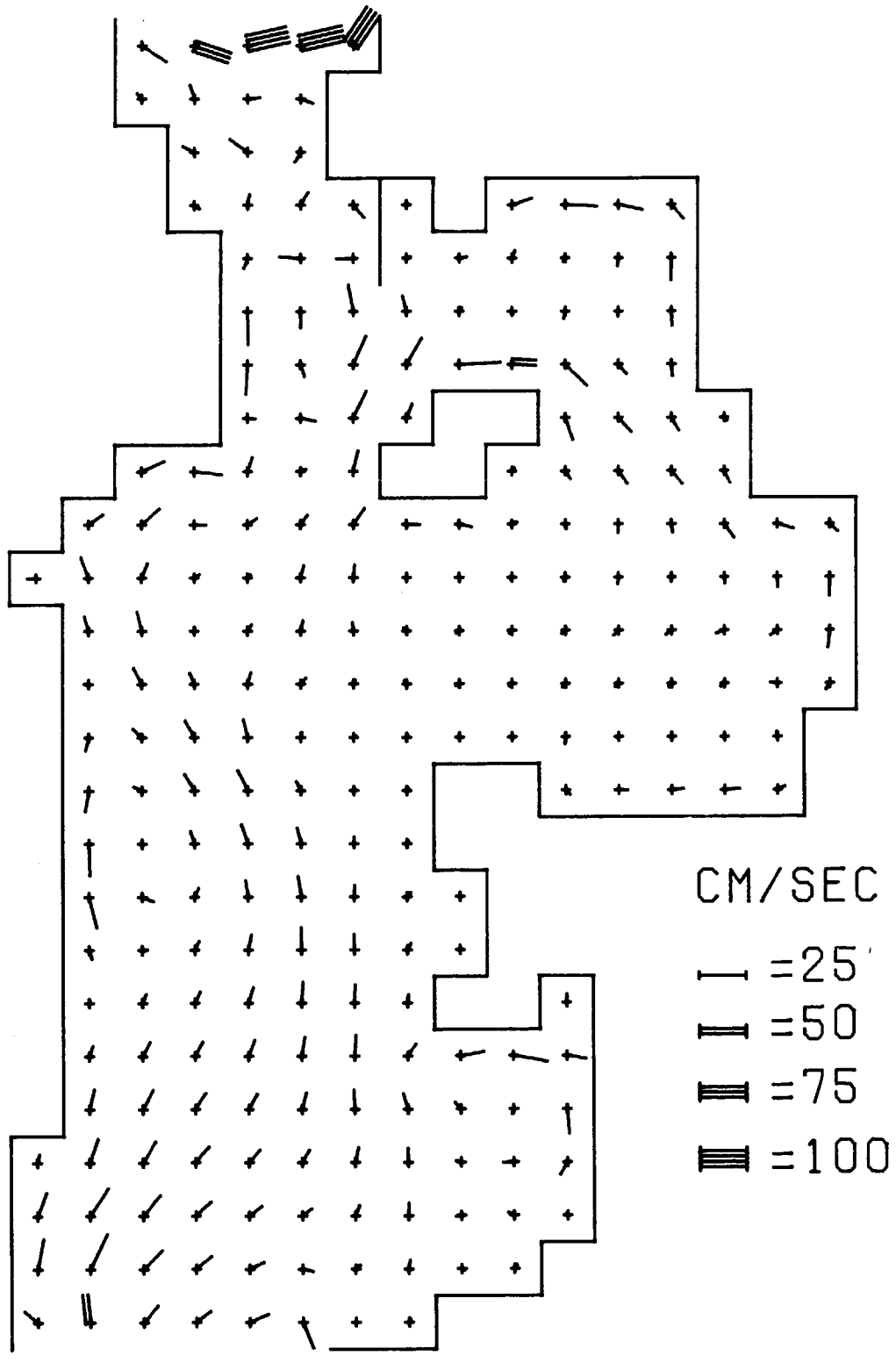

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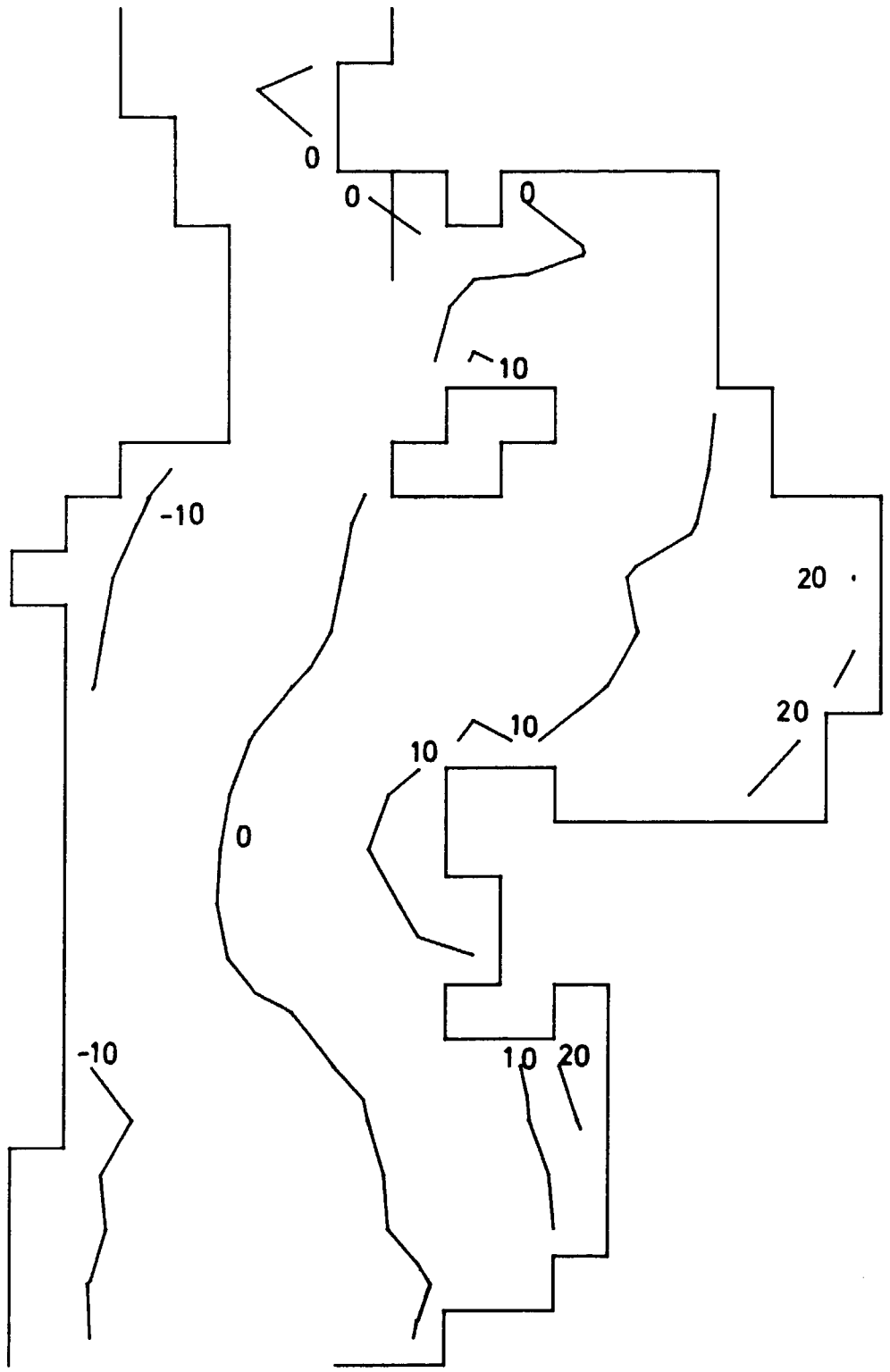

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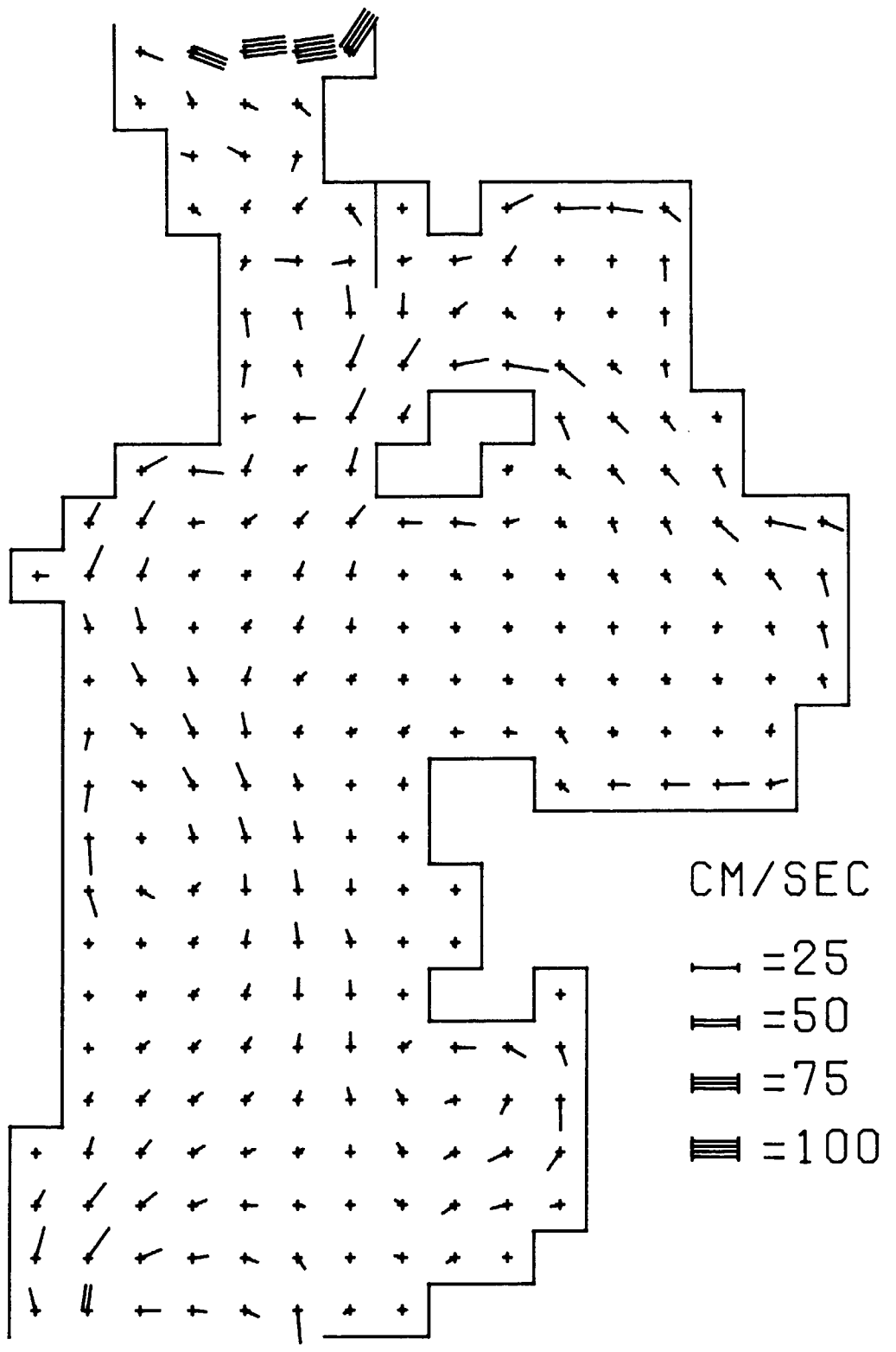

19 HRS 12TH

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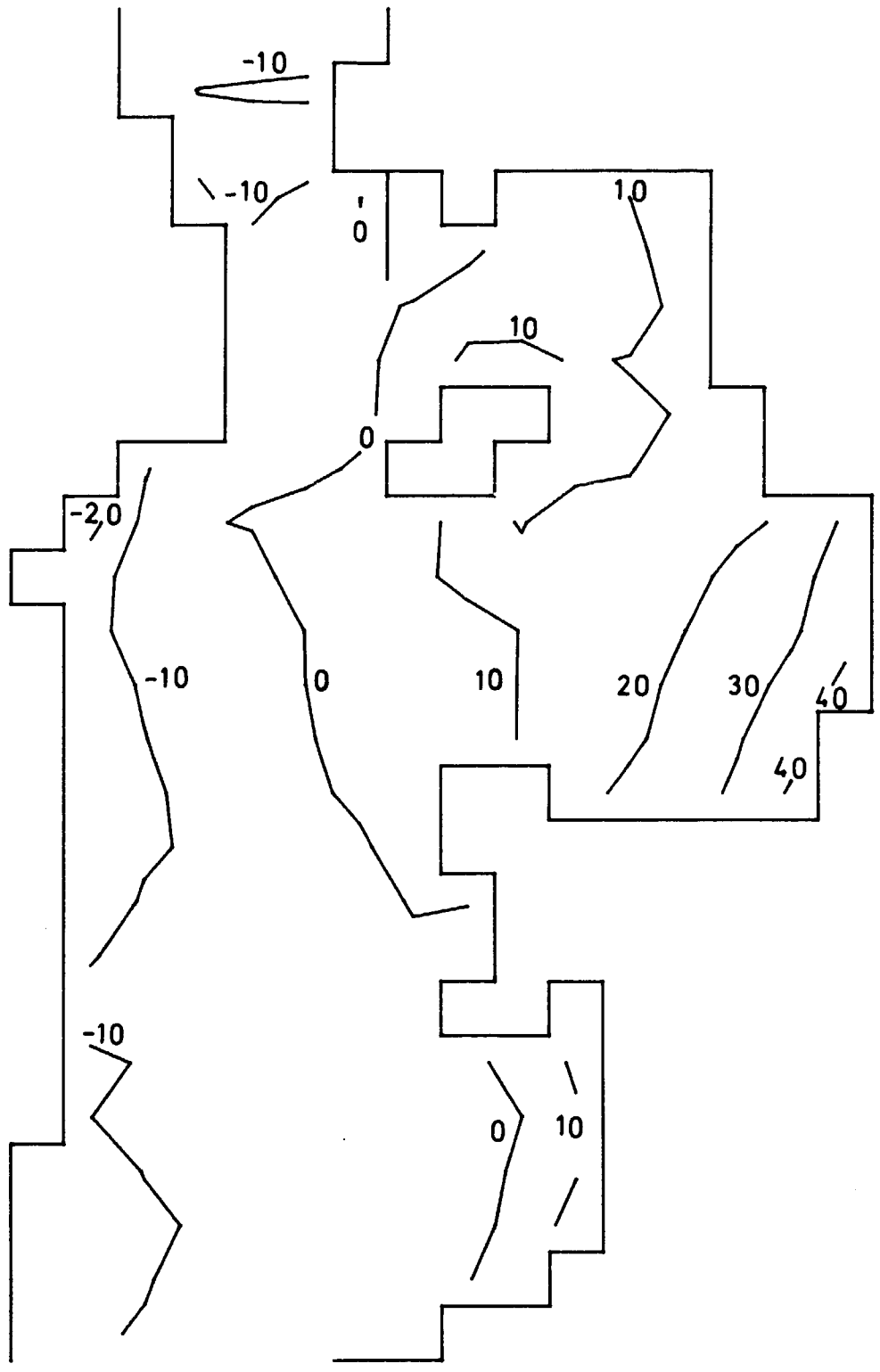

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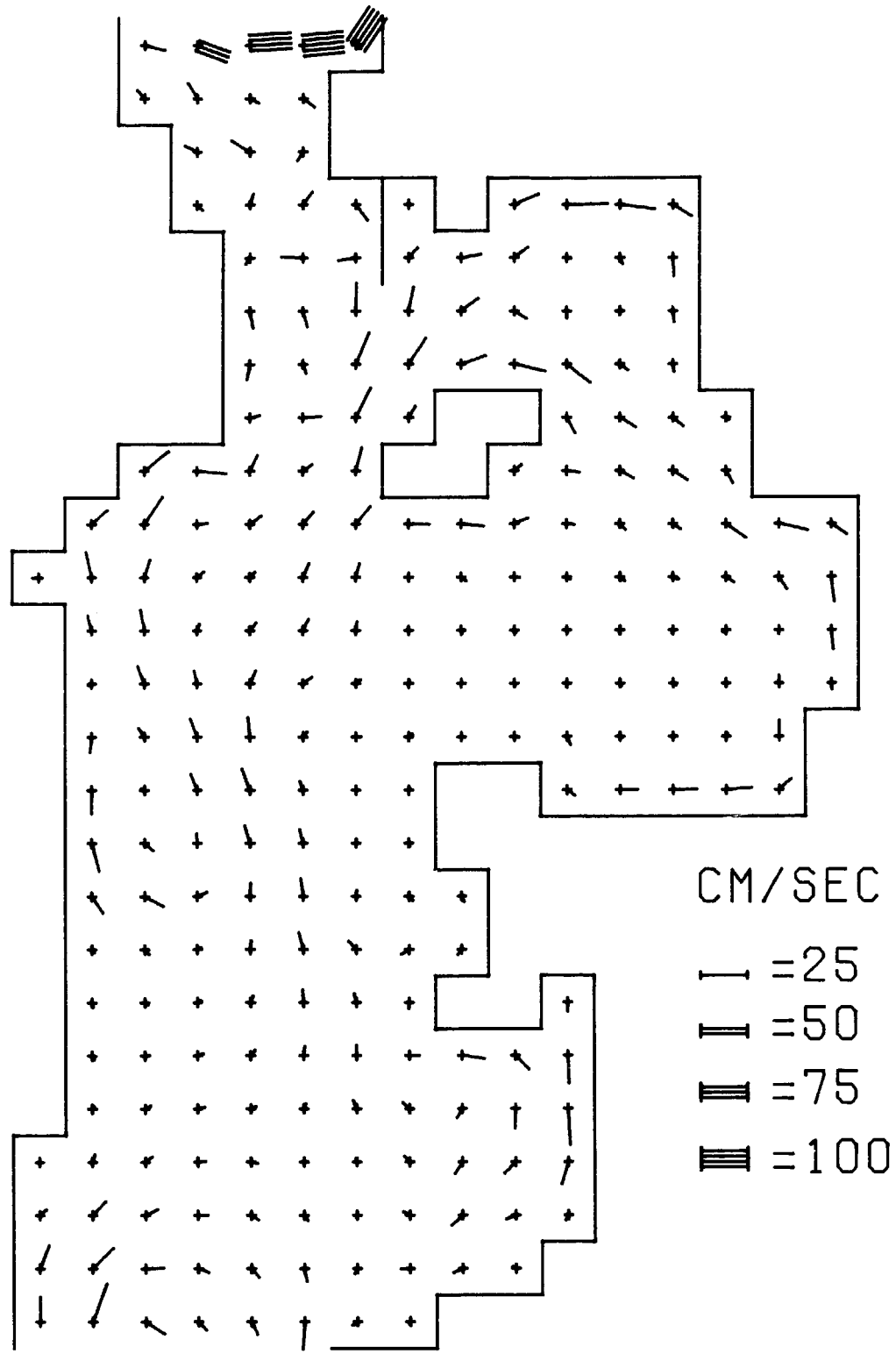

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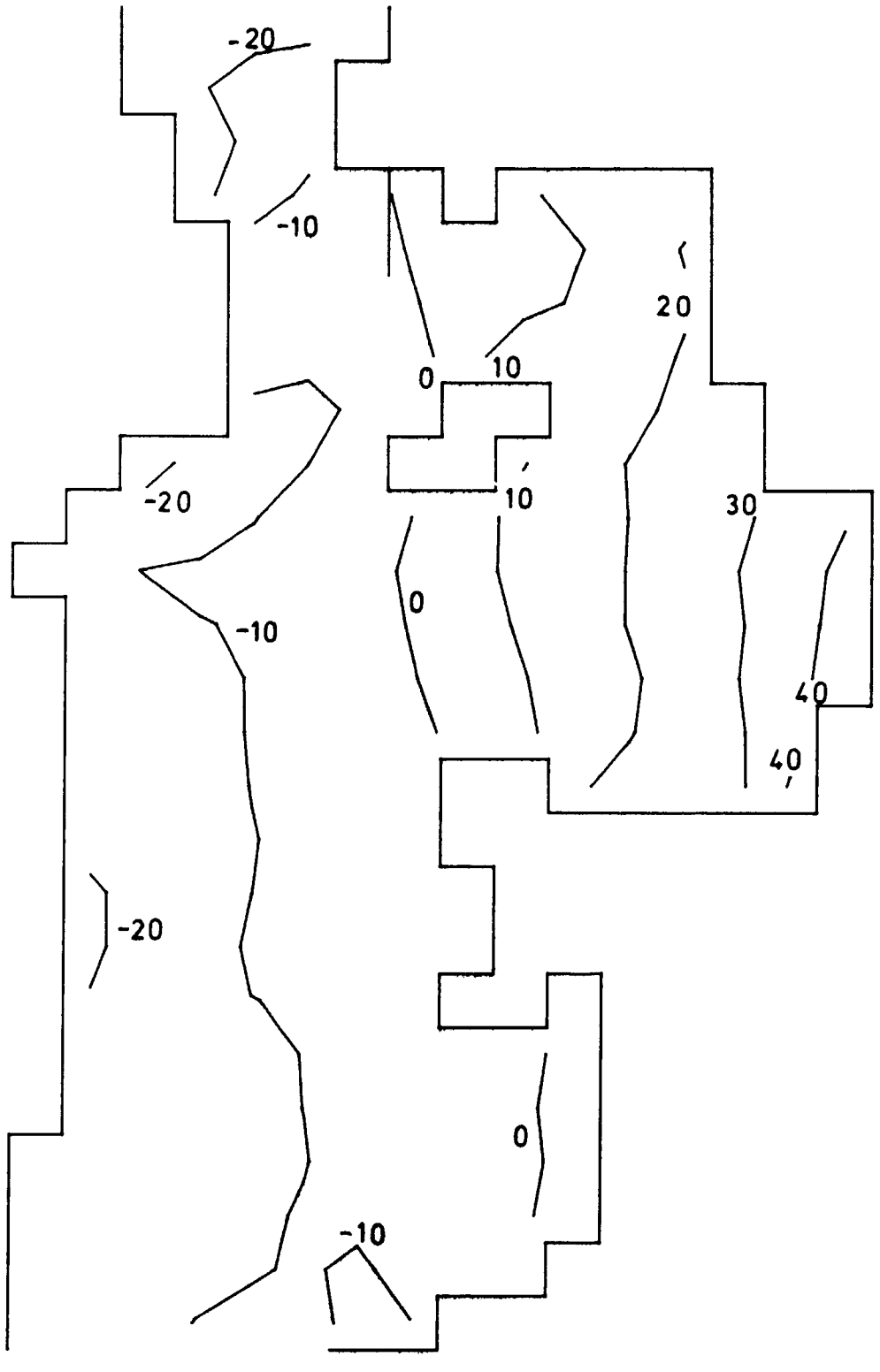

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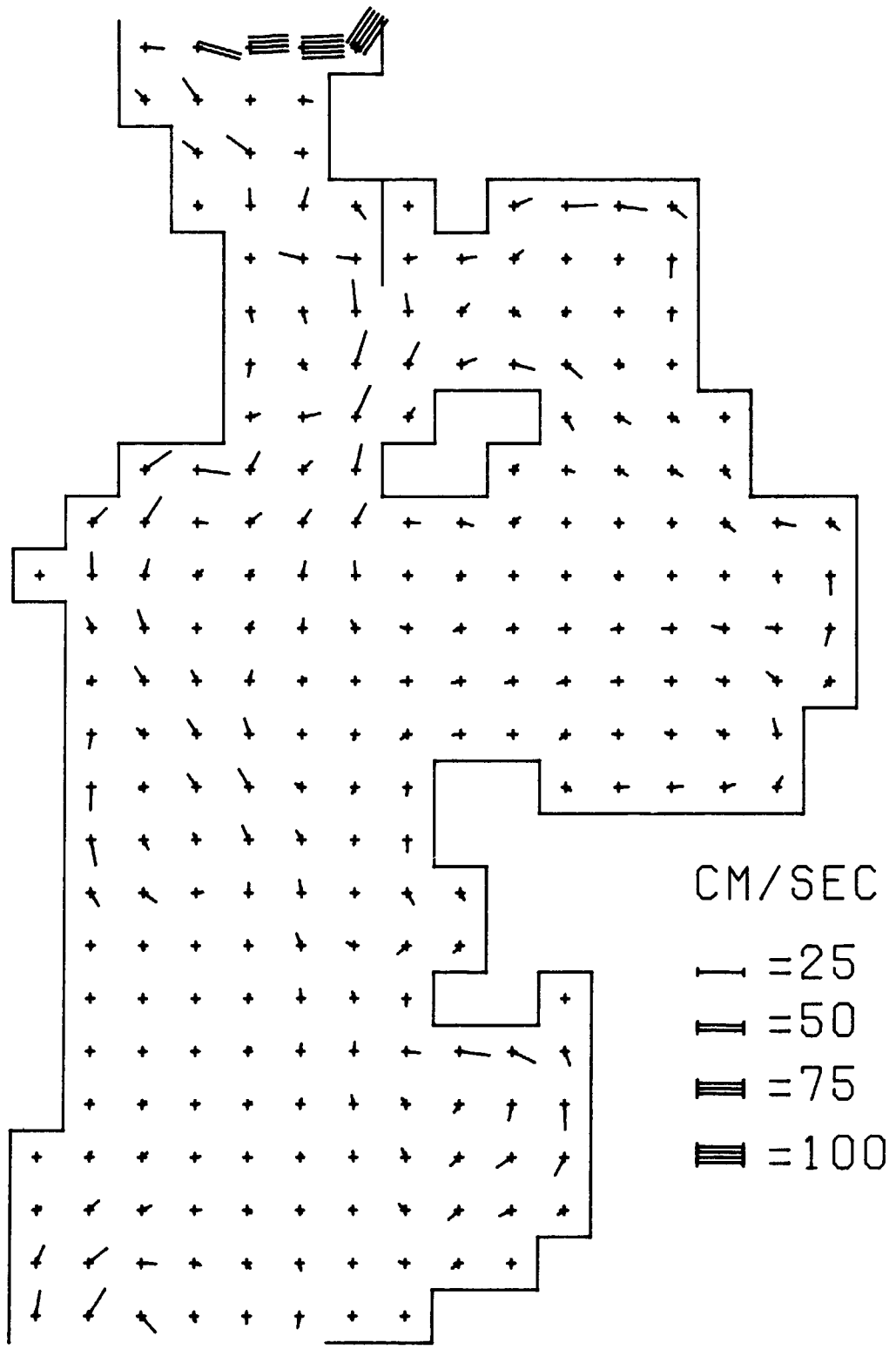

21 HRS 12TH

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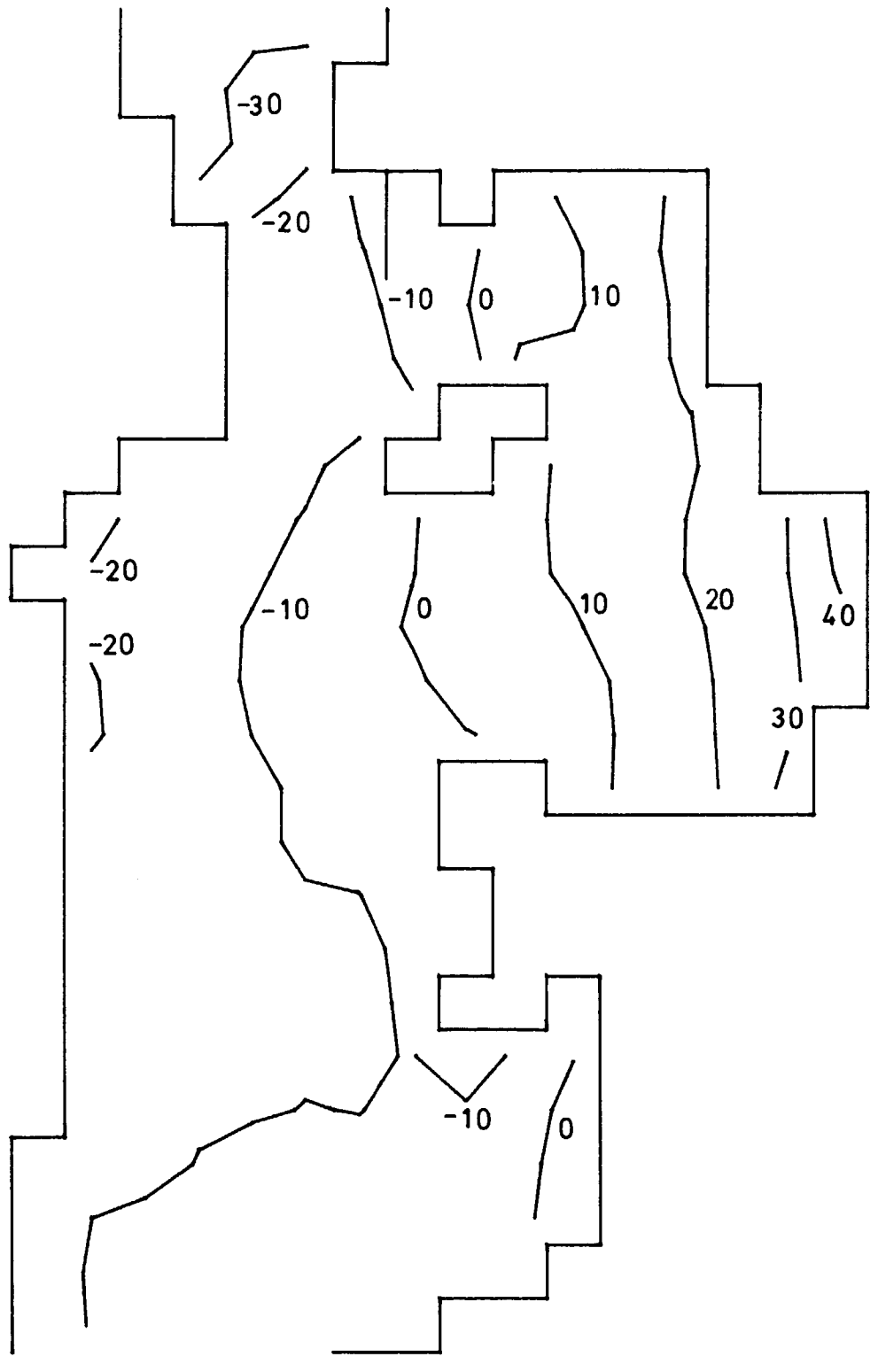

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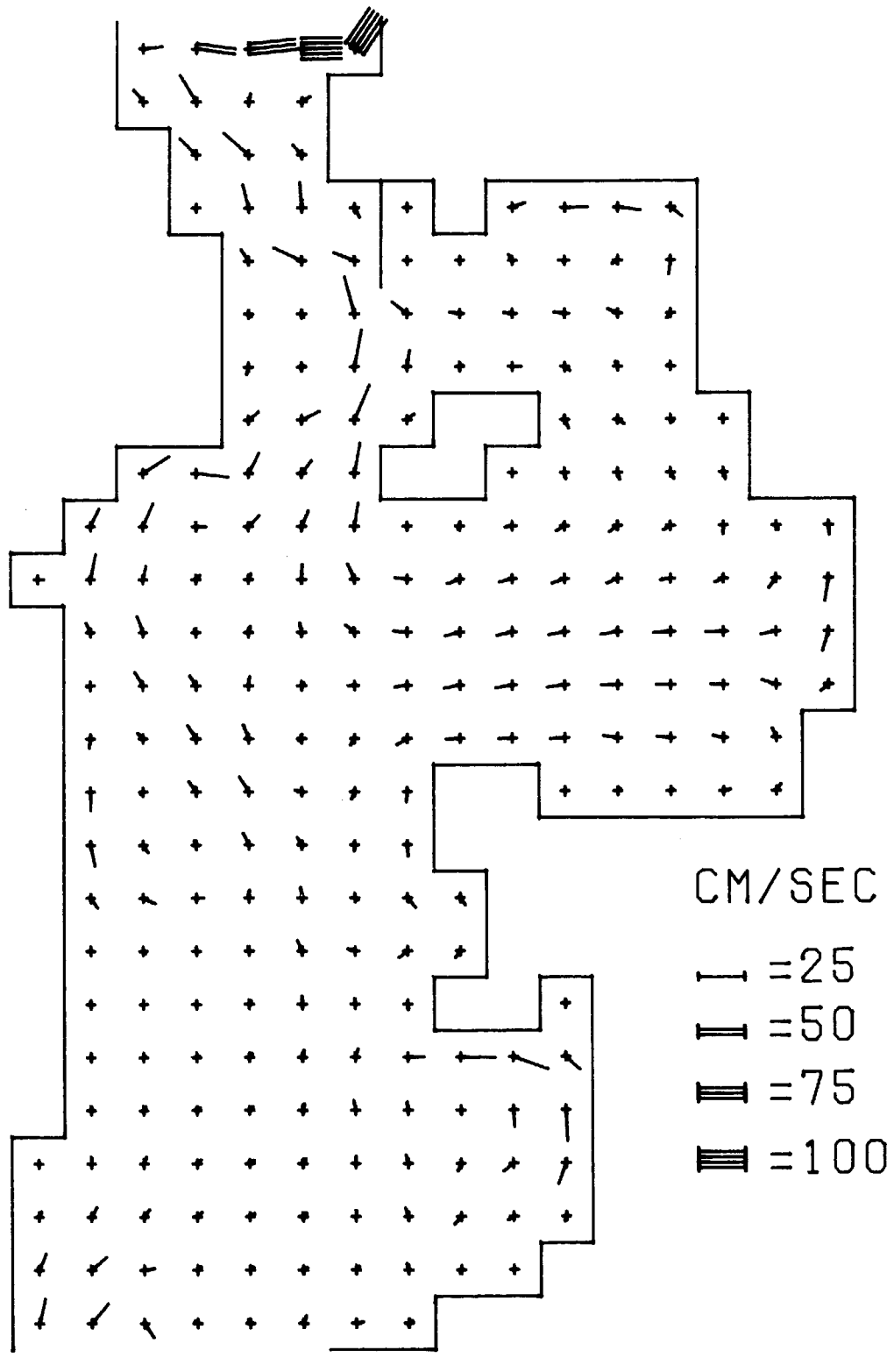

22 HRS 12TH

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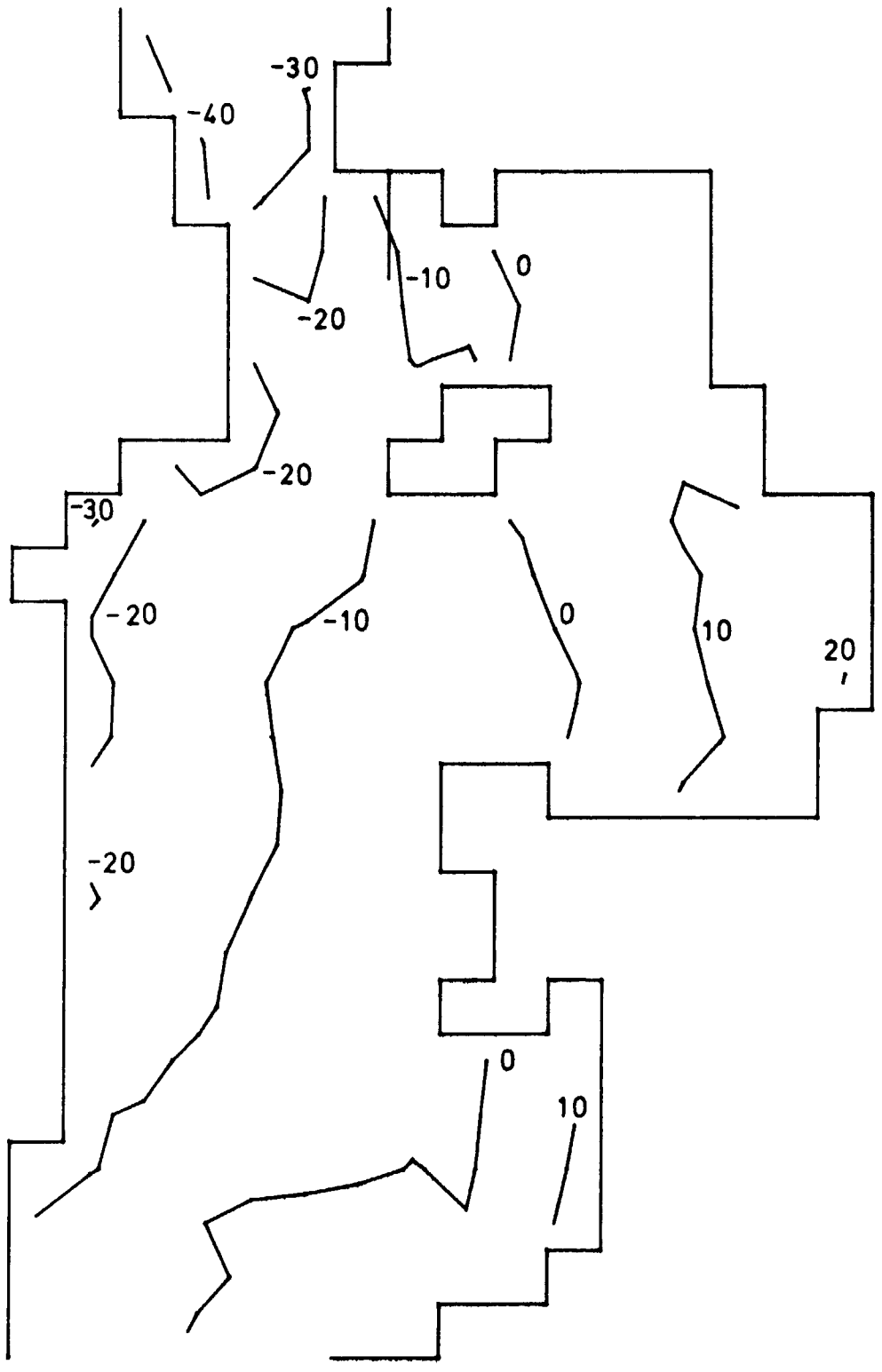

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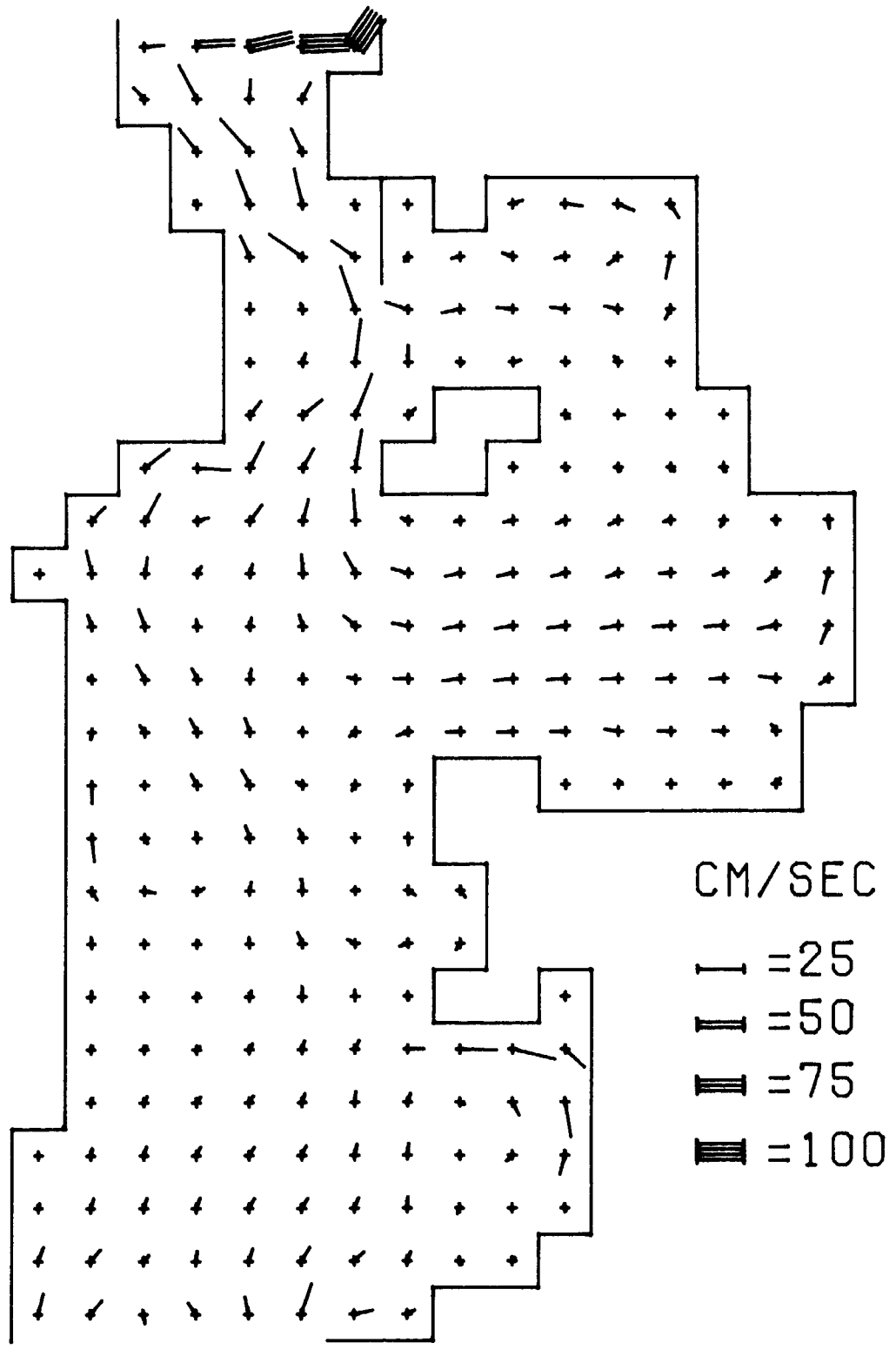

23 HRS 12TH

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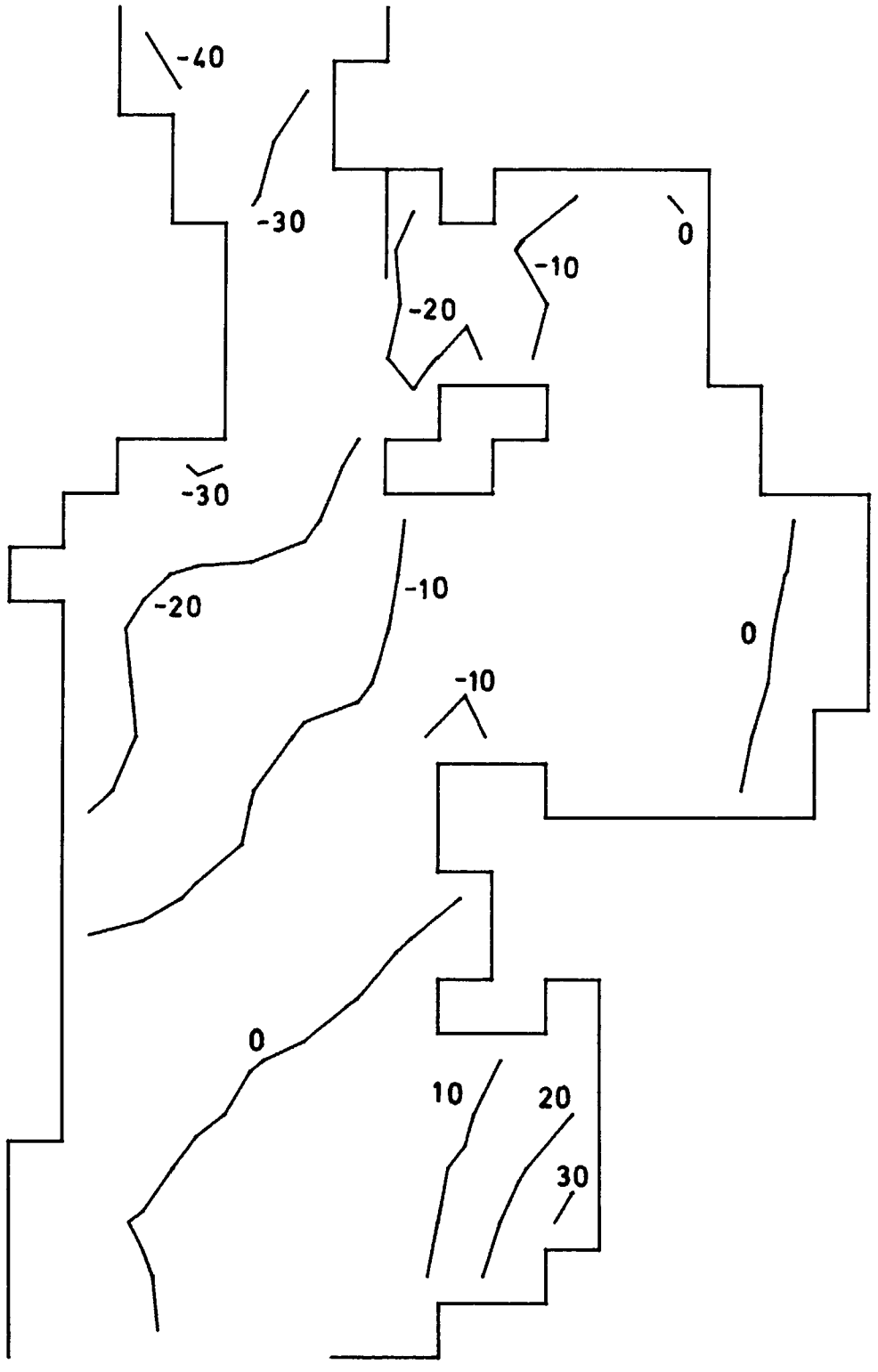

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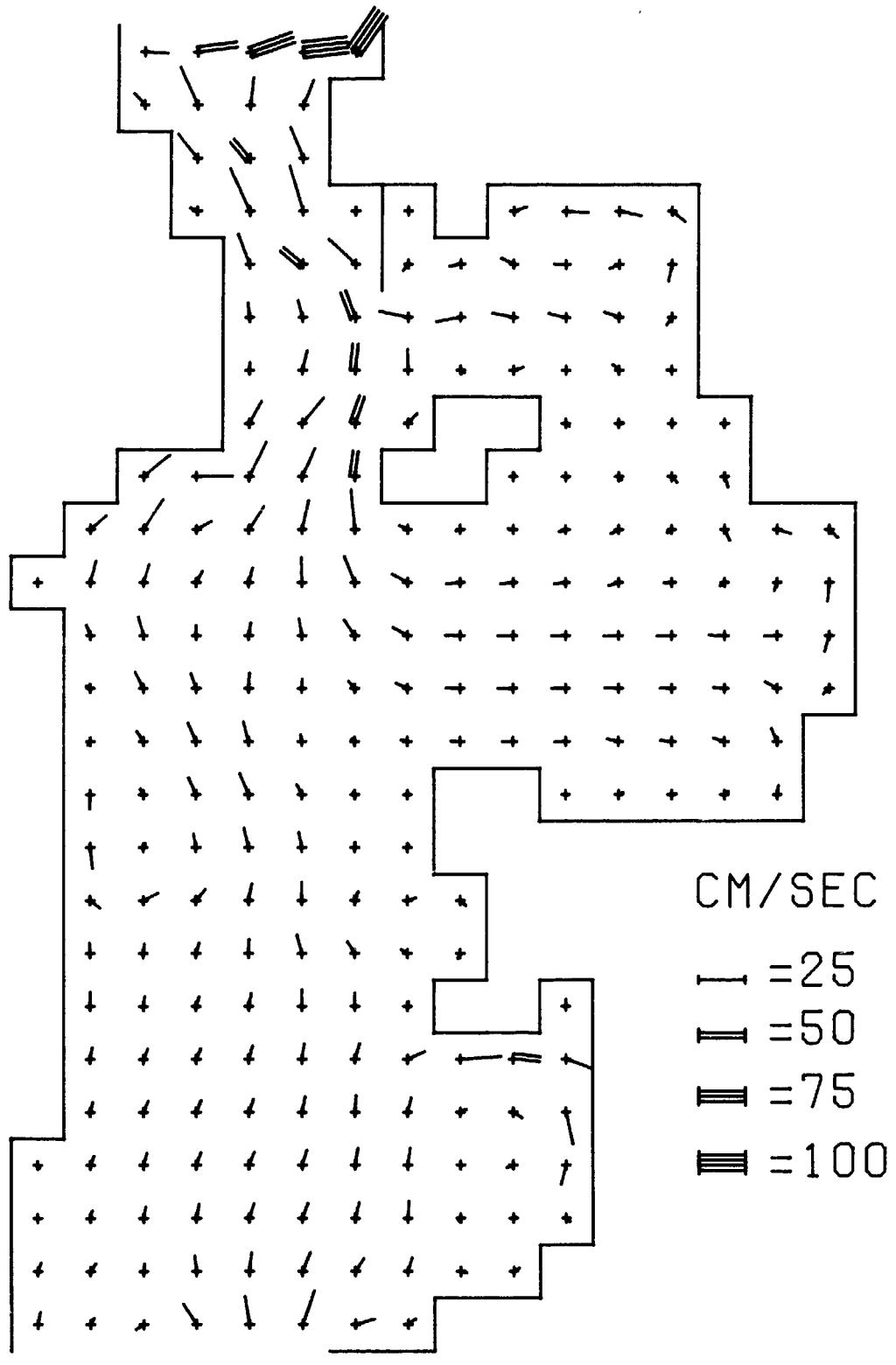

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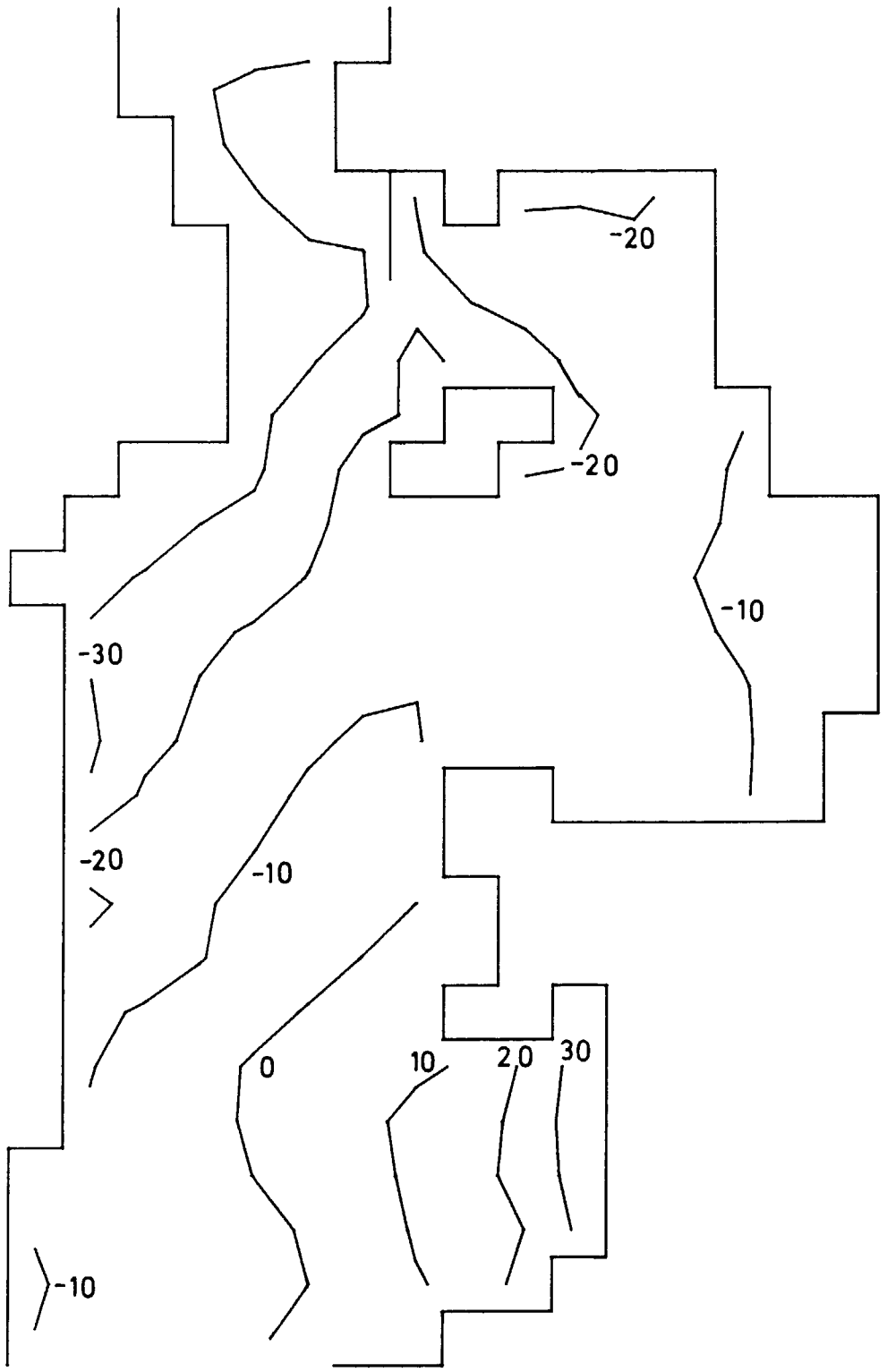

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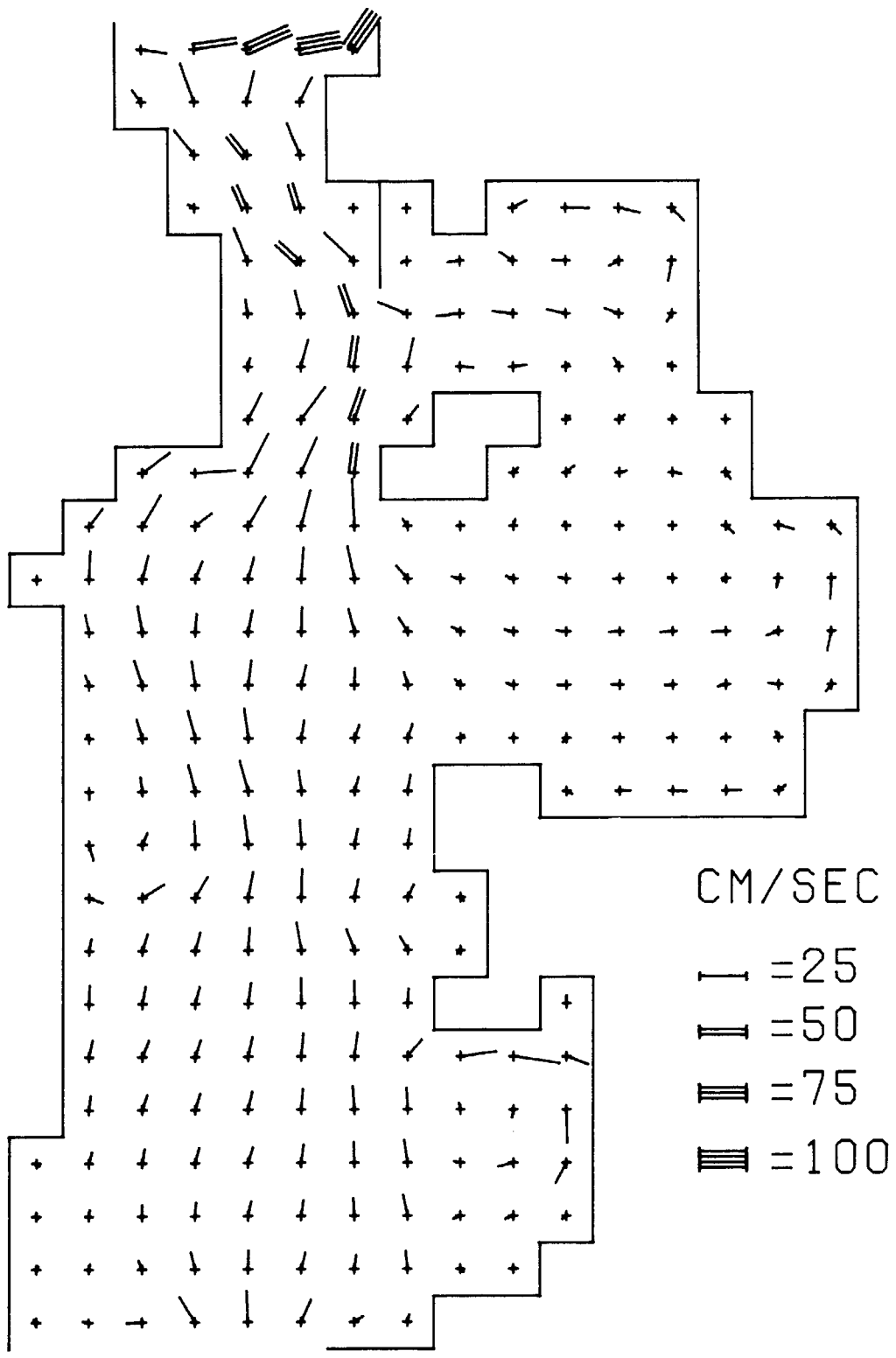

1 HRS 13TH

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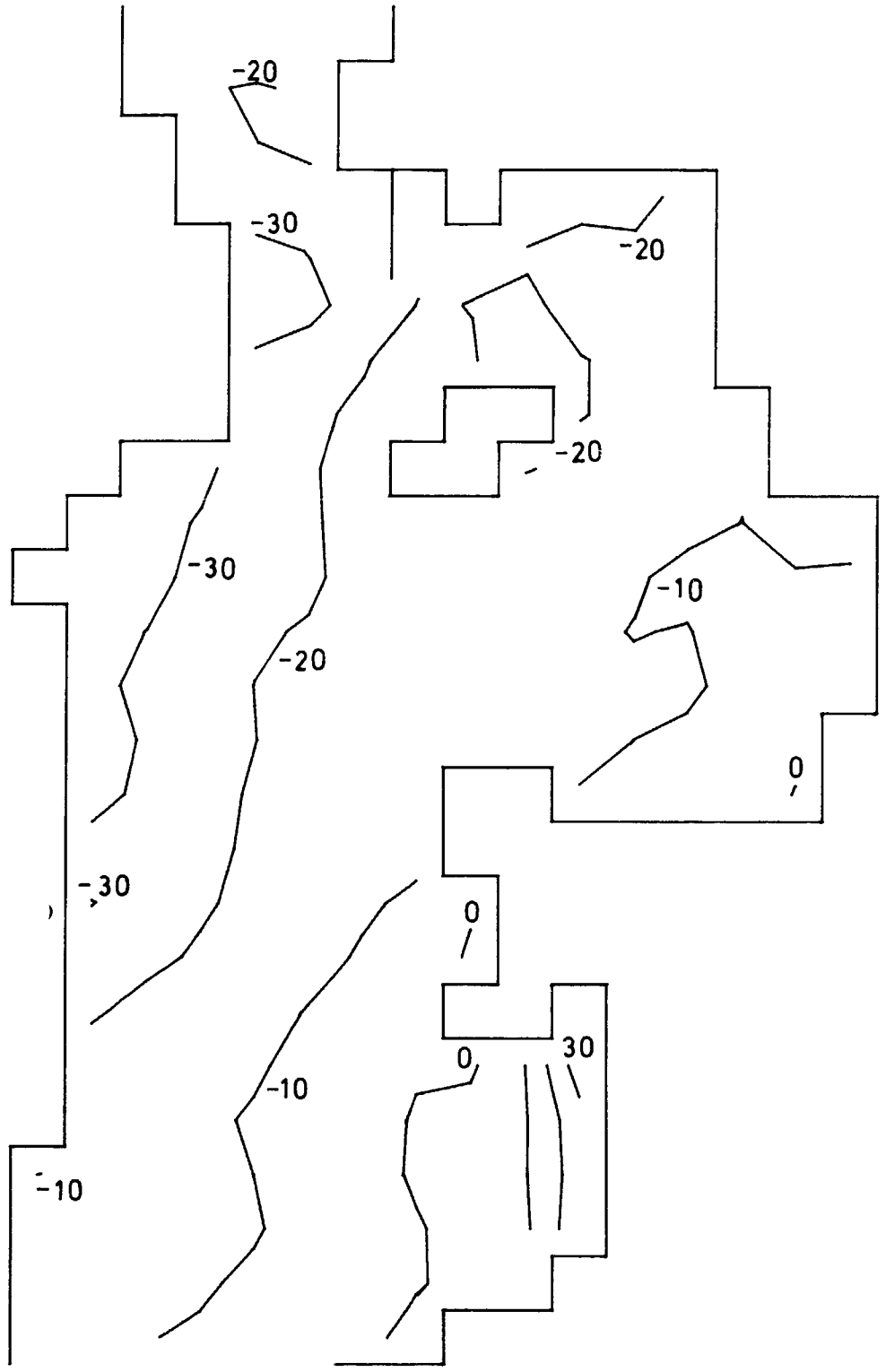

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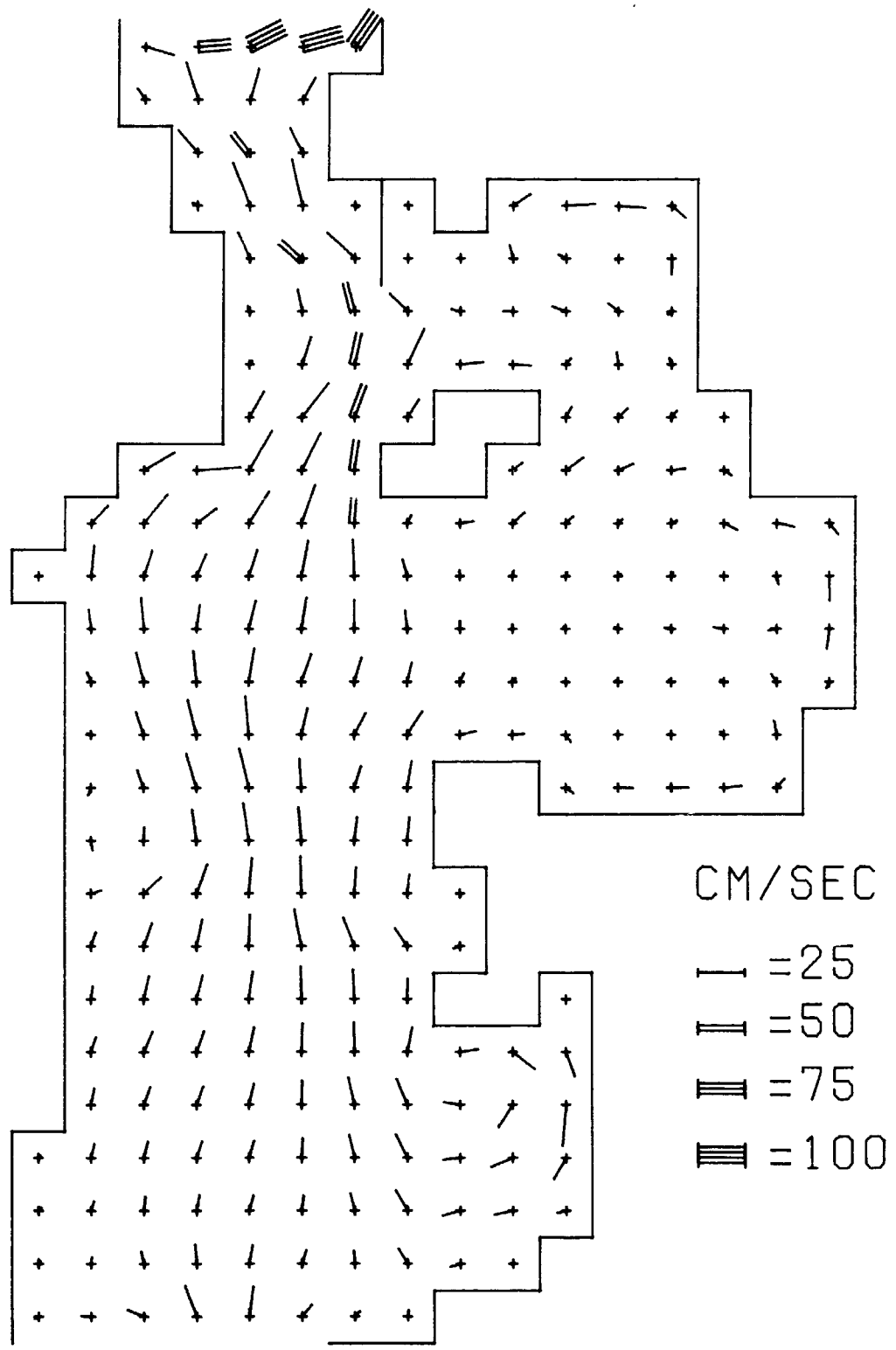

2 HRS 13TH

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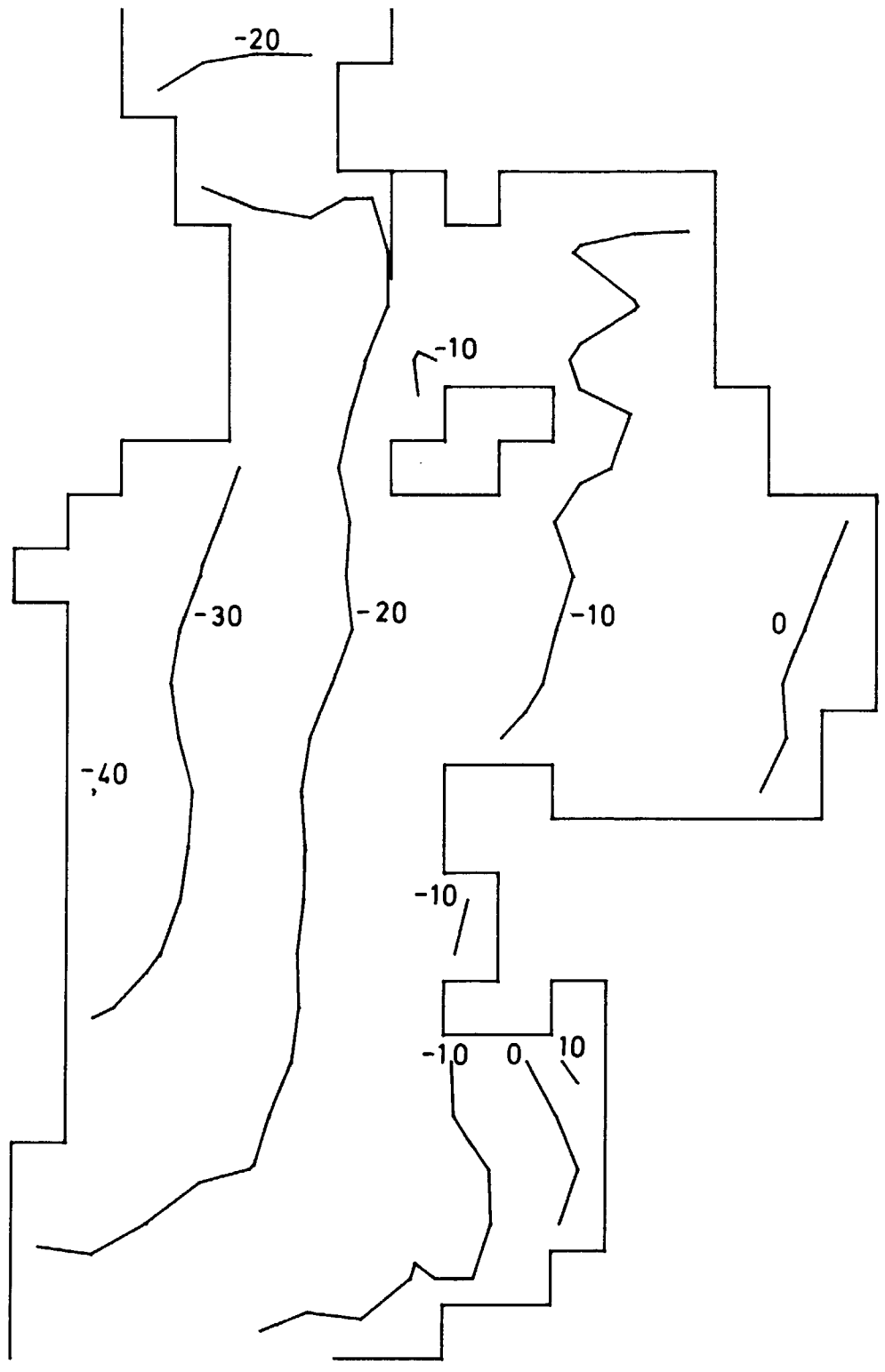

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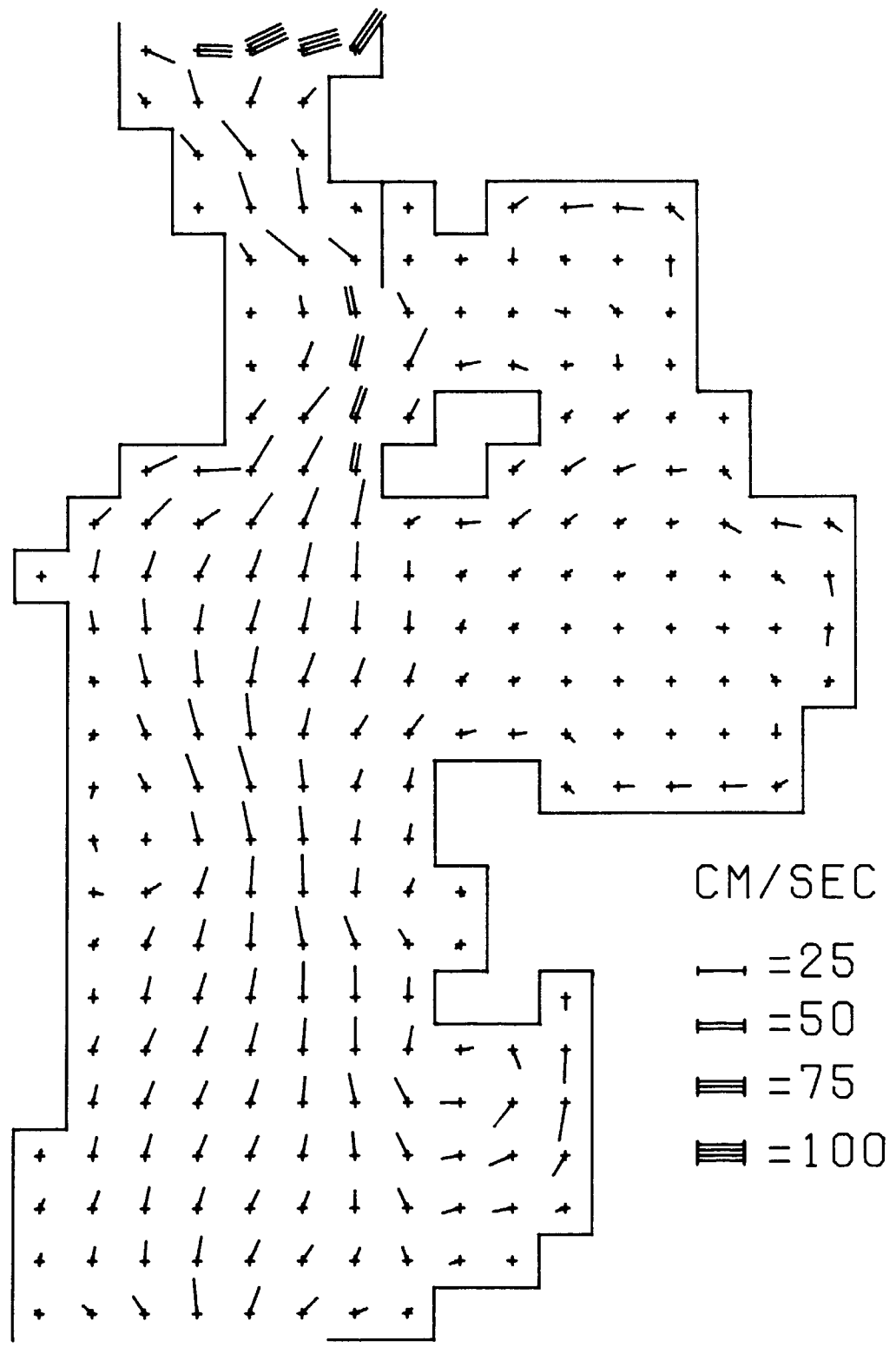

3 HRS 13TH

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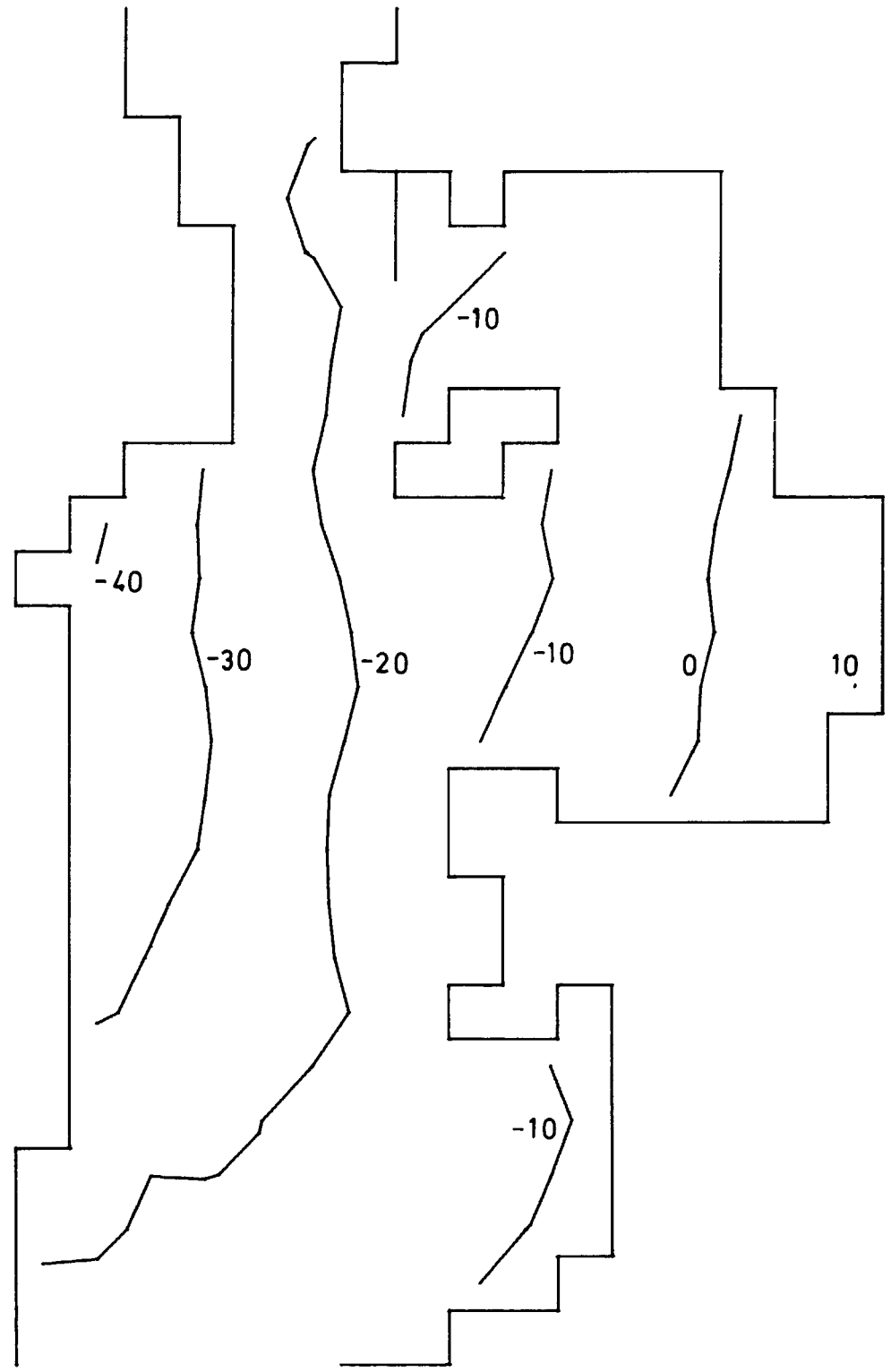

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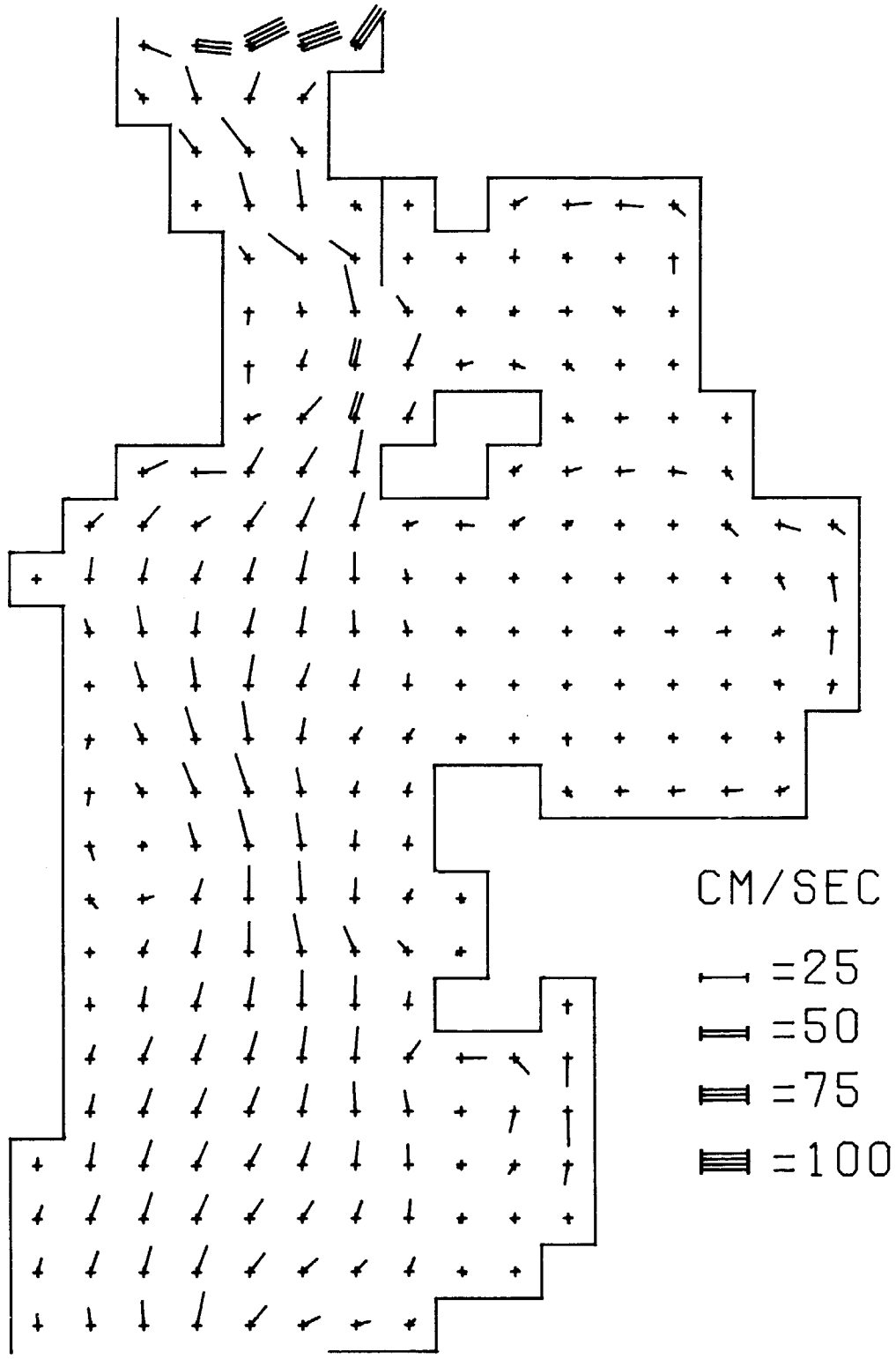

4 HRS 13TH

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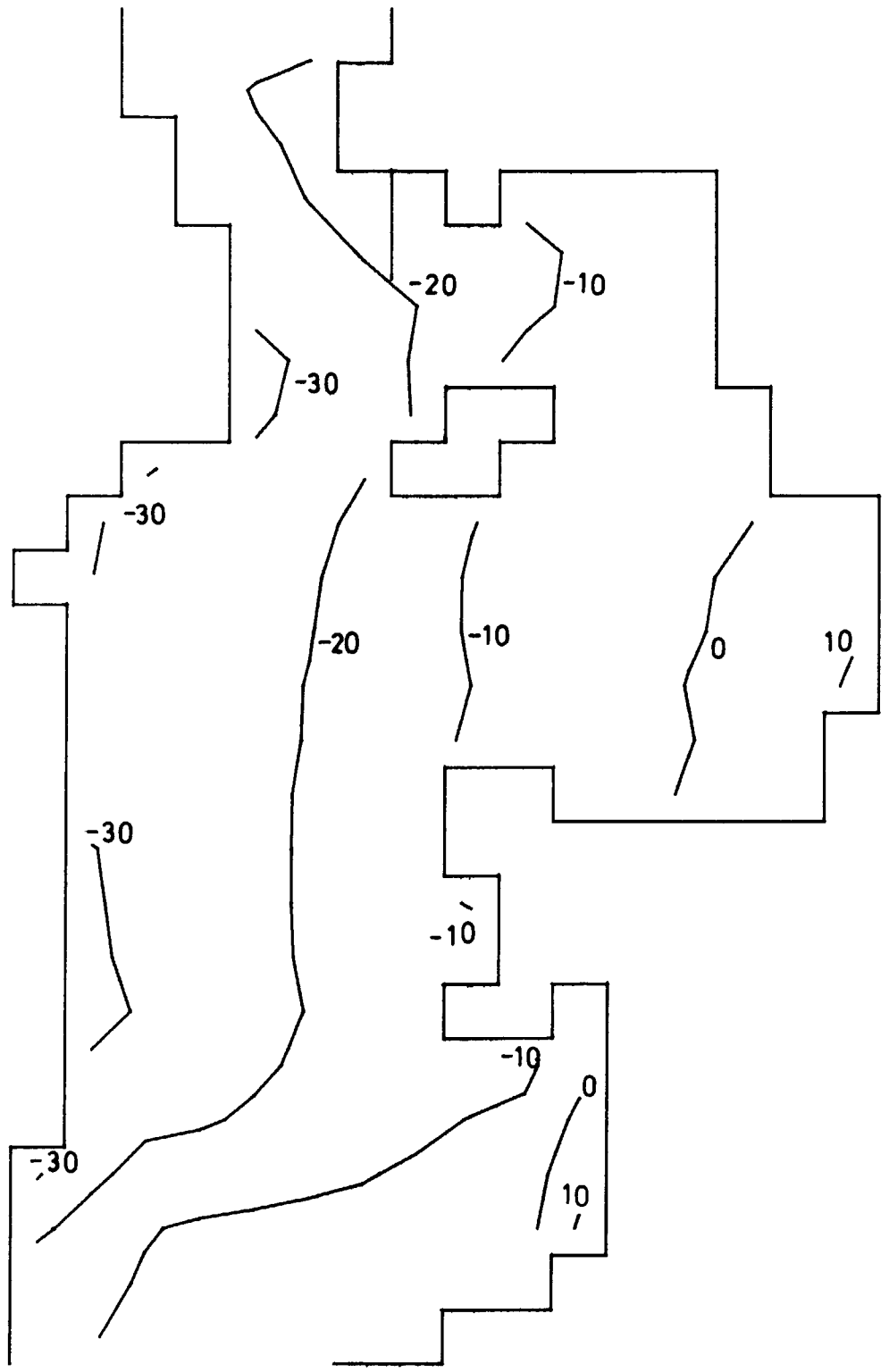

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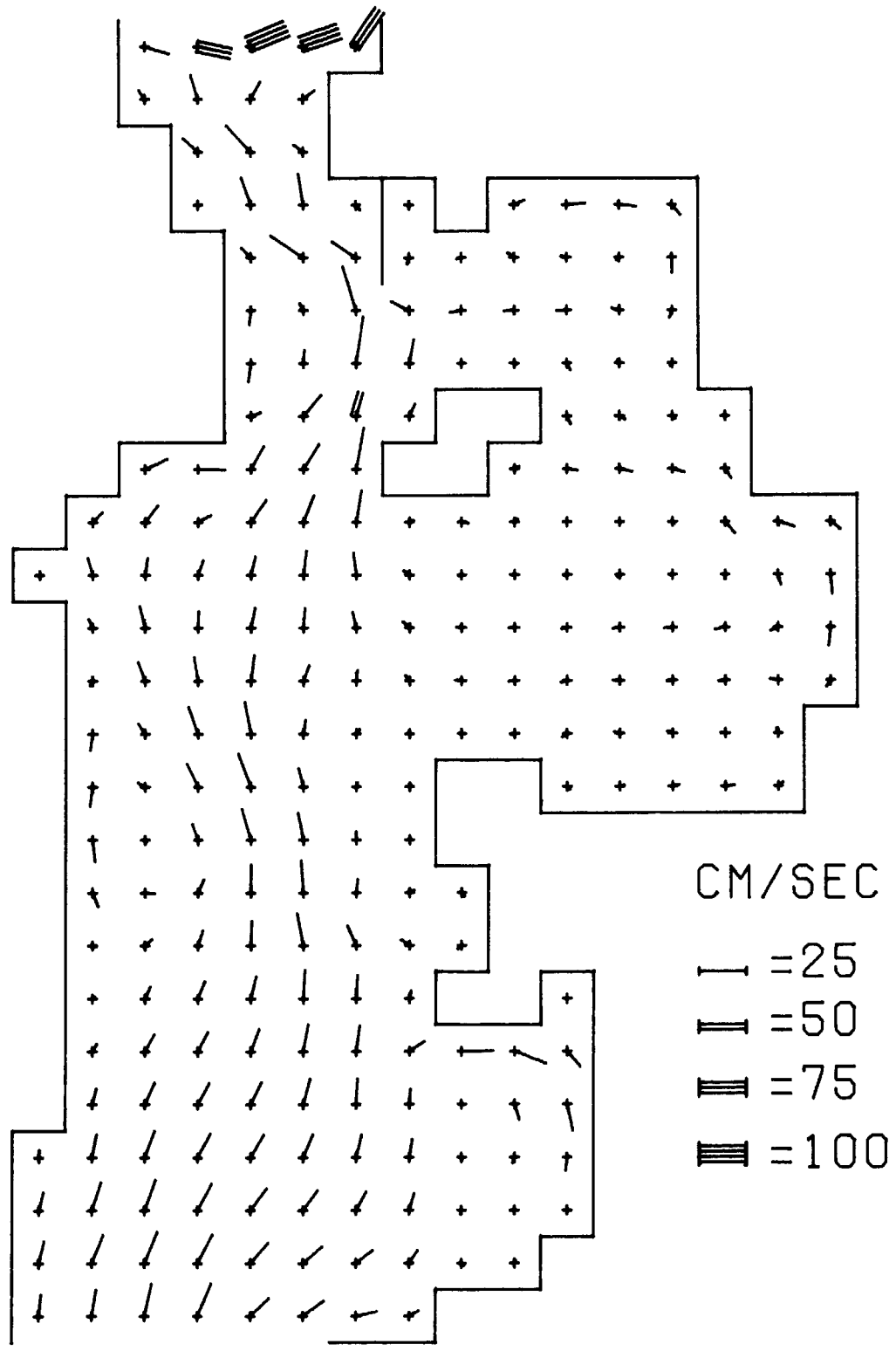

5 HRS 13TH

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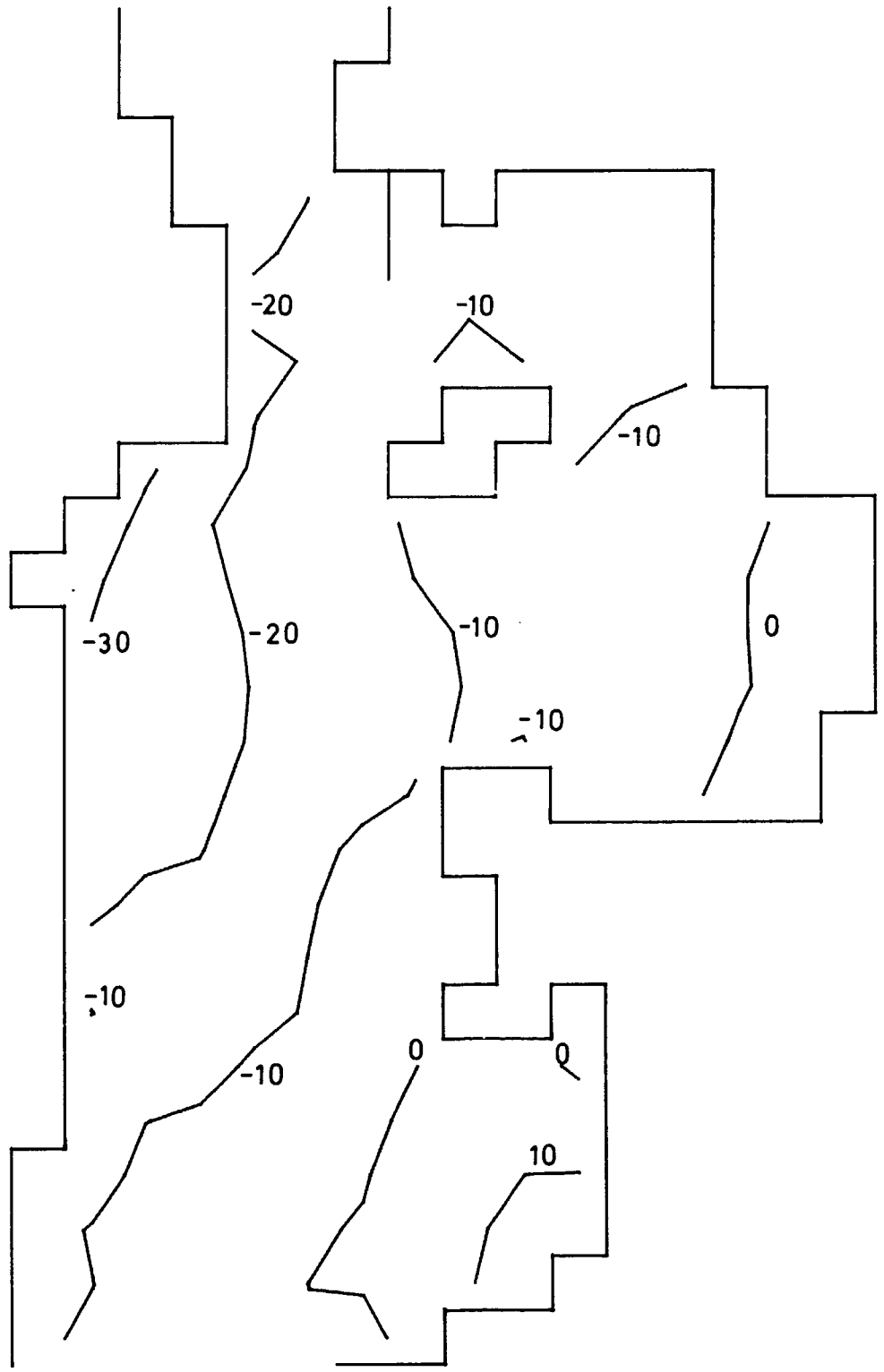

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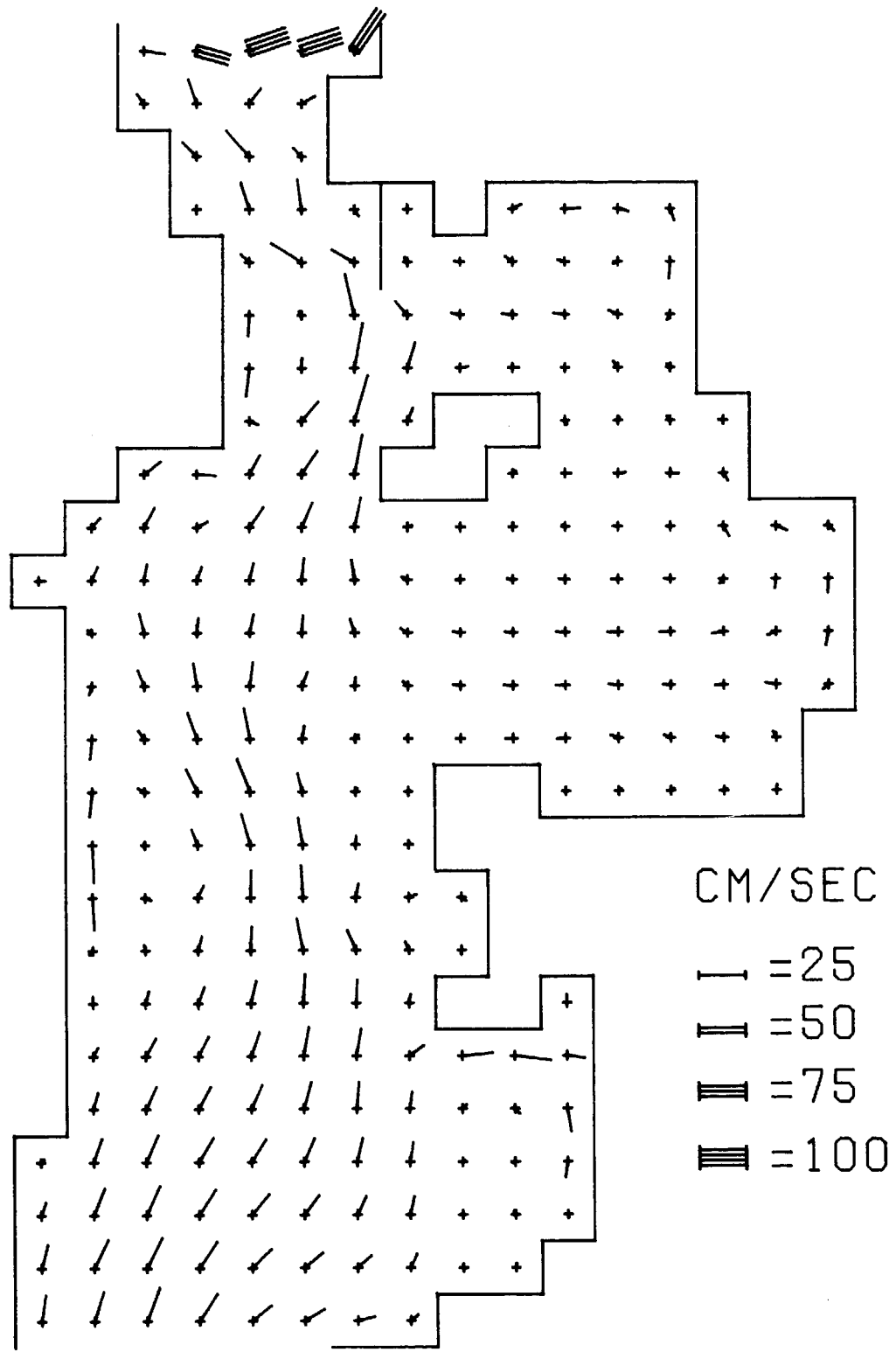

6 HRS 13TH

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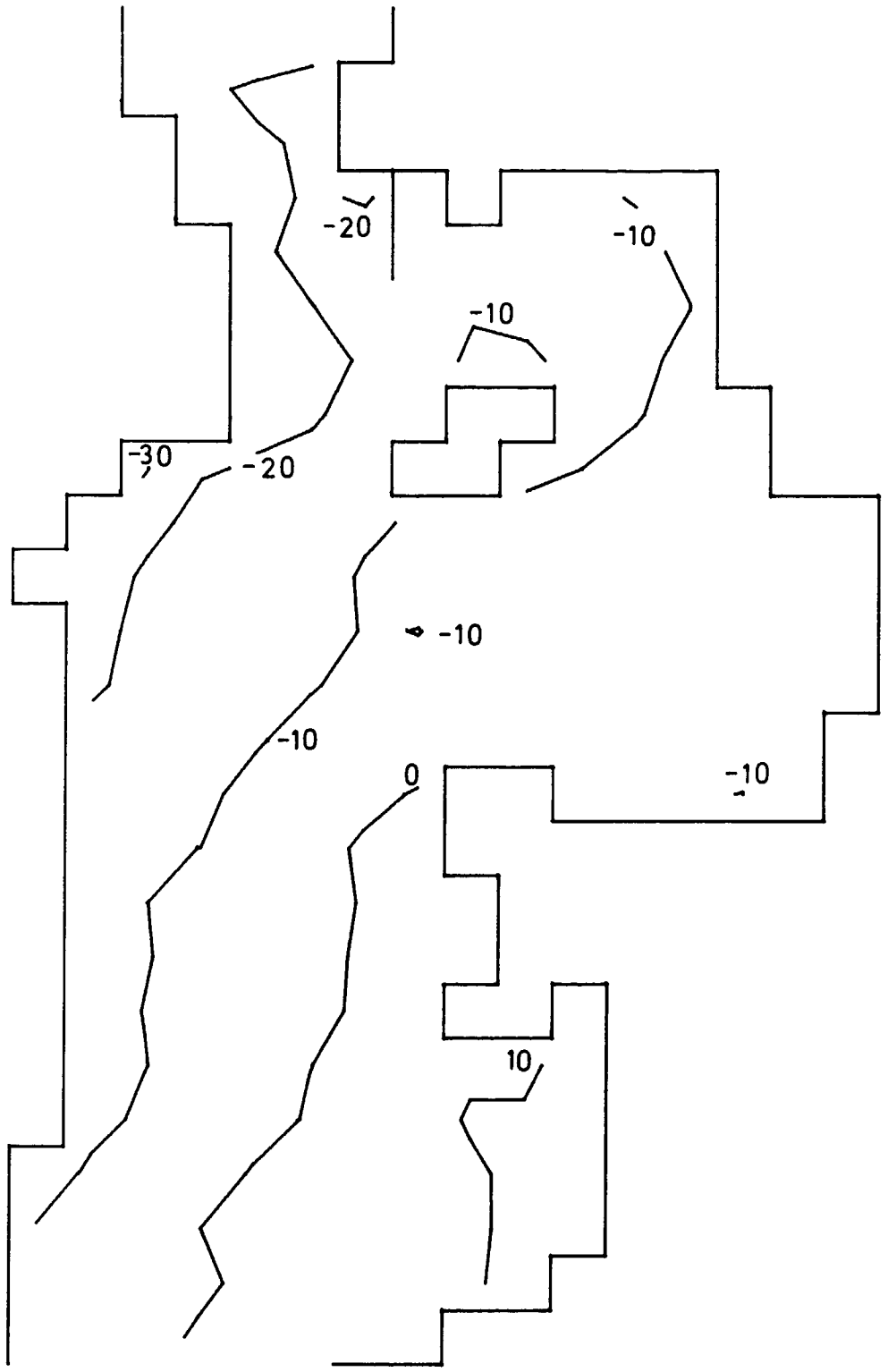

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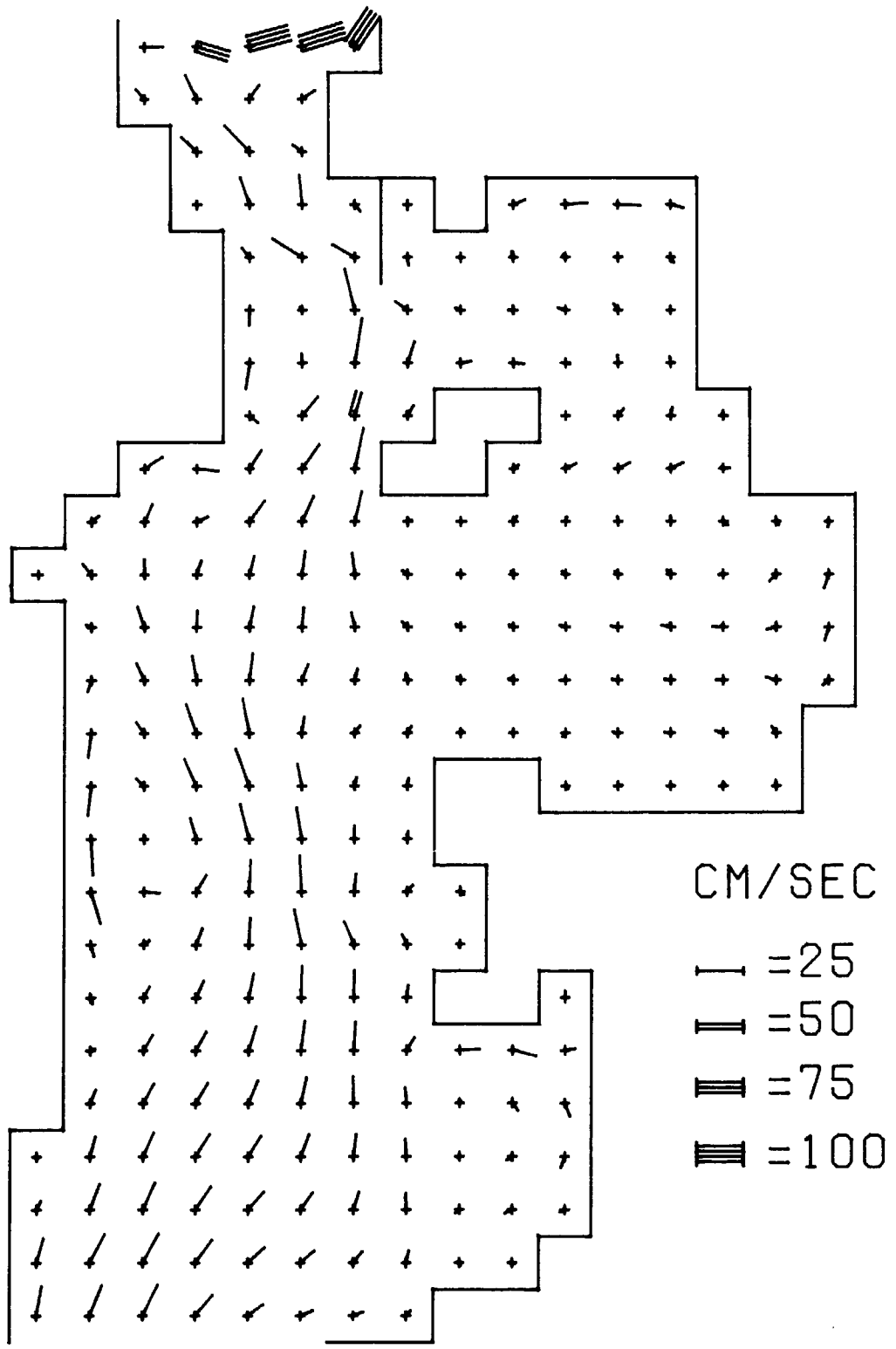

7 HRS 13TH

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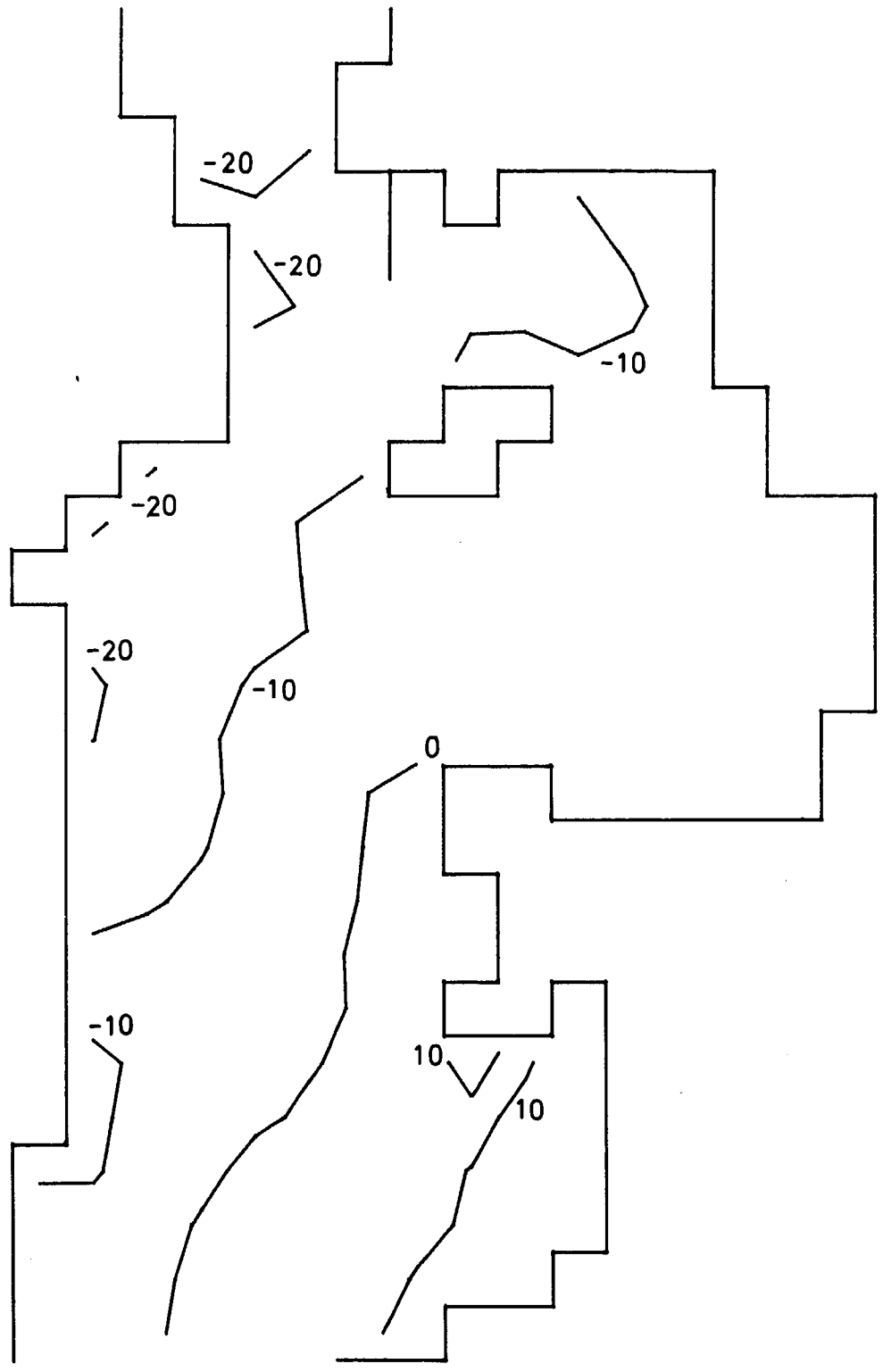

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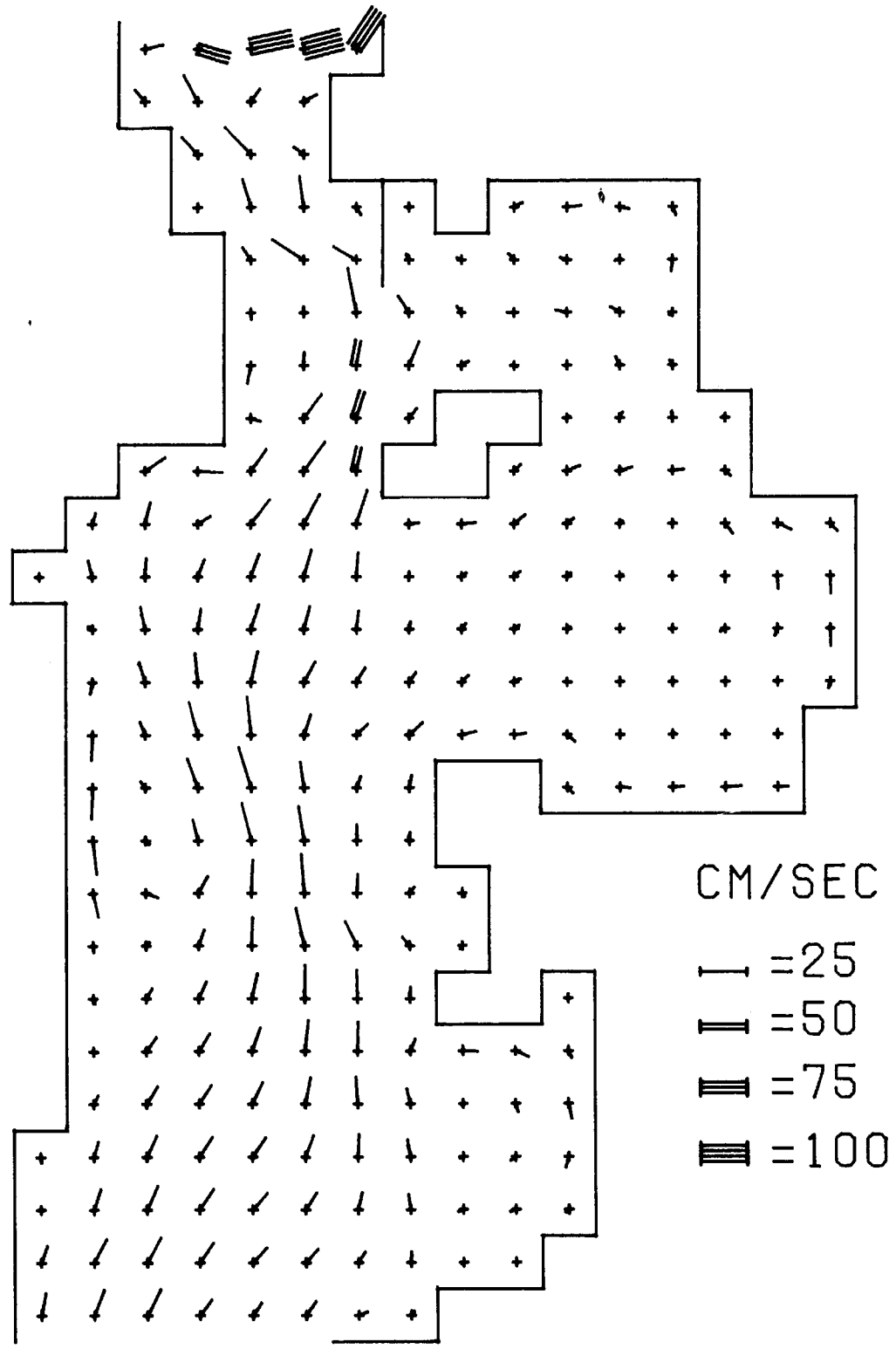

8 HRS 13TH

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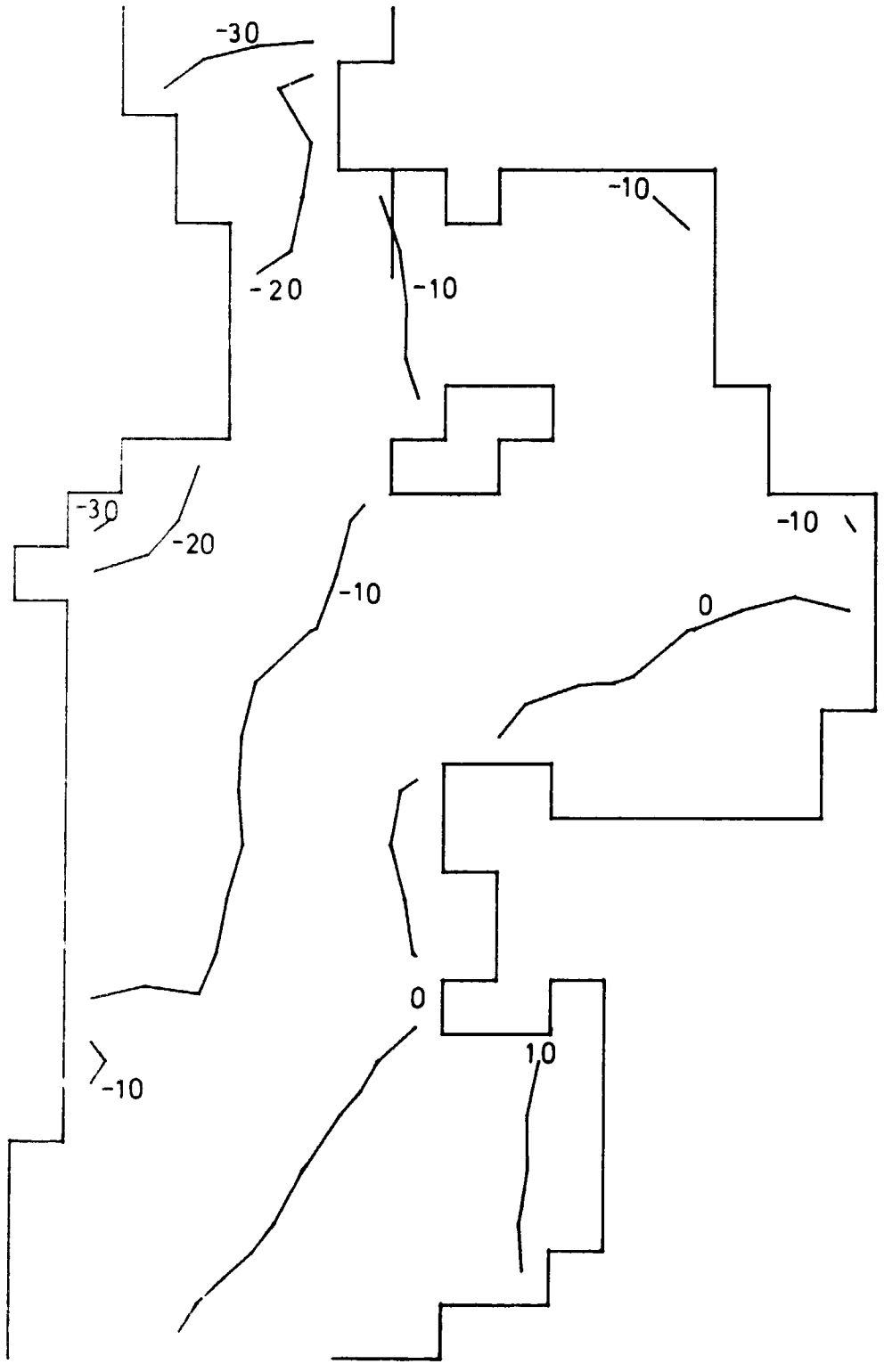

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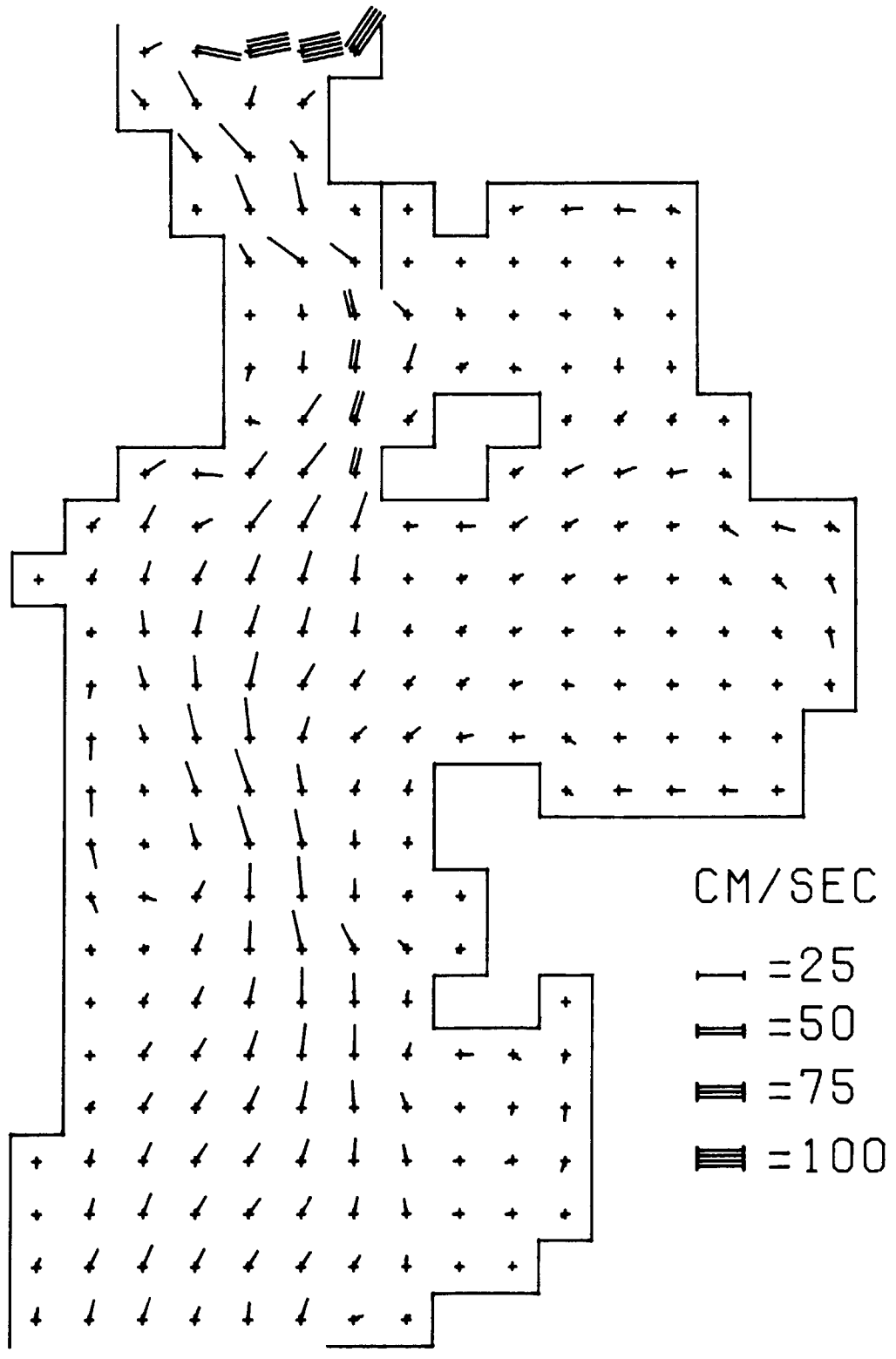

9 HRS 13TH

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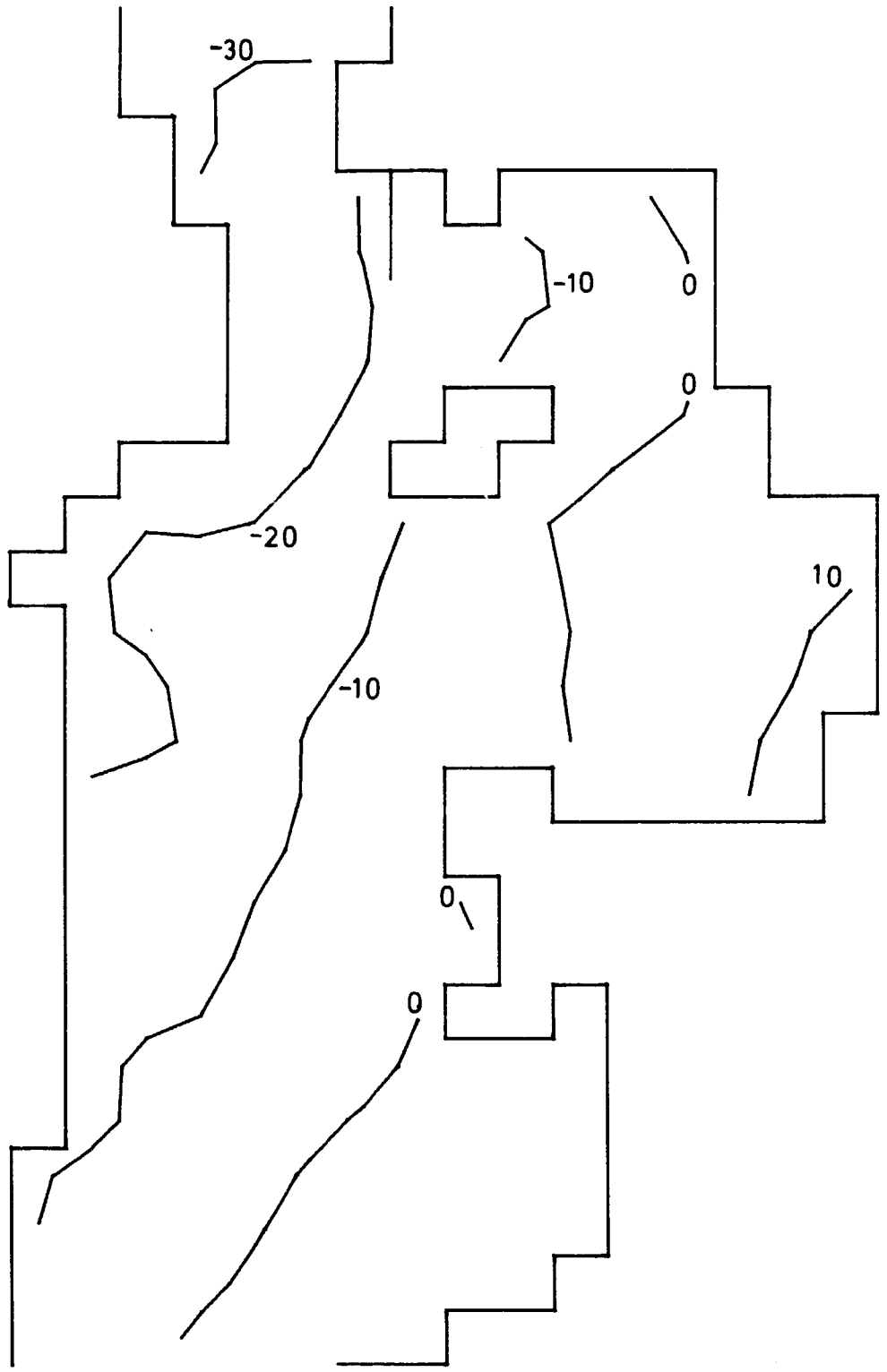

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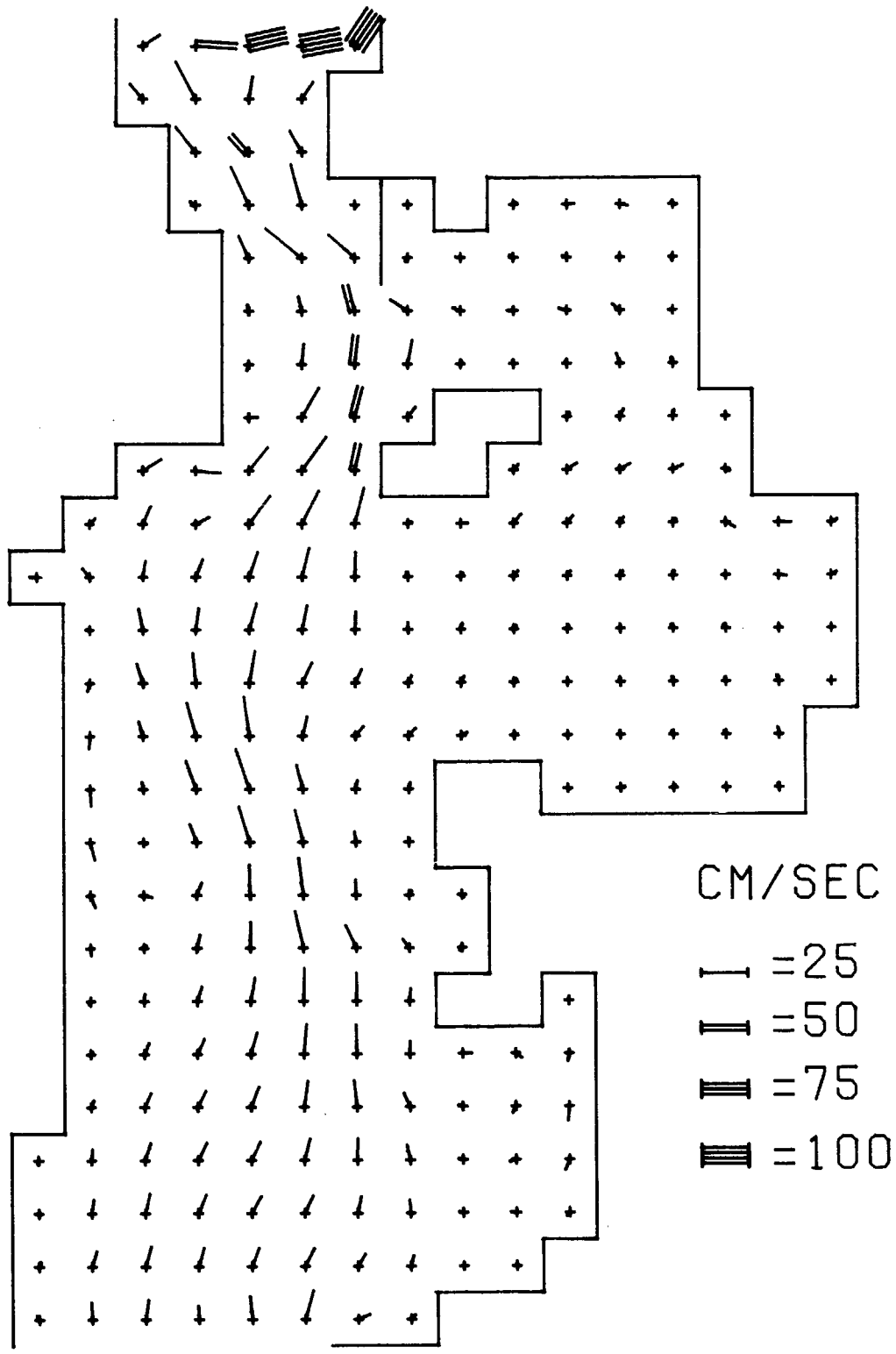

10 HRS 13TH

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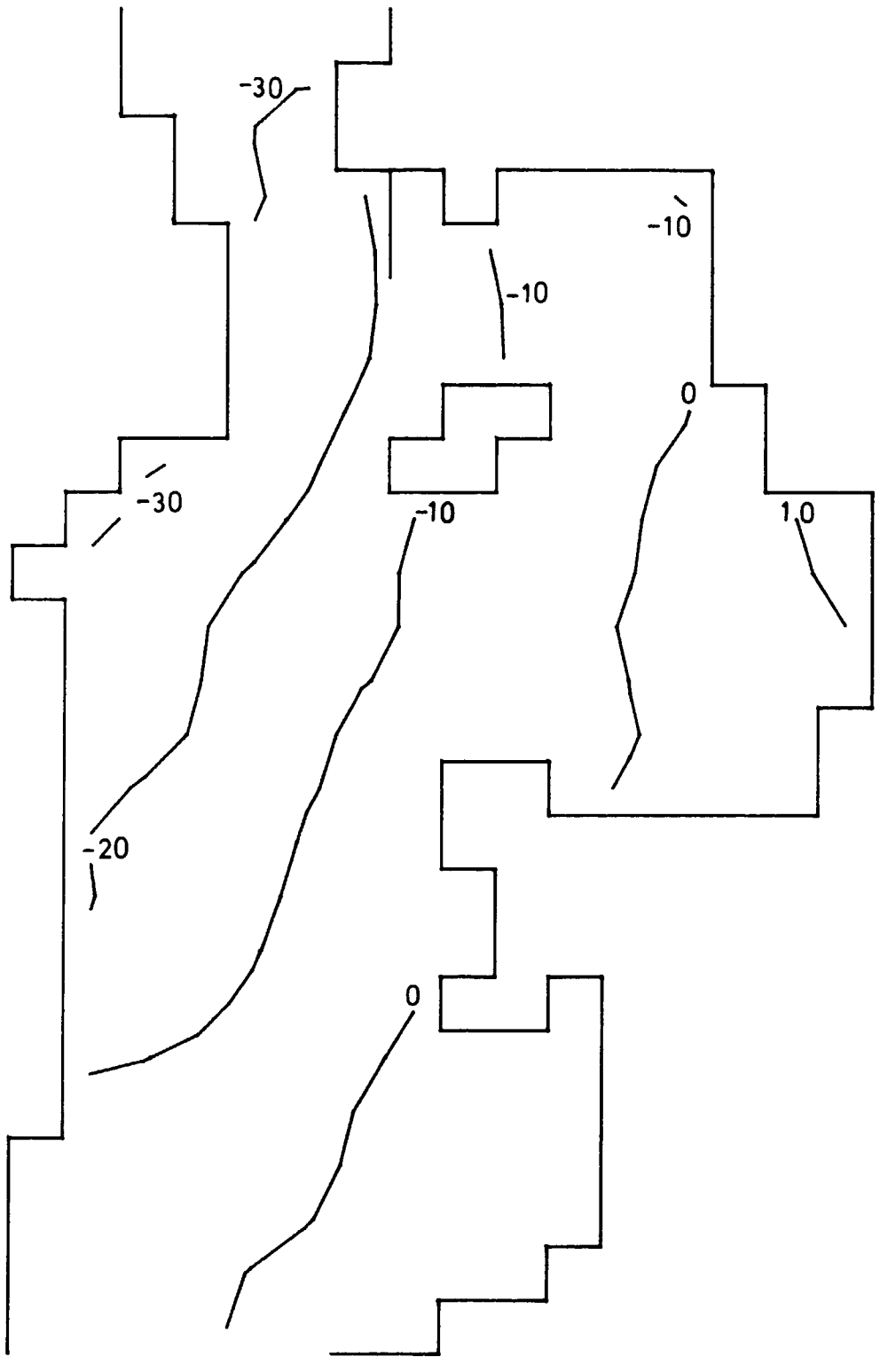

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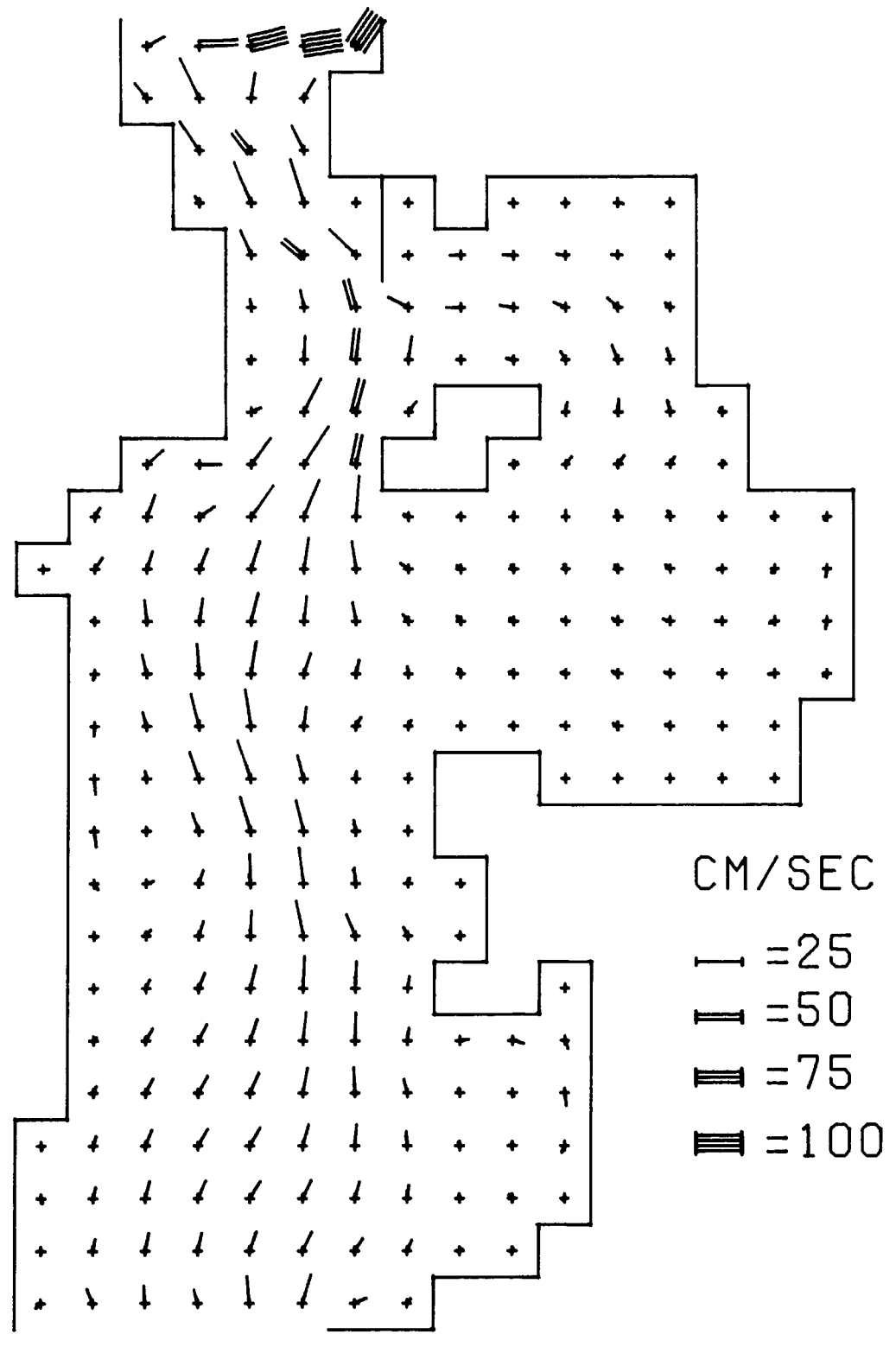

11 HRS 13TH

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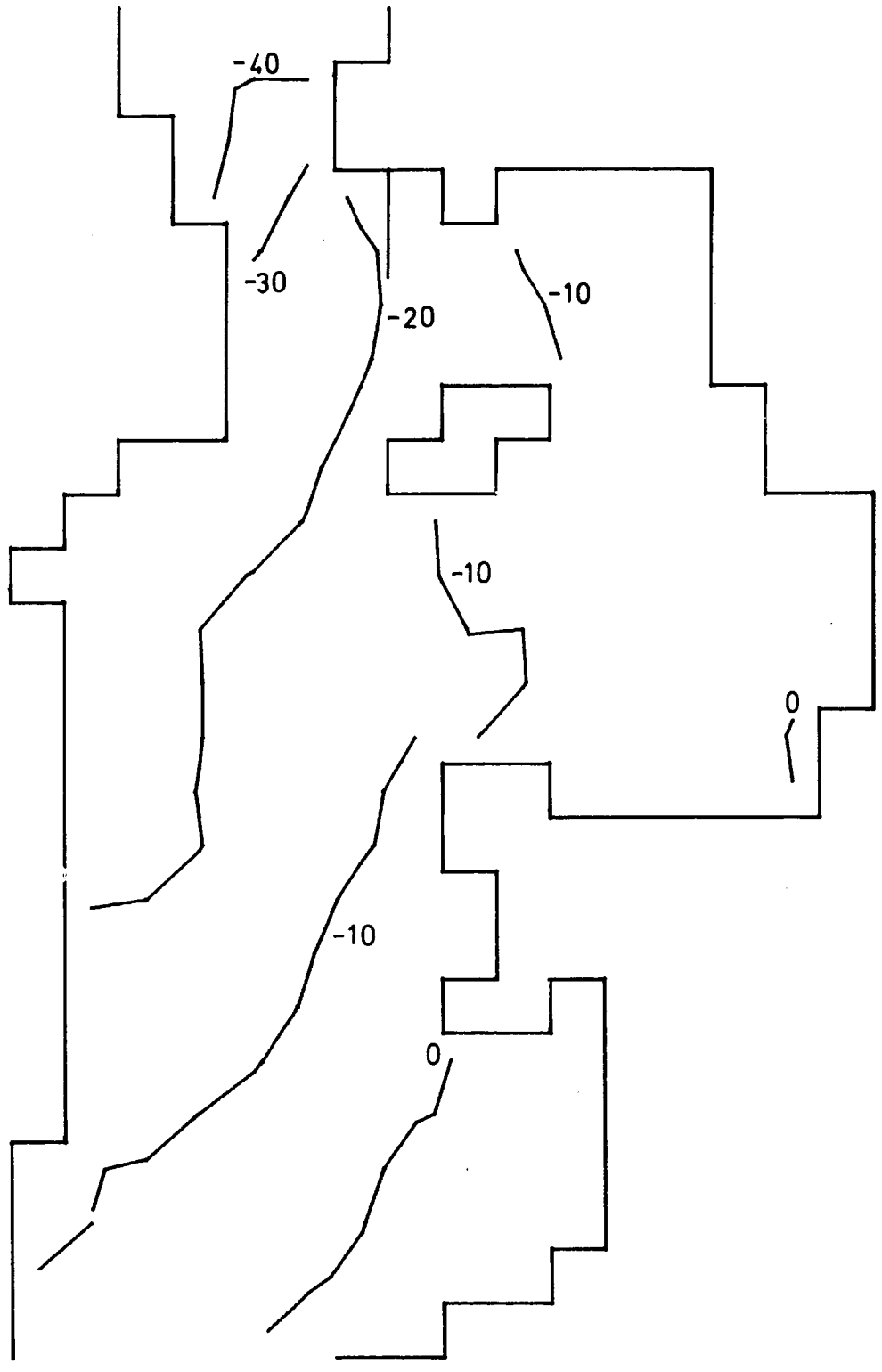

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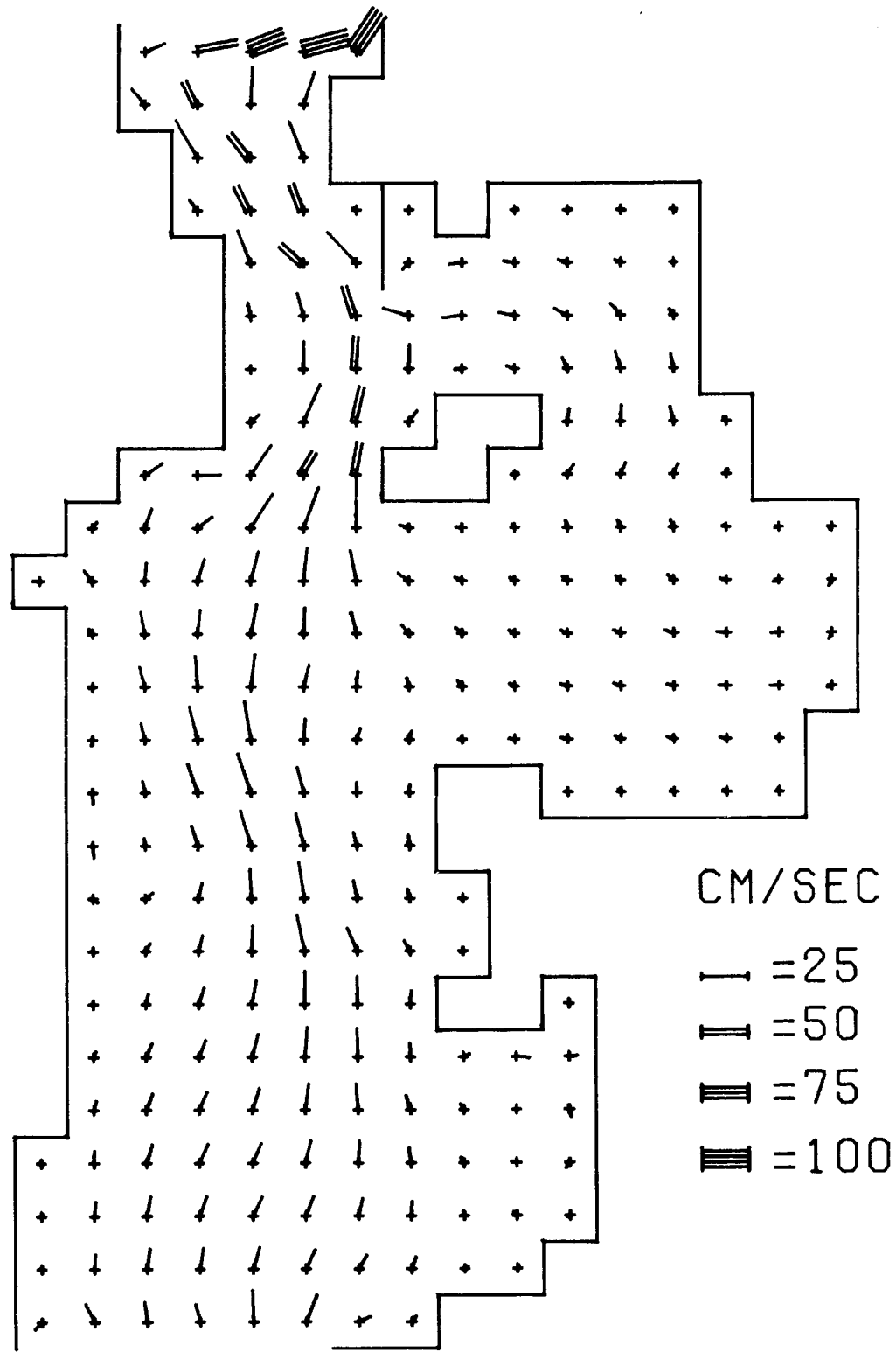

12 HRS 13TH

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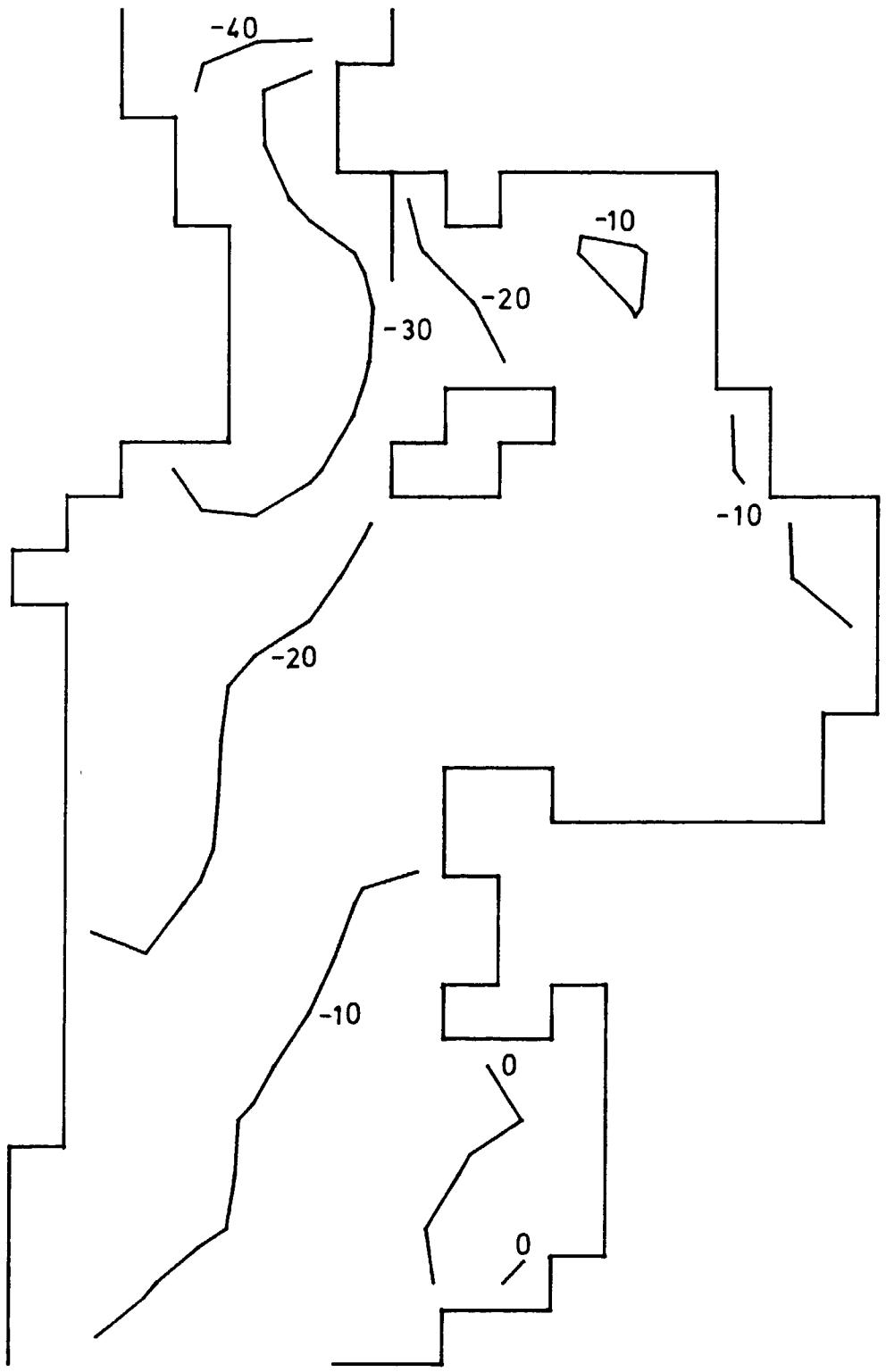

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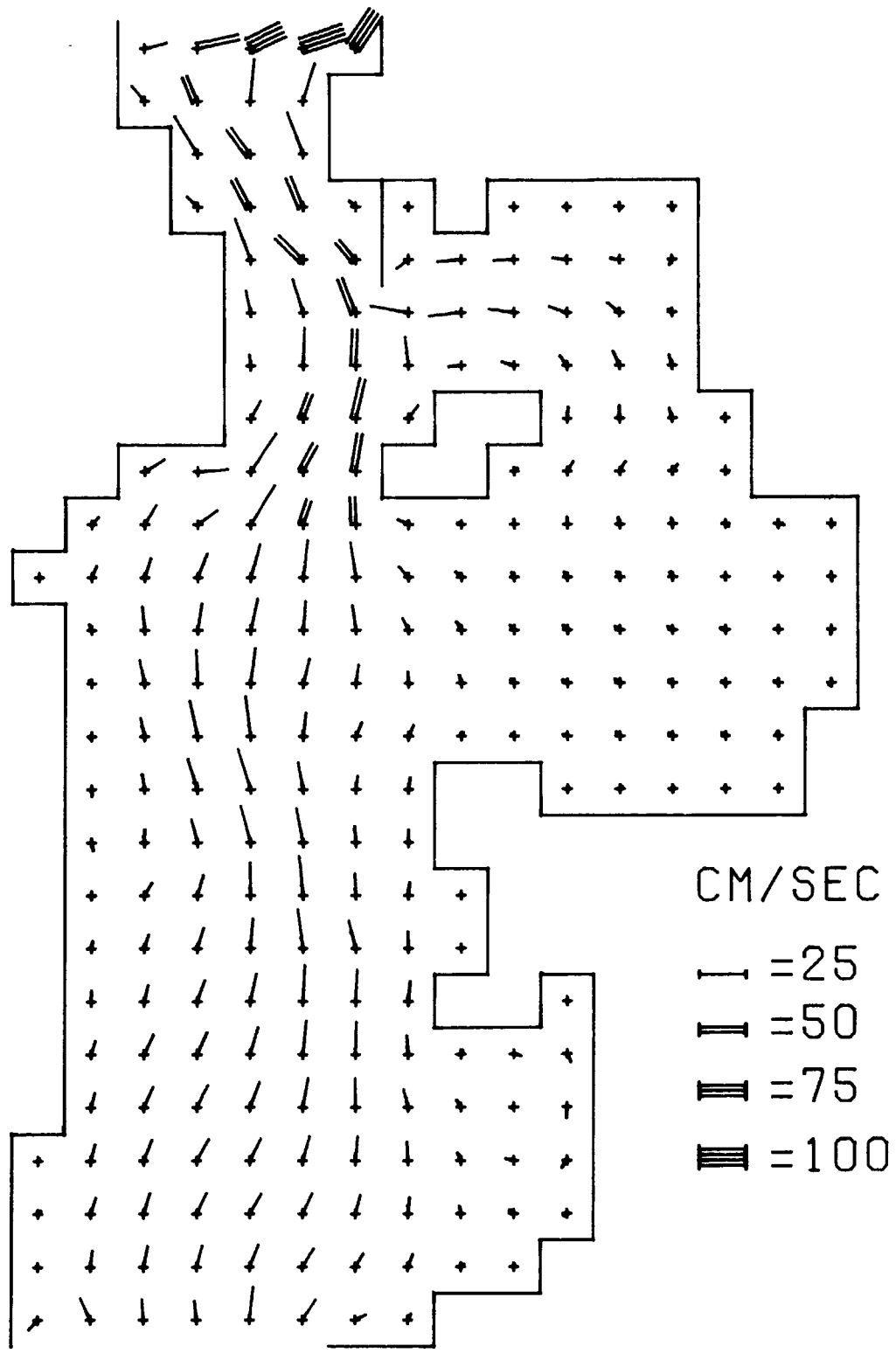

13 HRS 13TH

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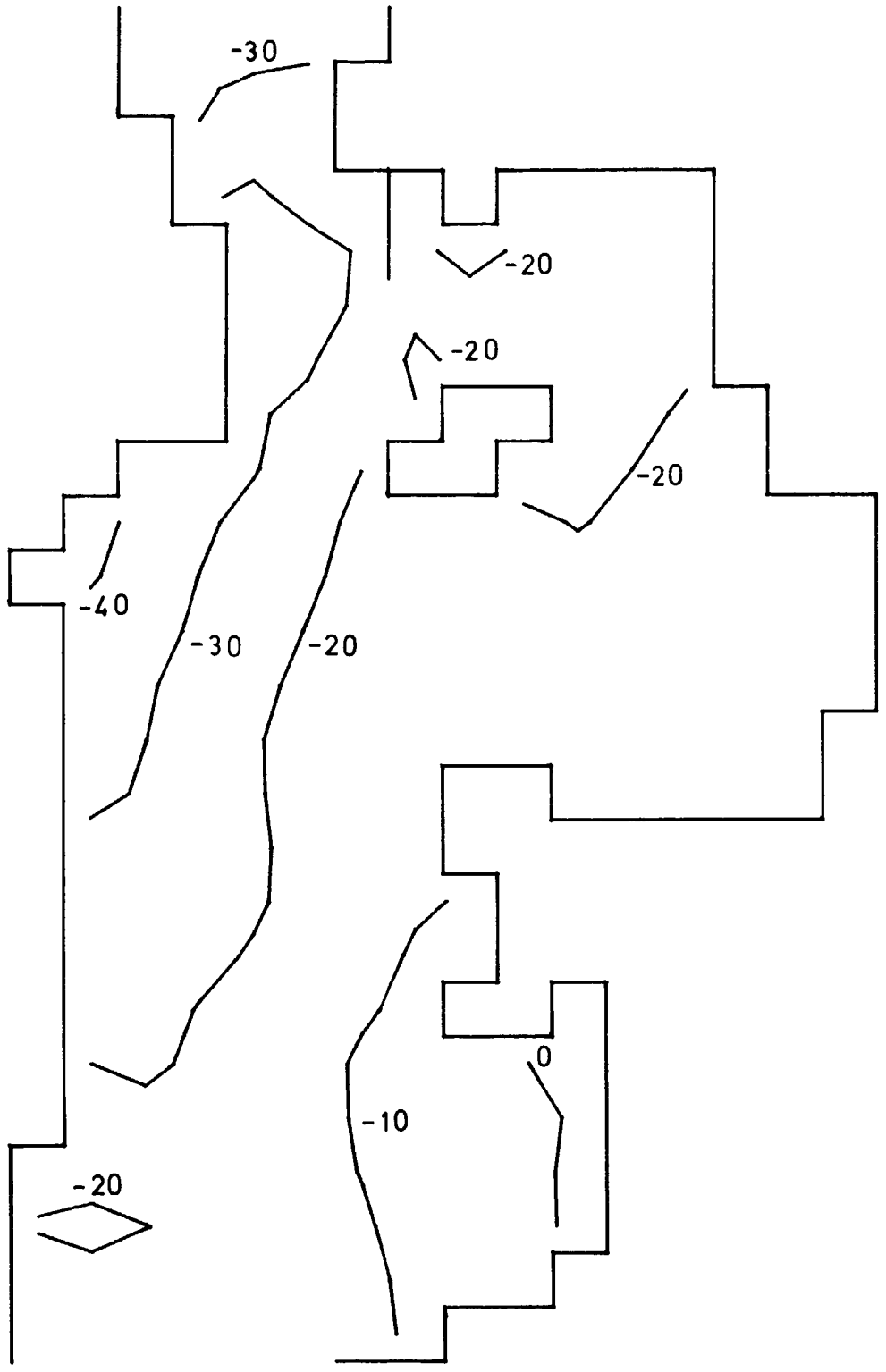

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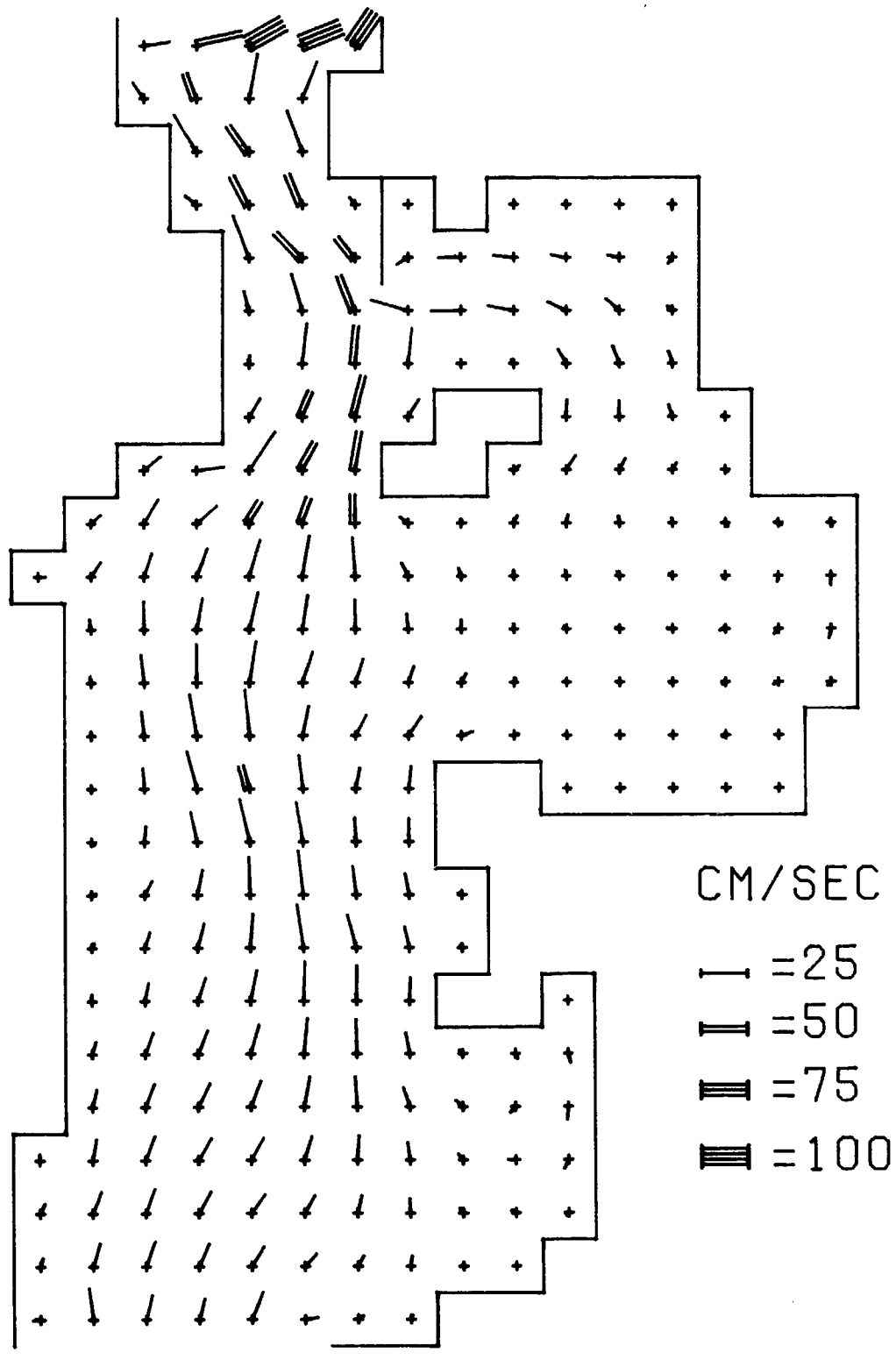

14 HRS 13TH

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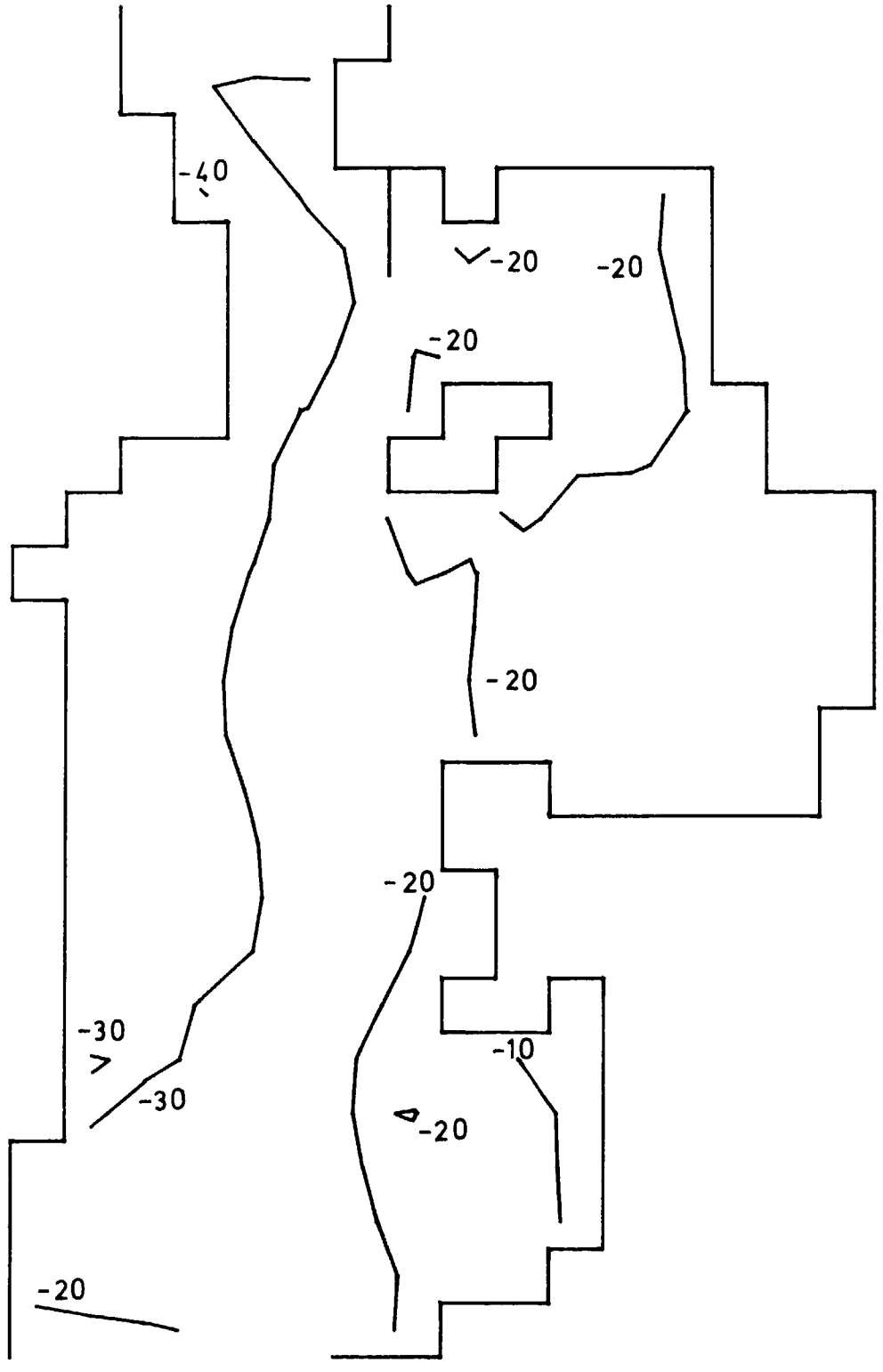

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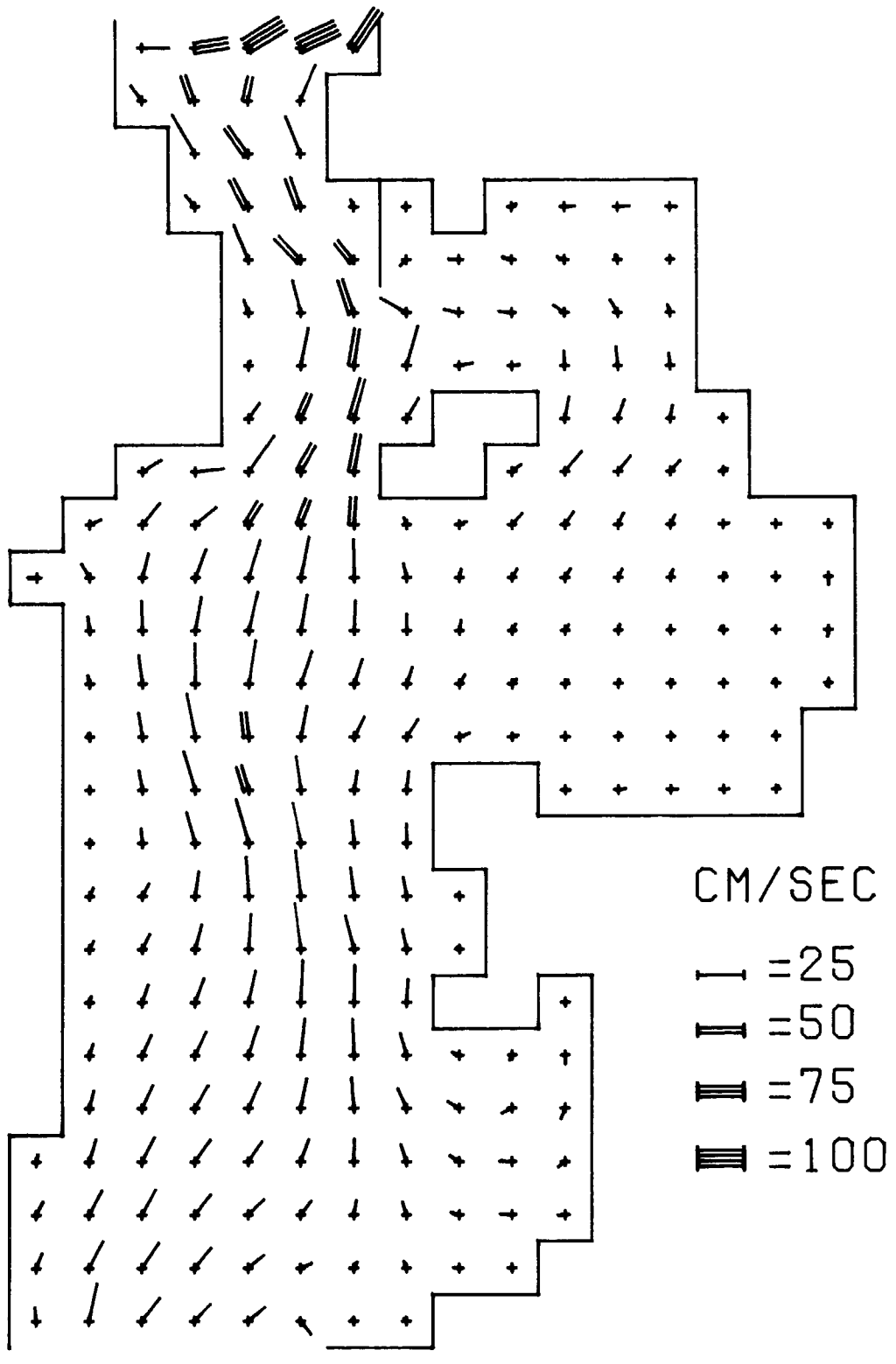

15 HRS 13TH

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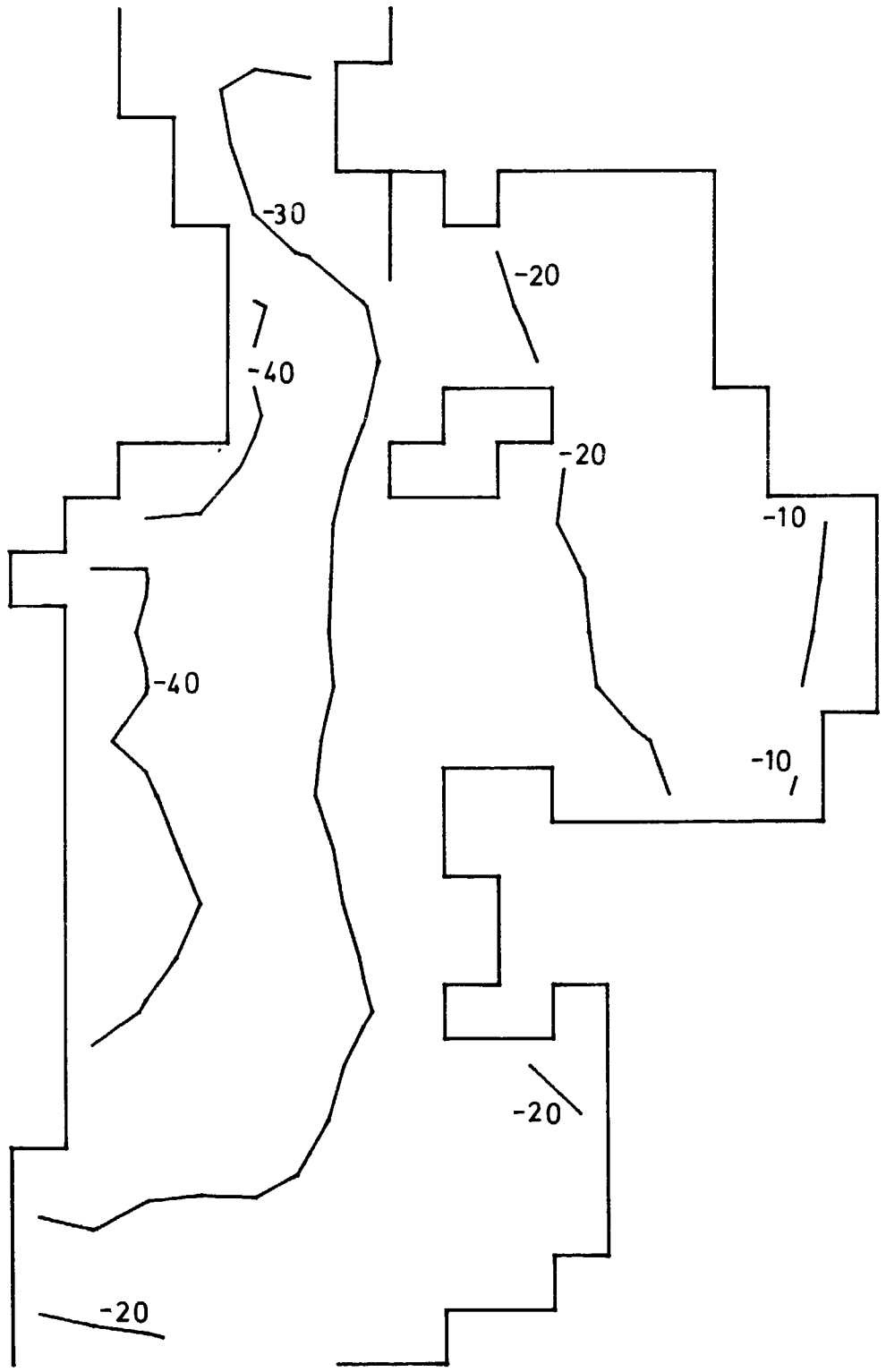

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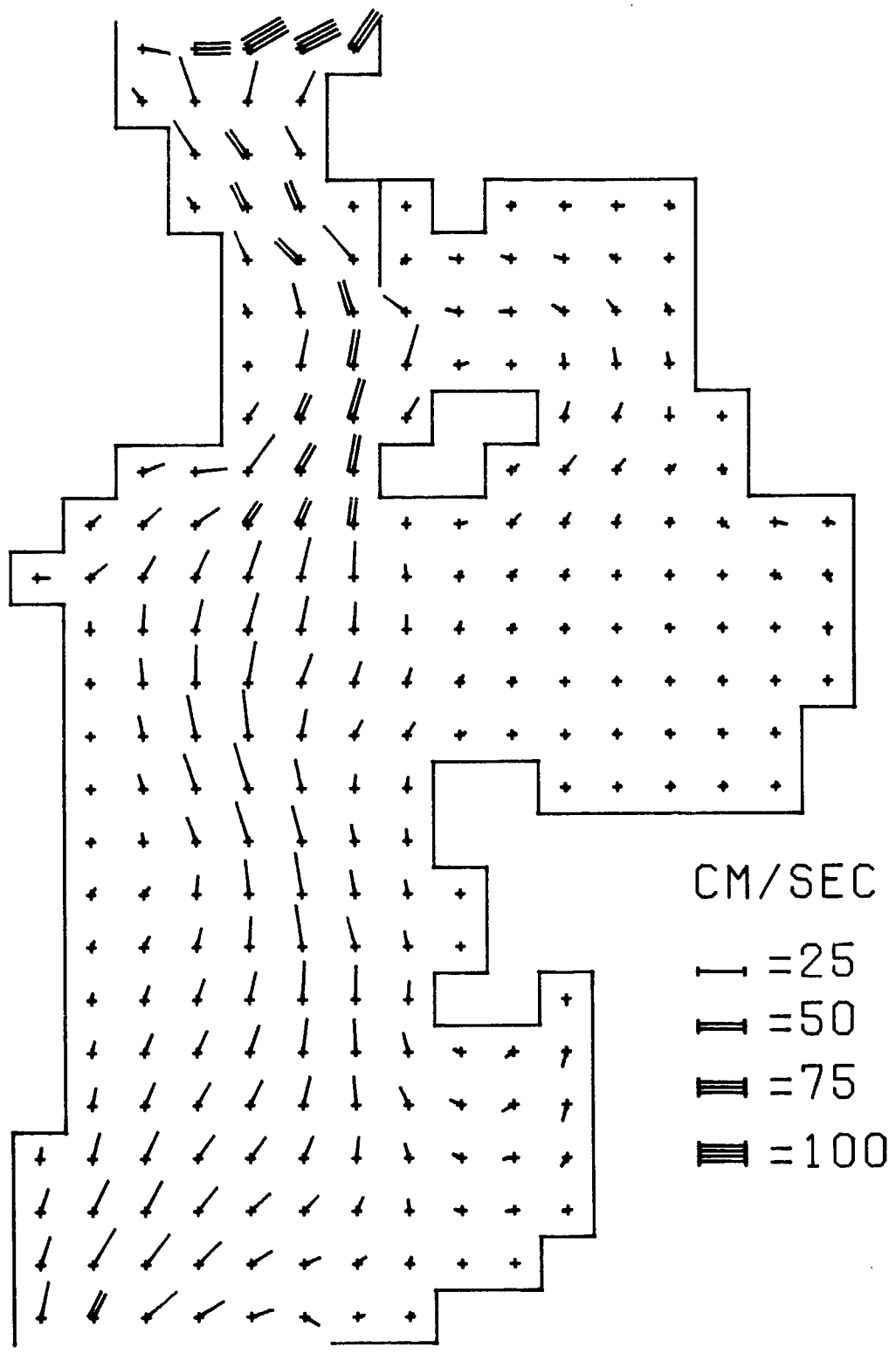

16 HRS 13TH

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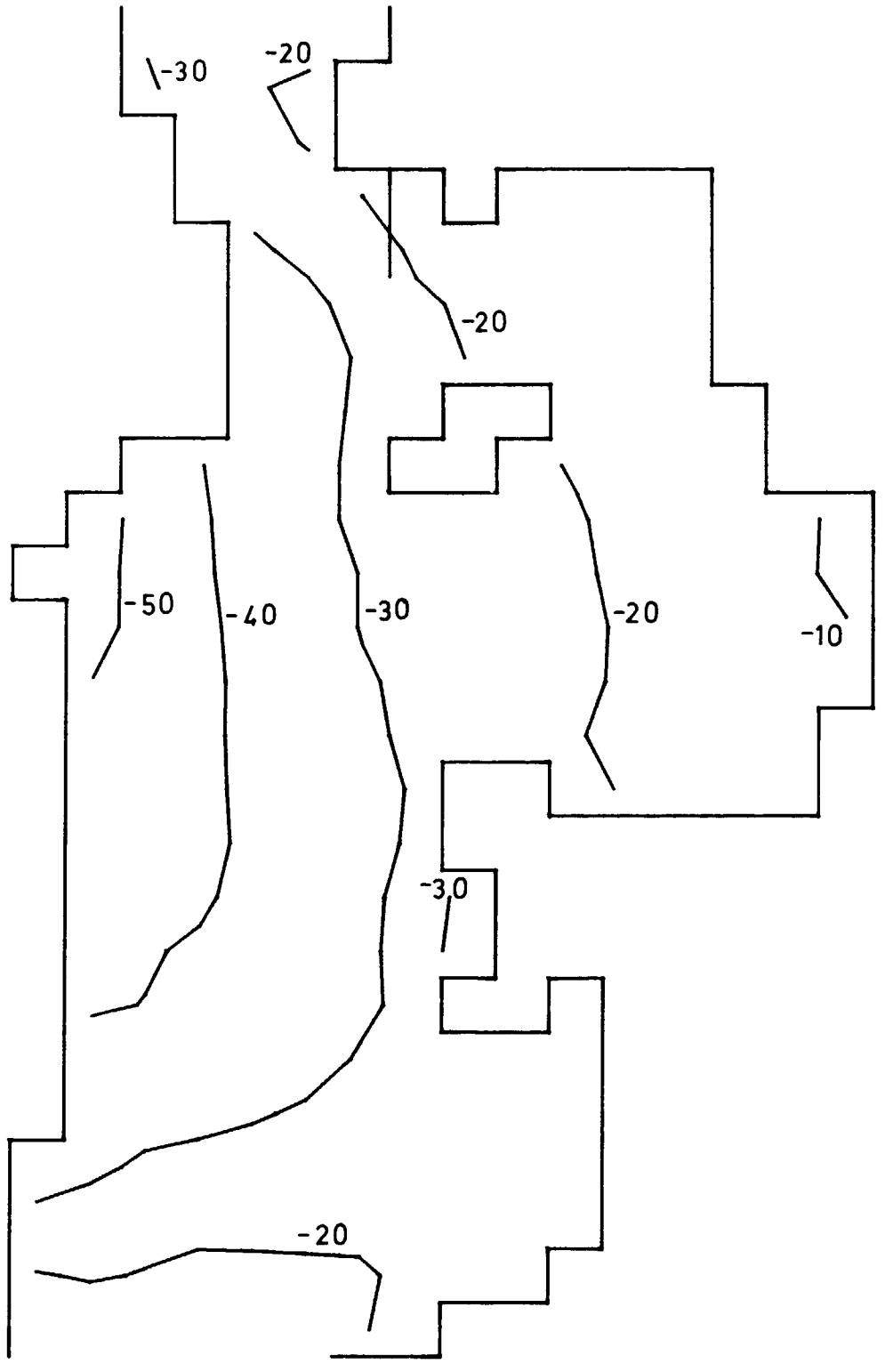

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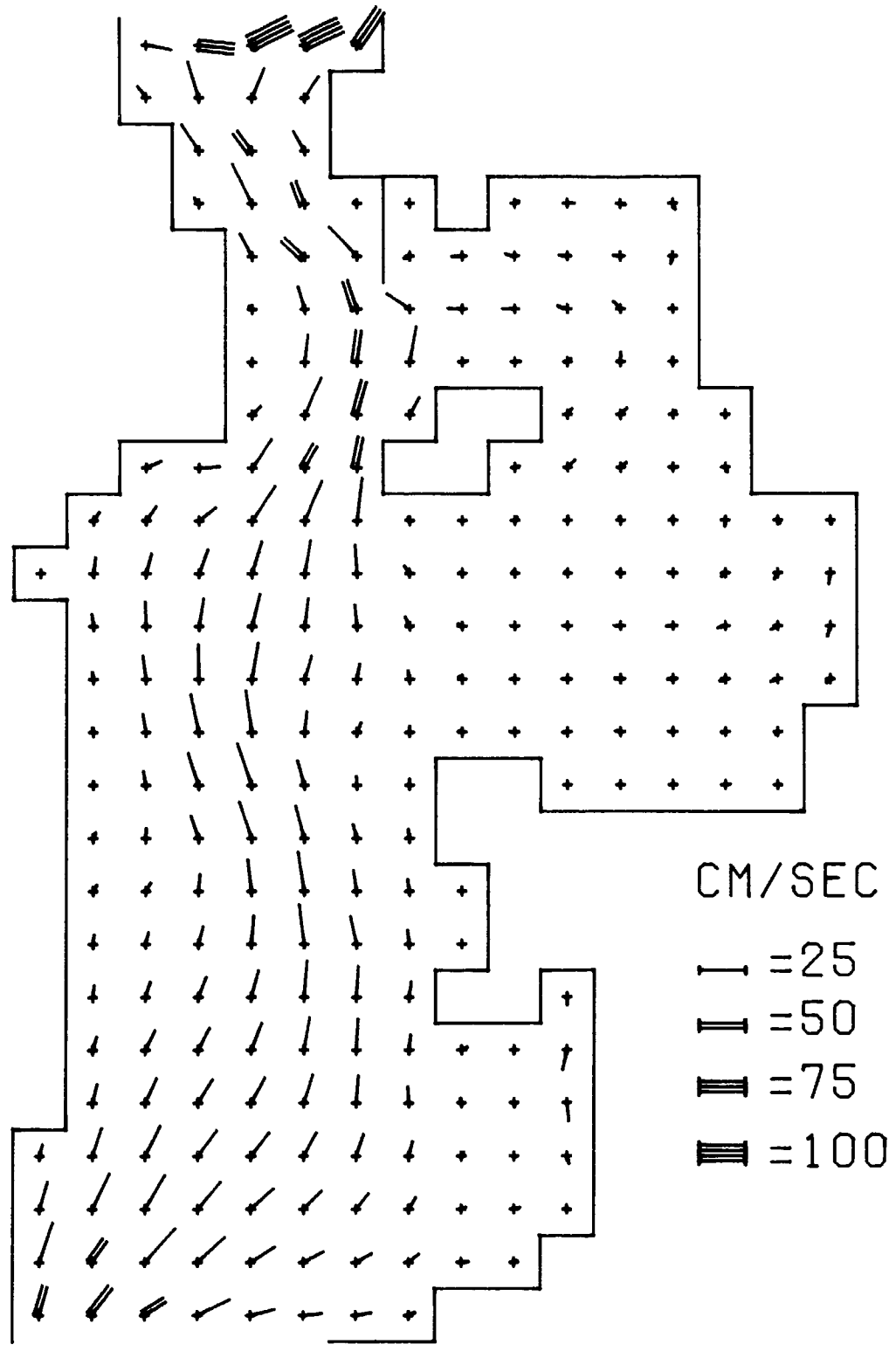

17 HRS 13TH

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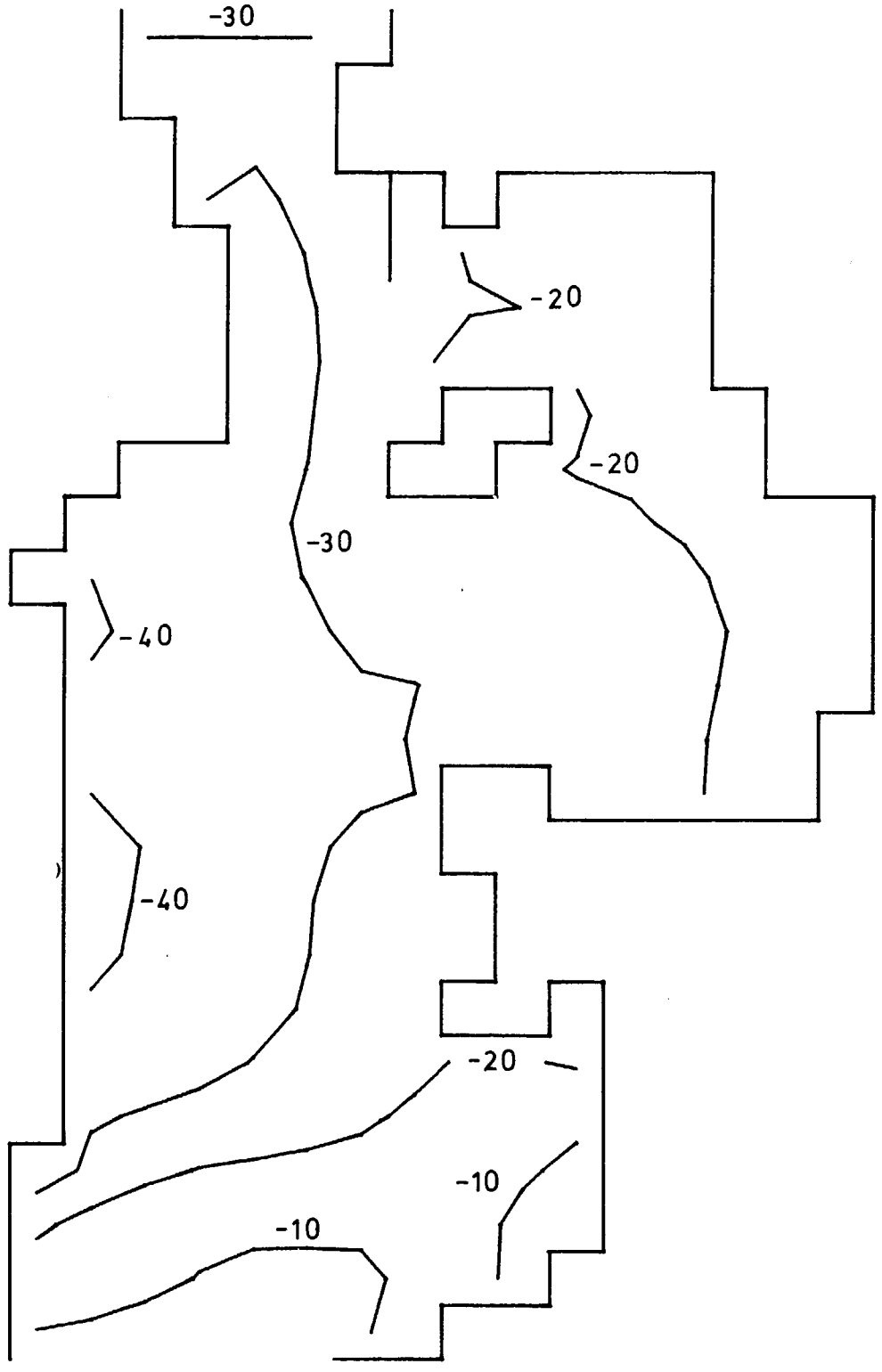

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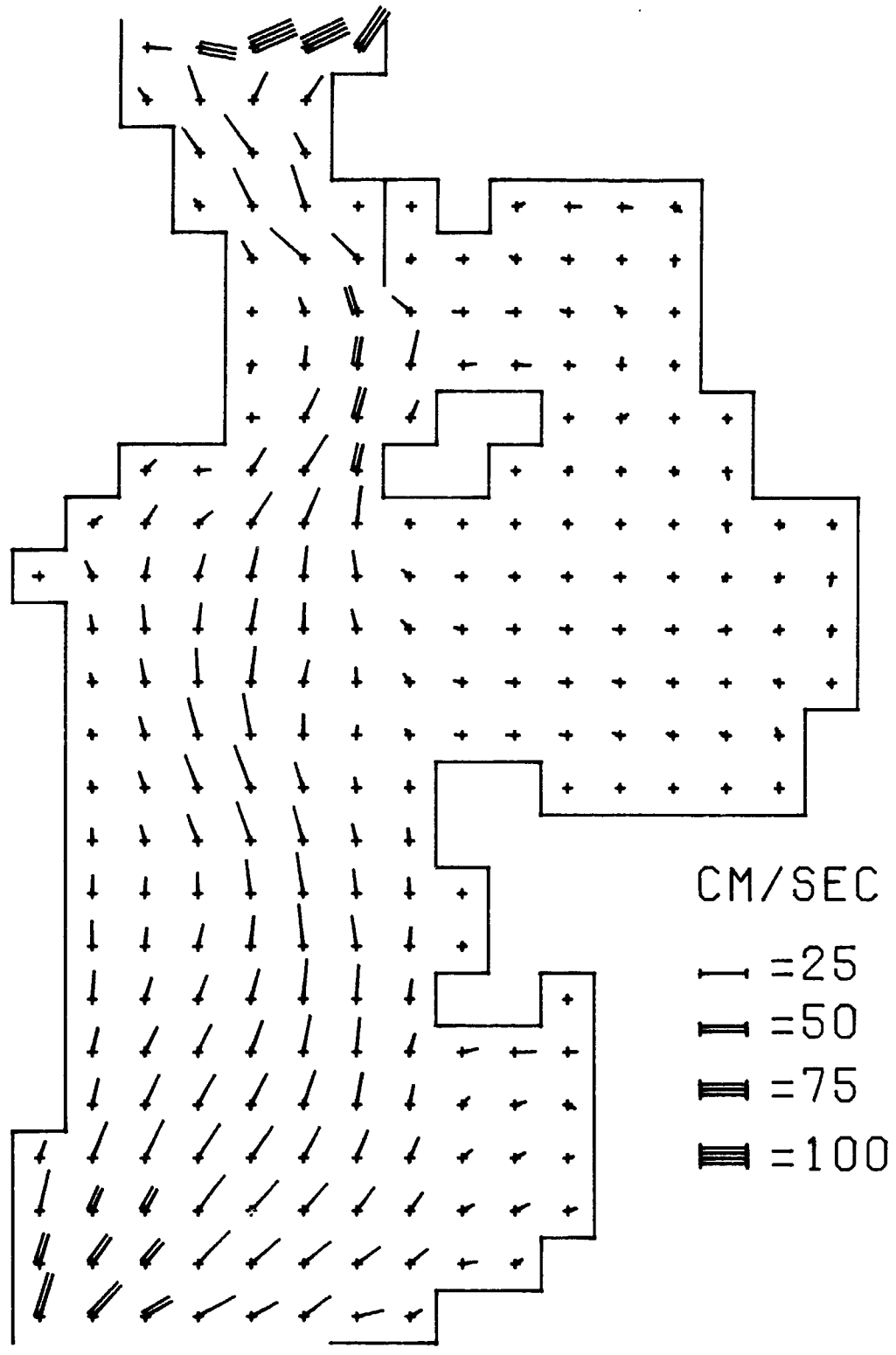

18 HRS 13TH

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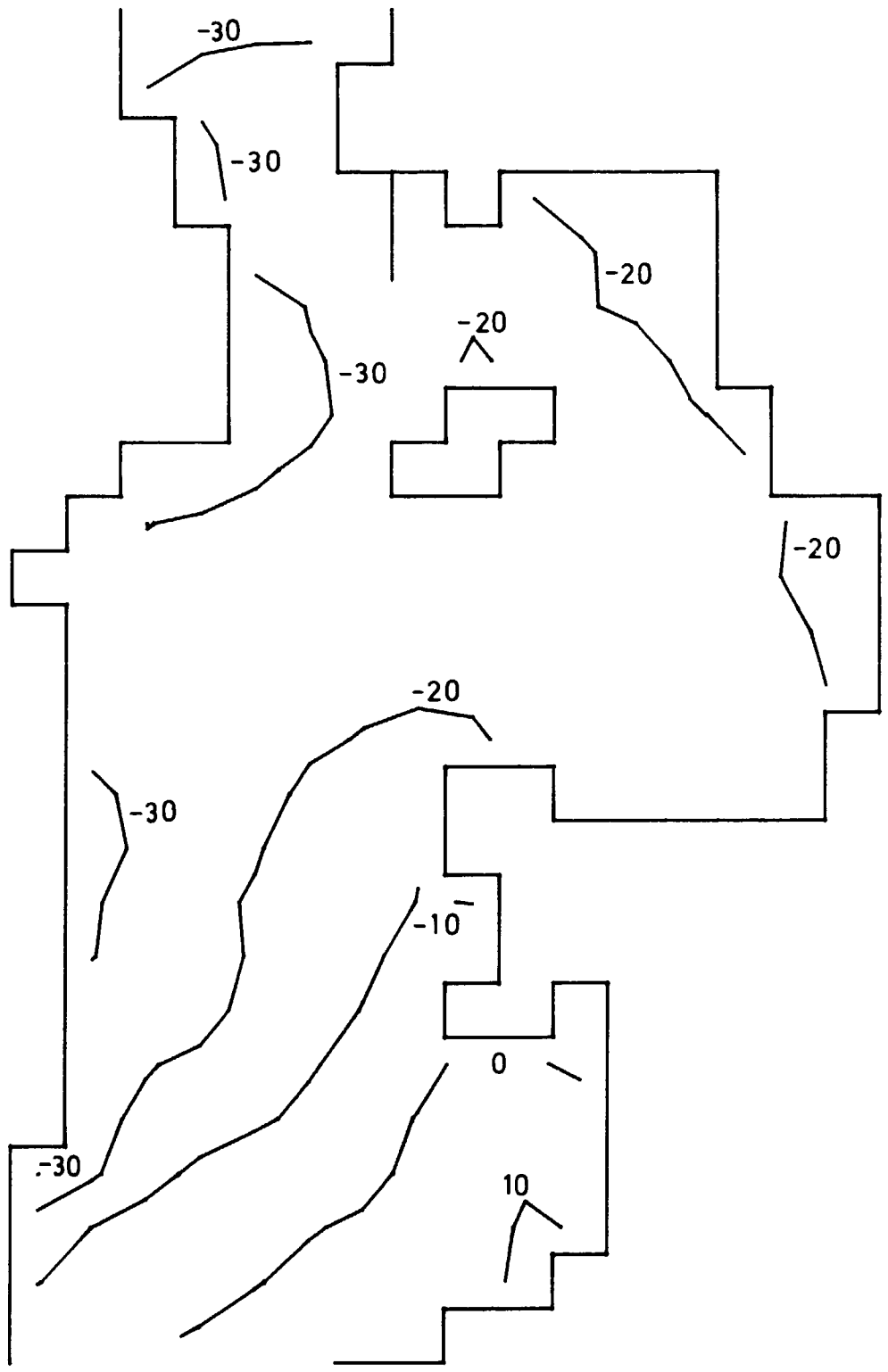

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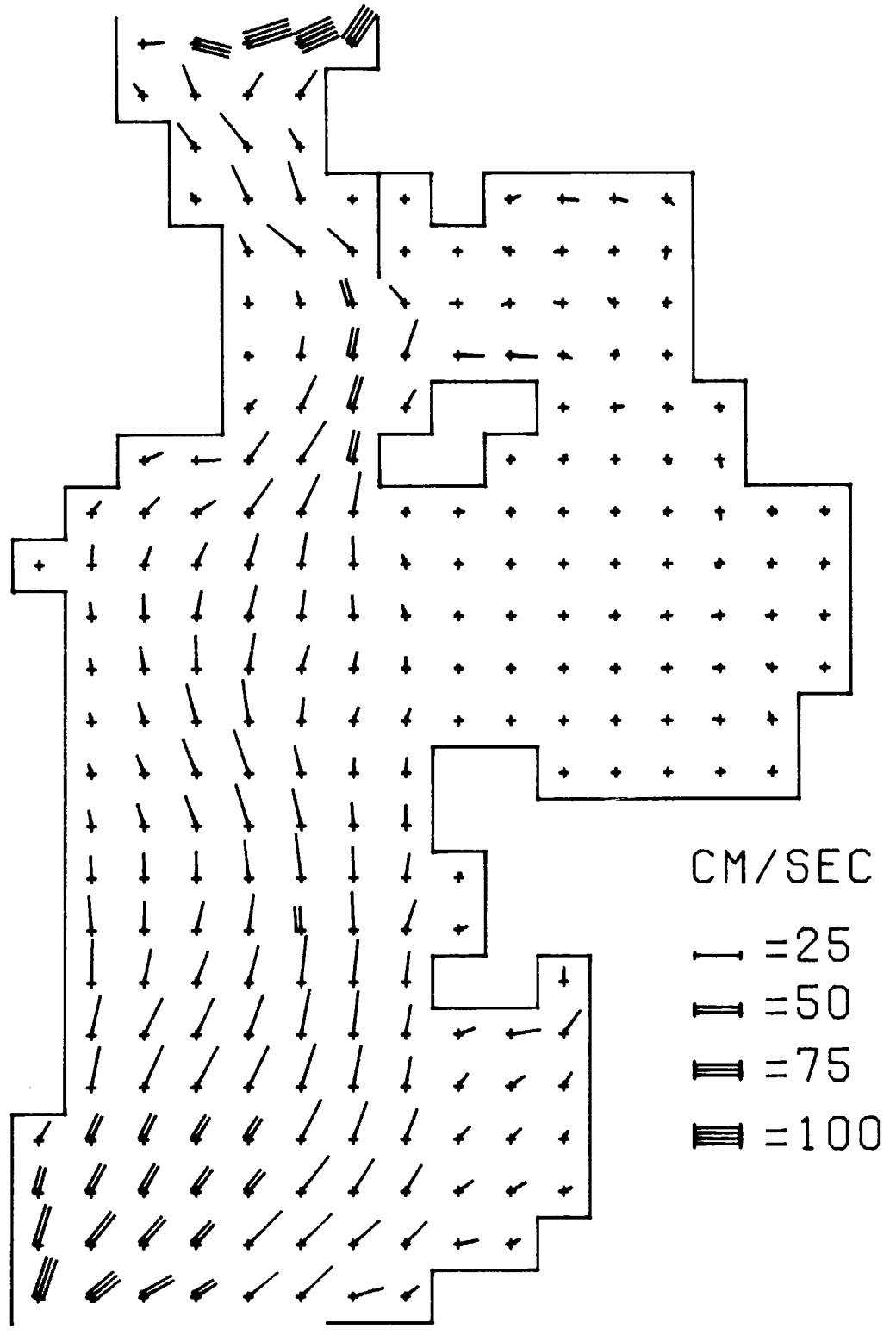

19 HRS 13TH

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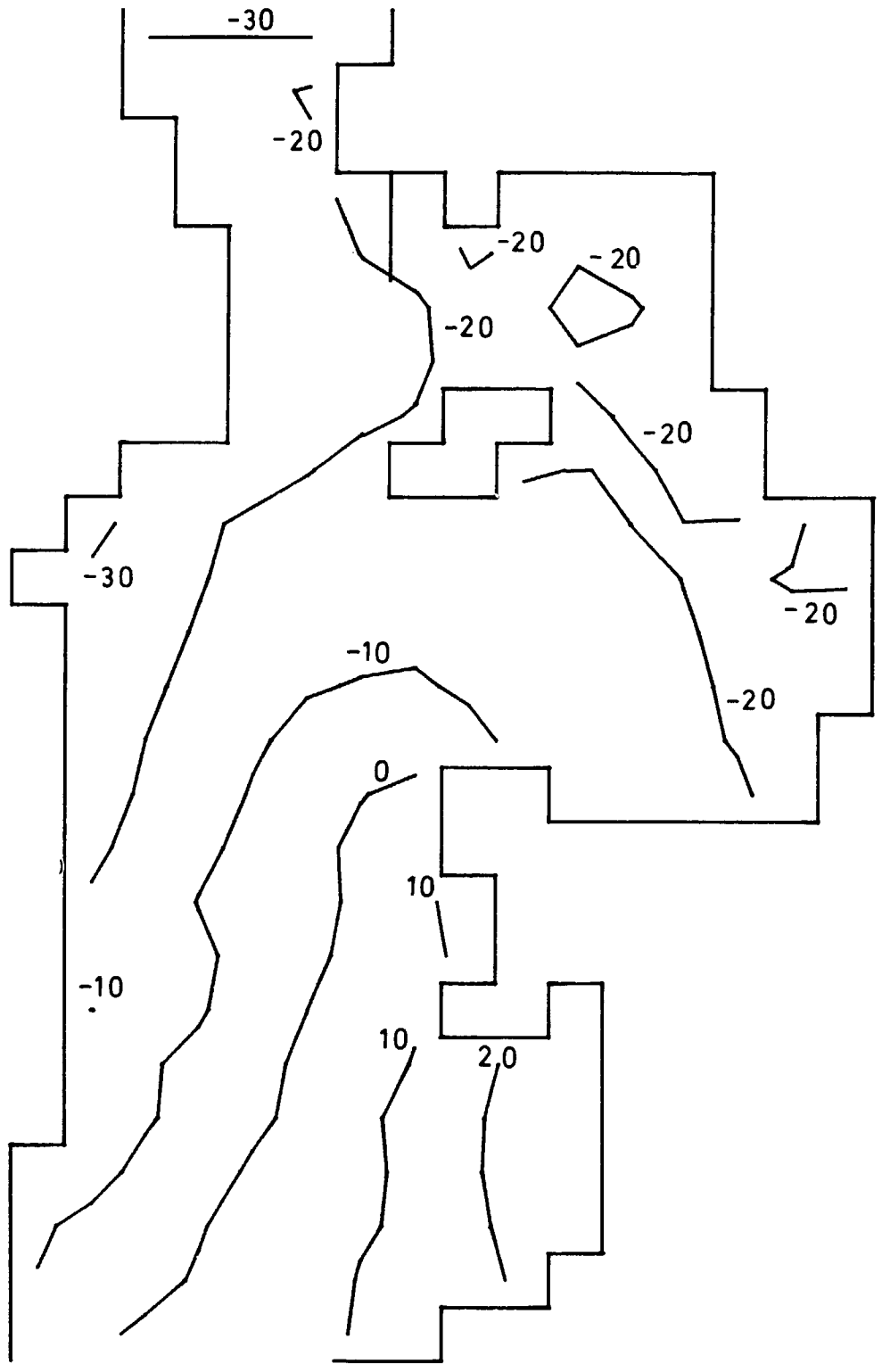

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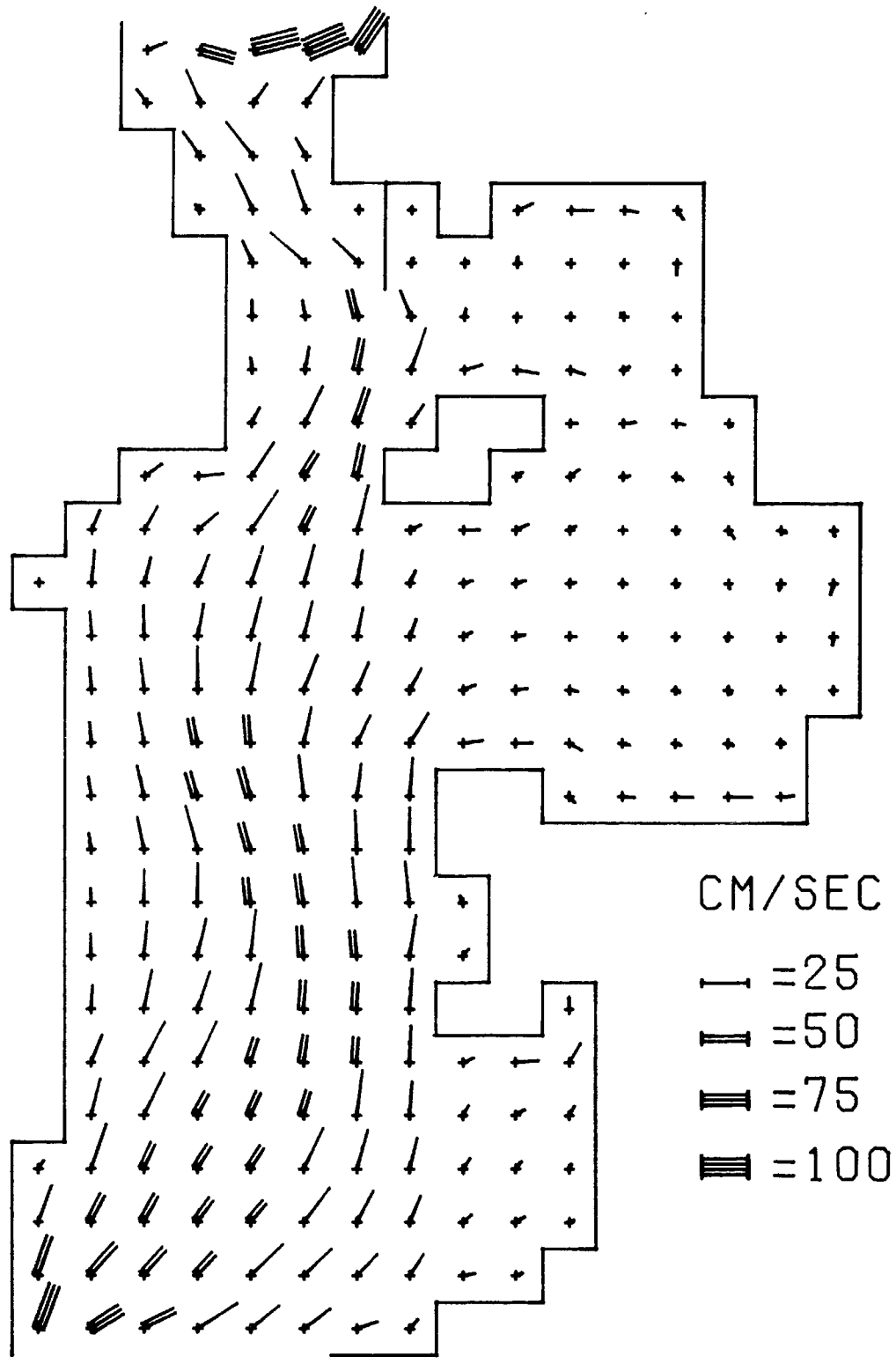

20 HRS 13TH

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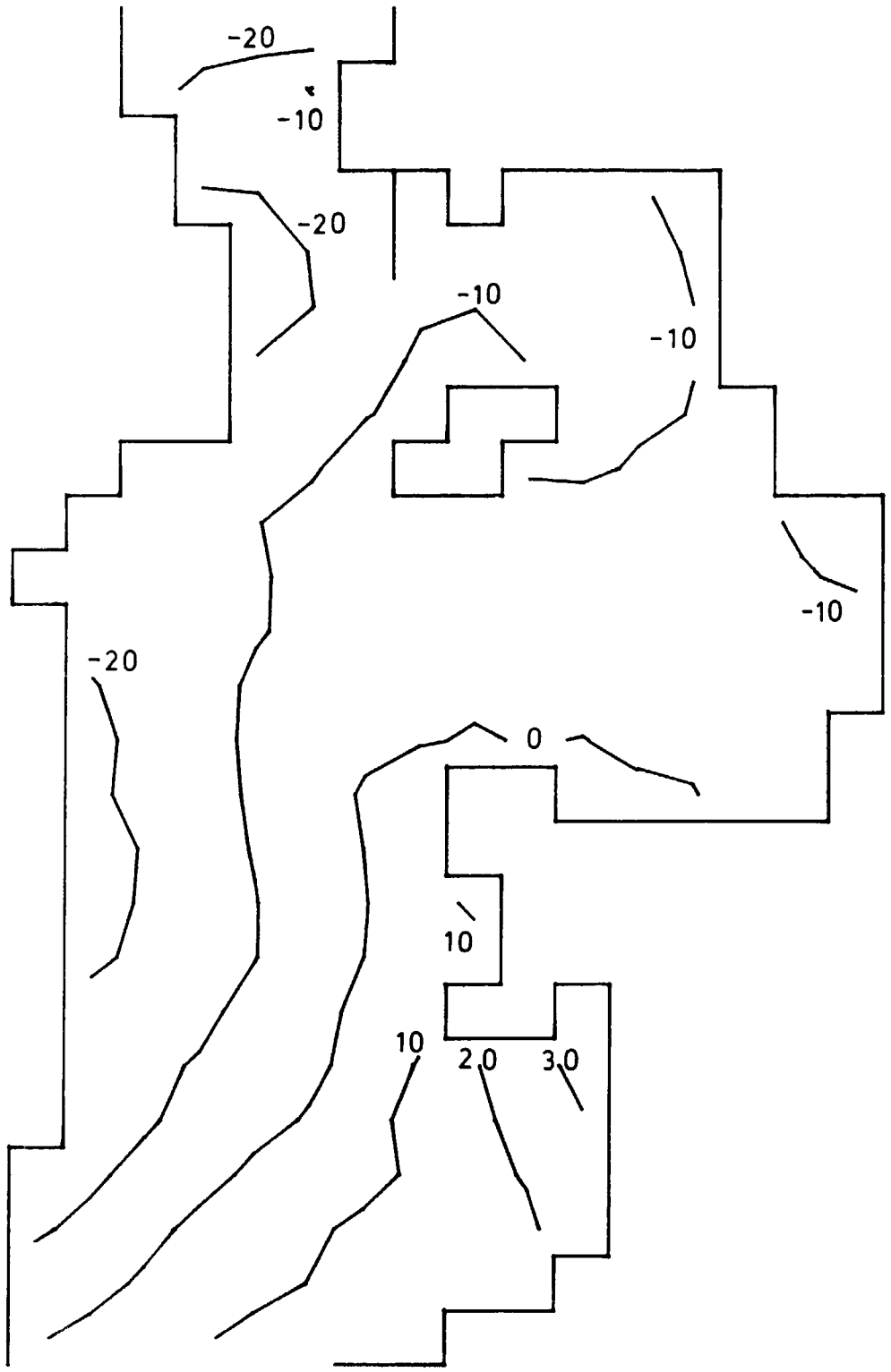

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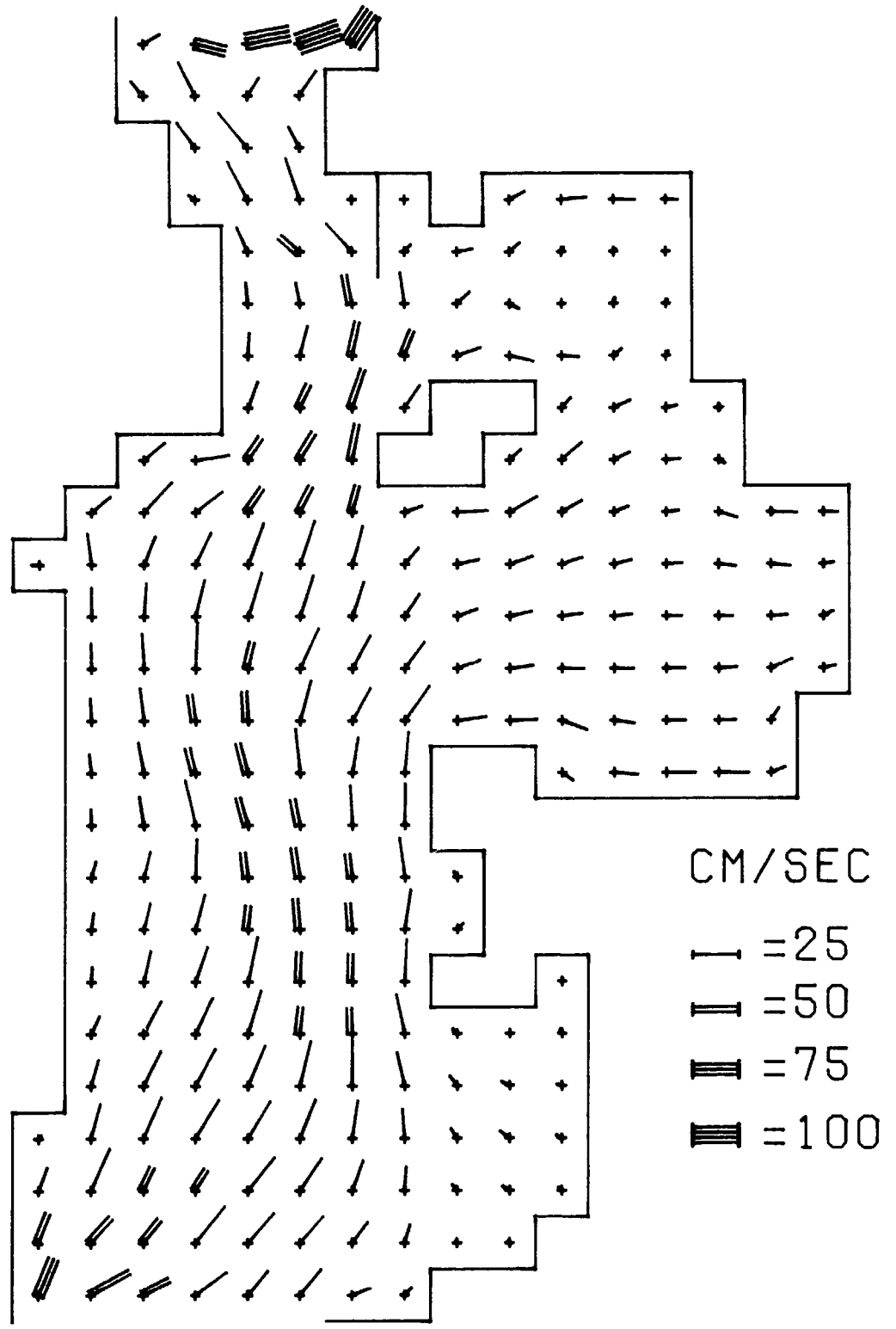

21 HRS 13TH

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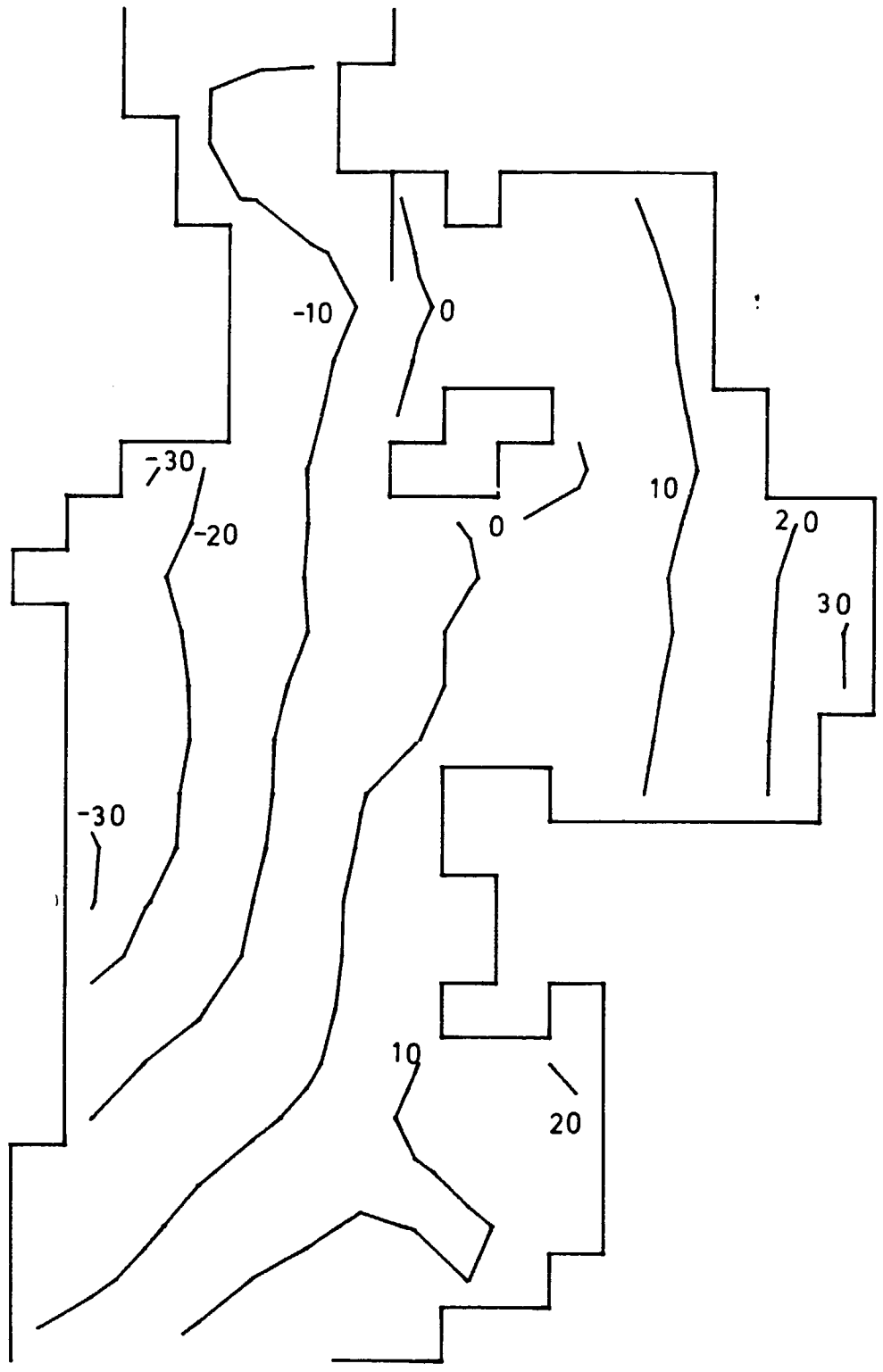

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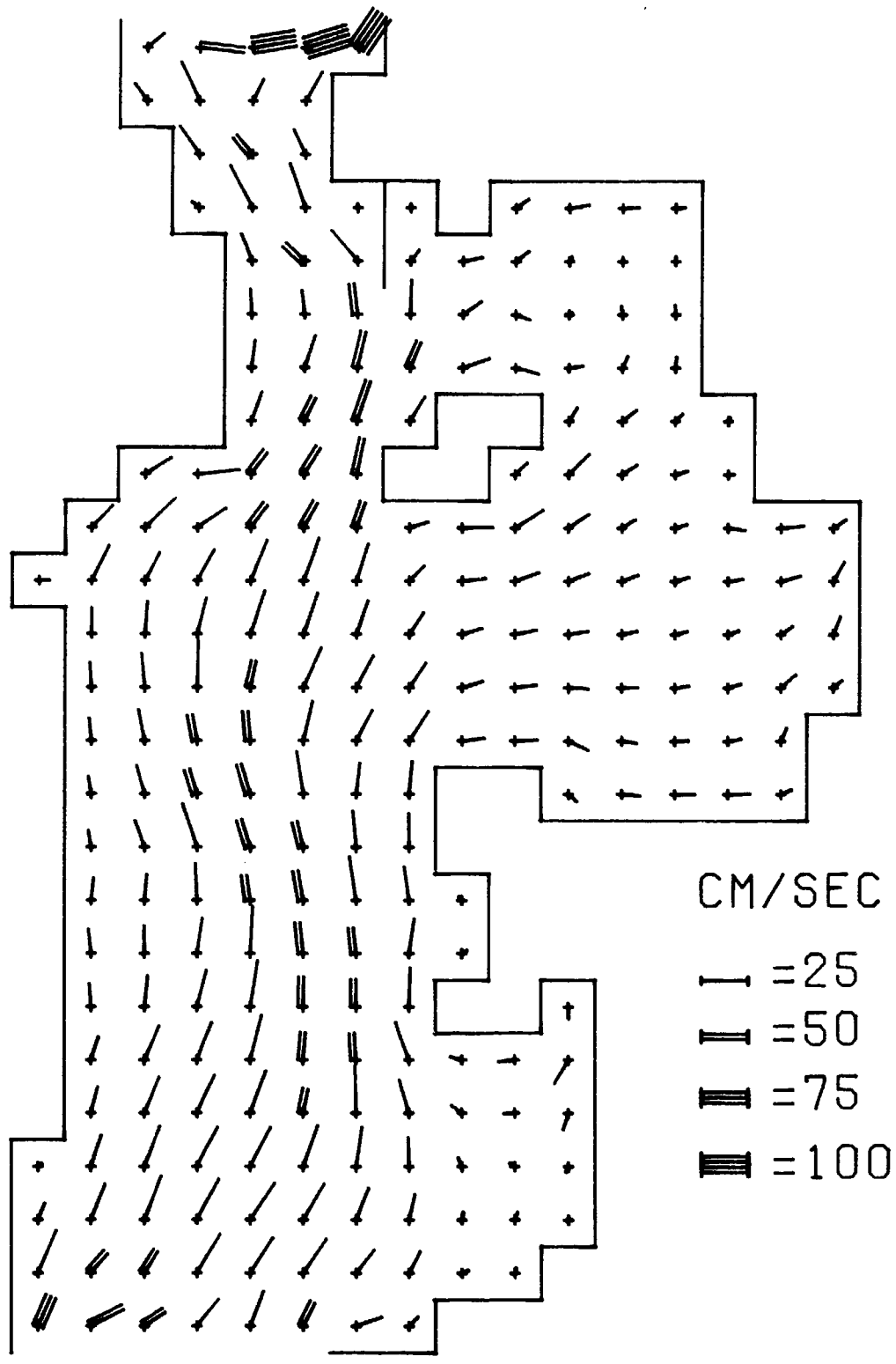

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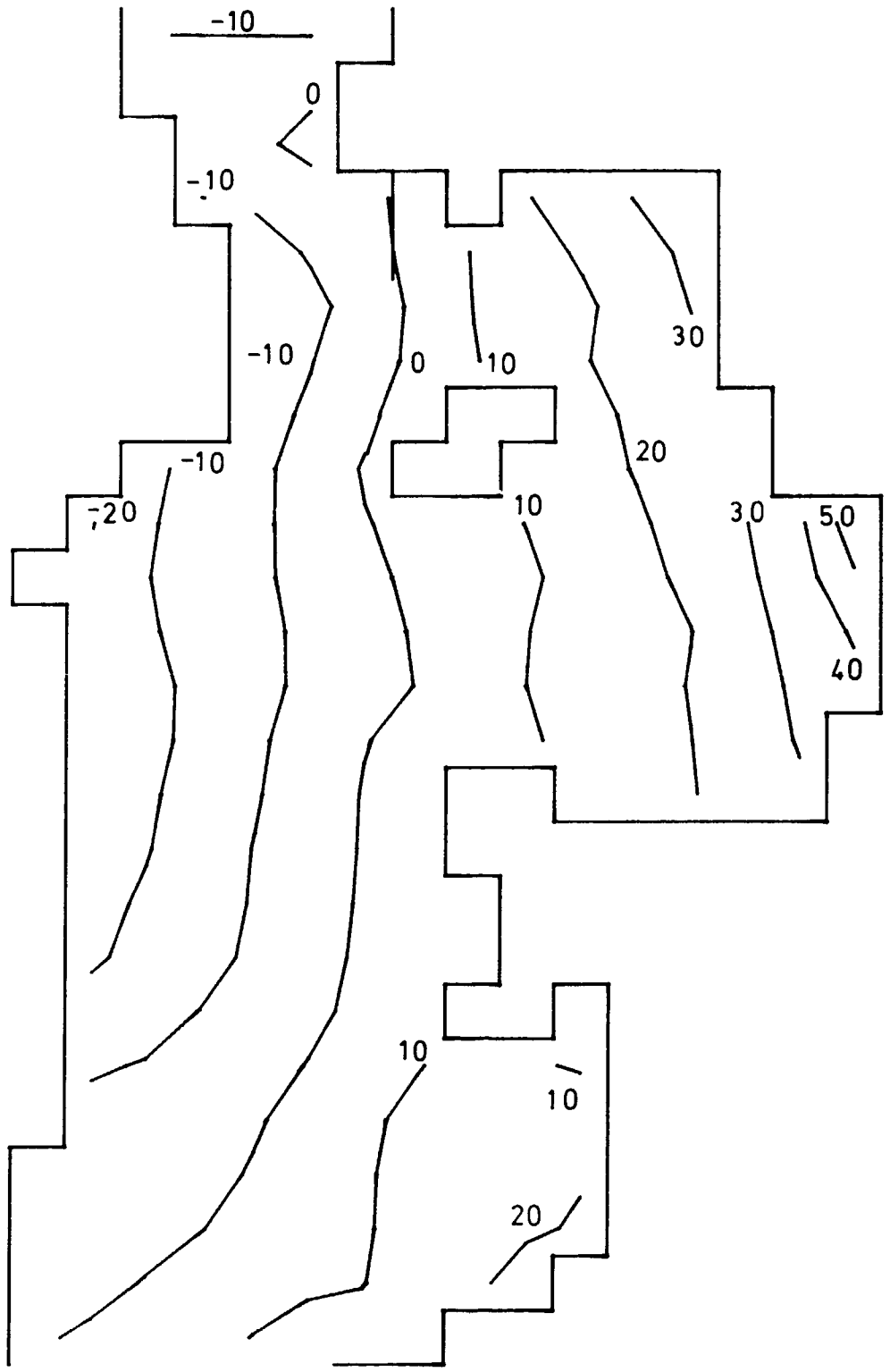

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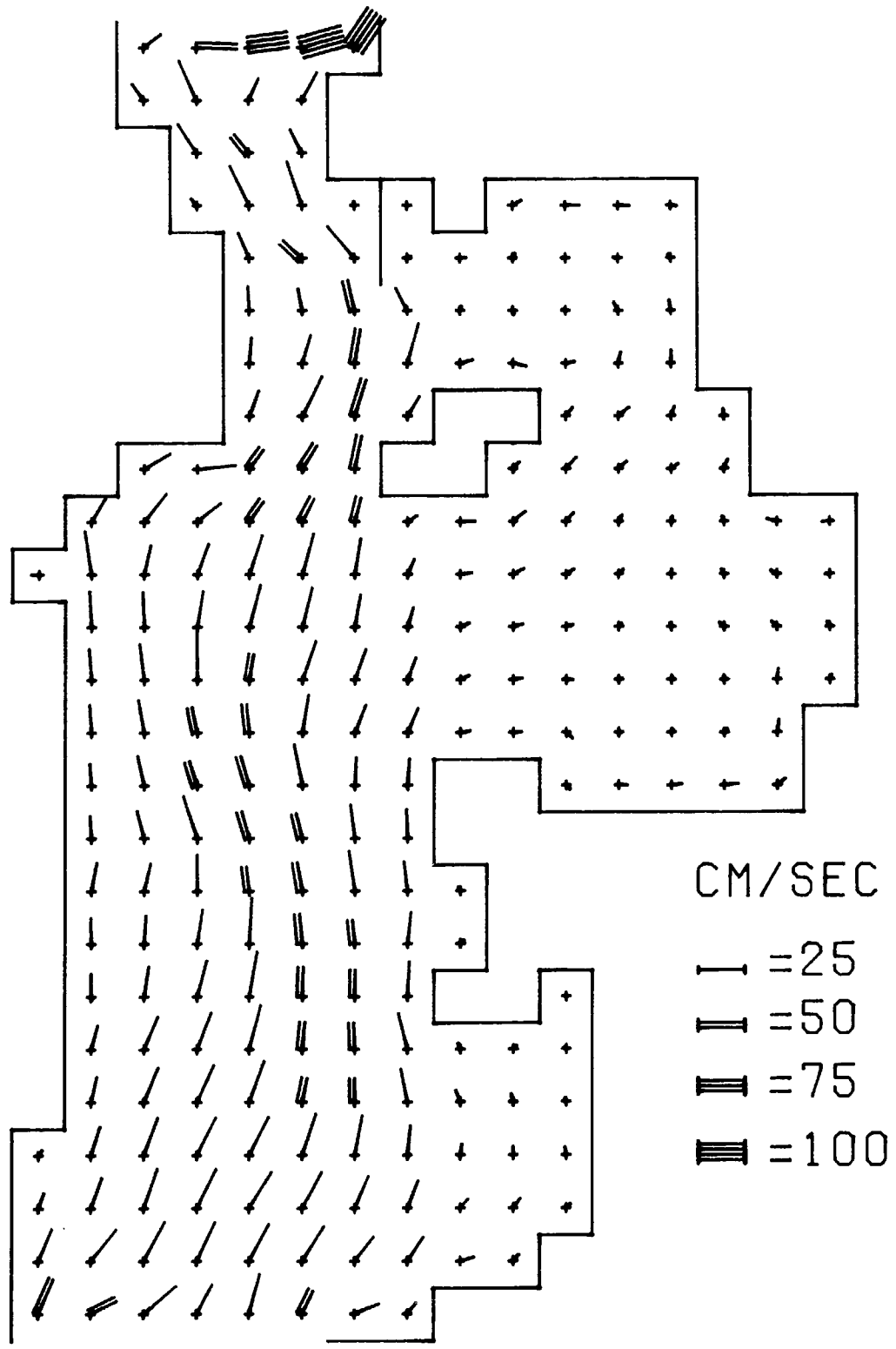

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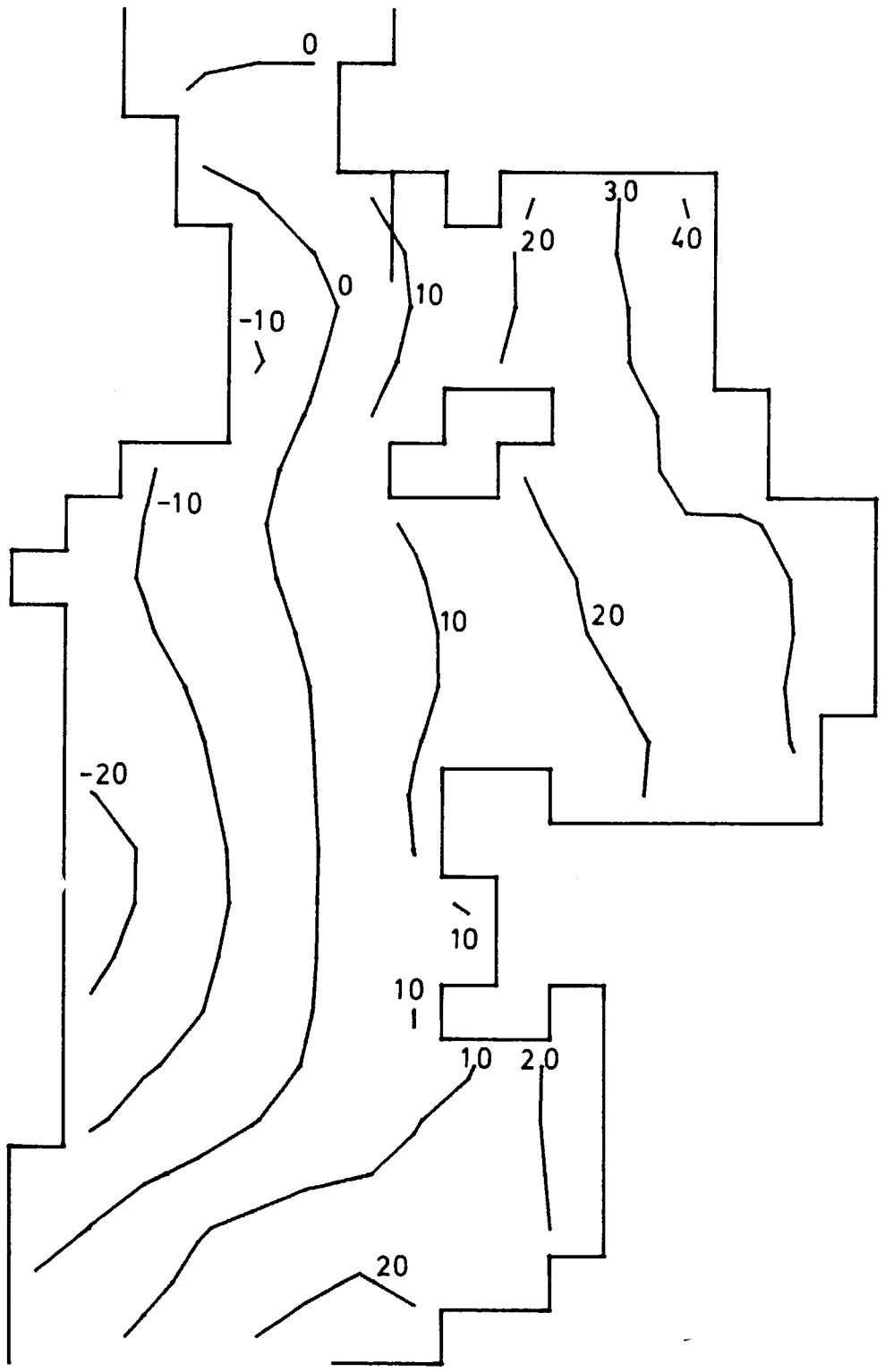

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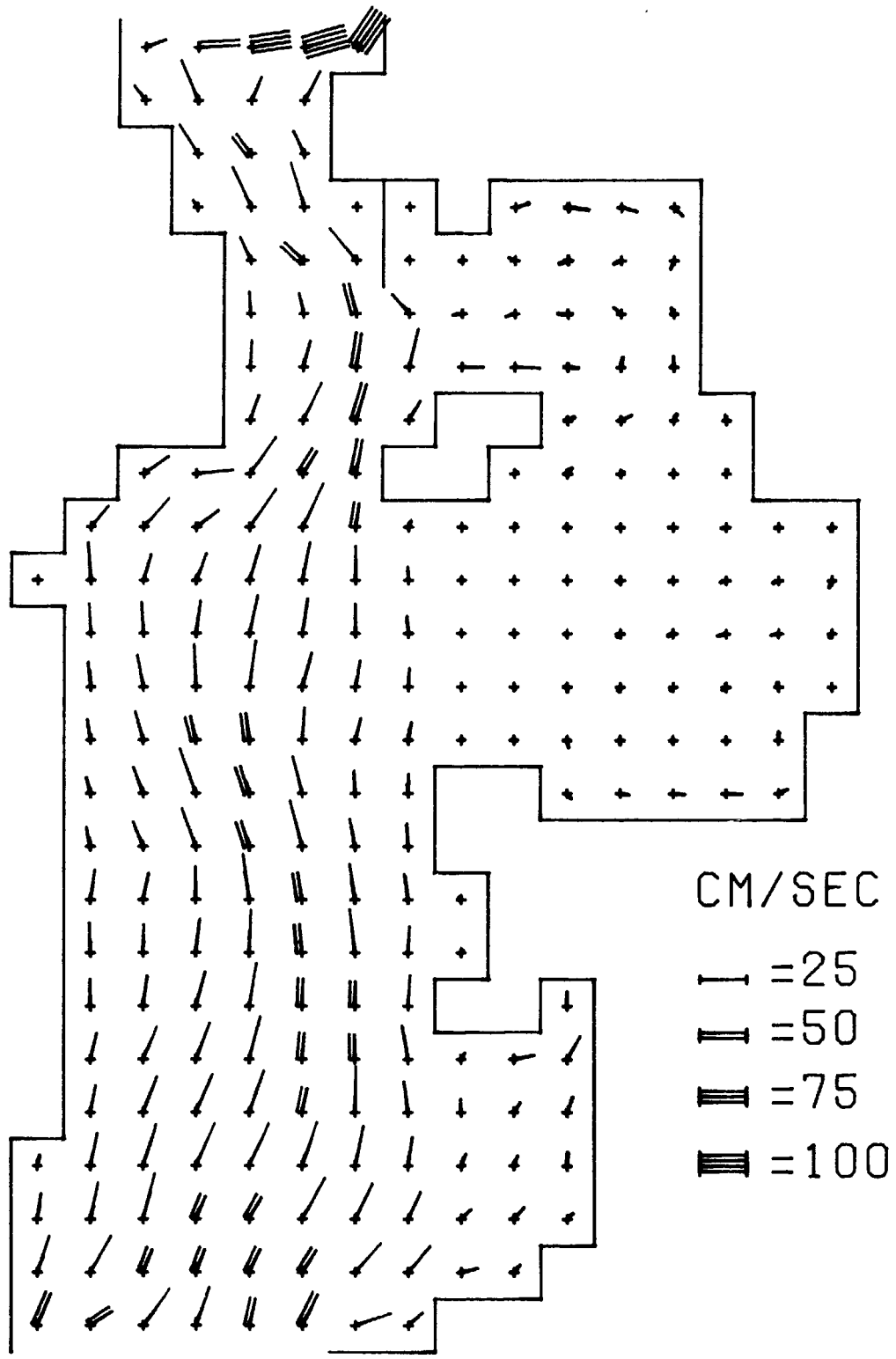

0 HRS 14TH

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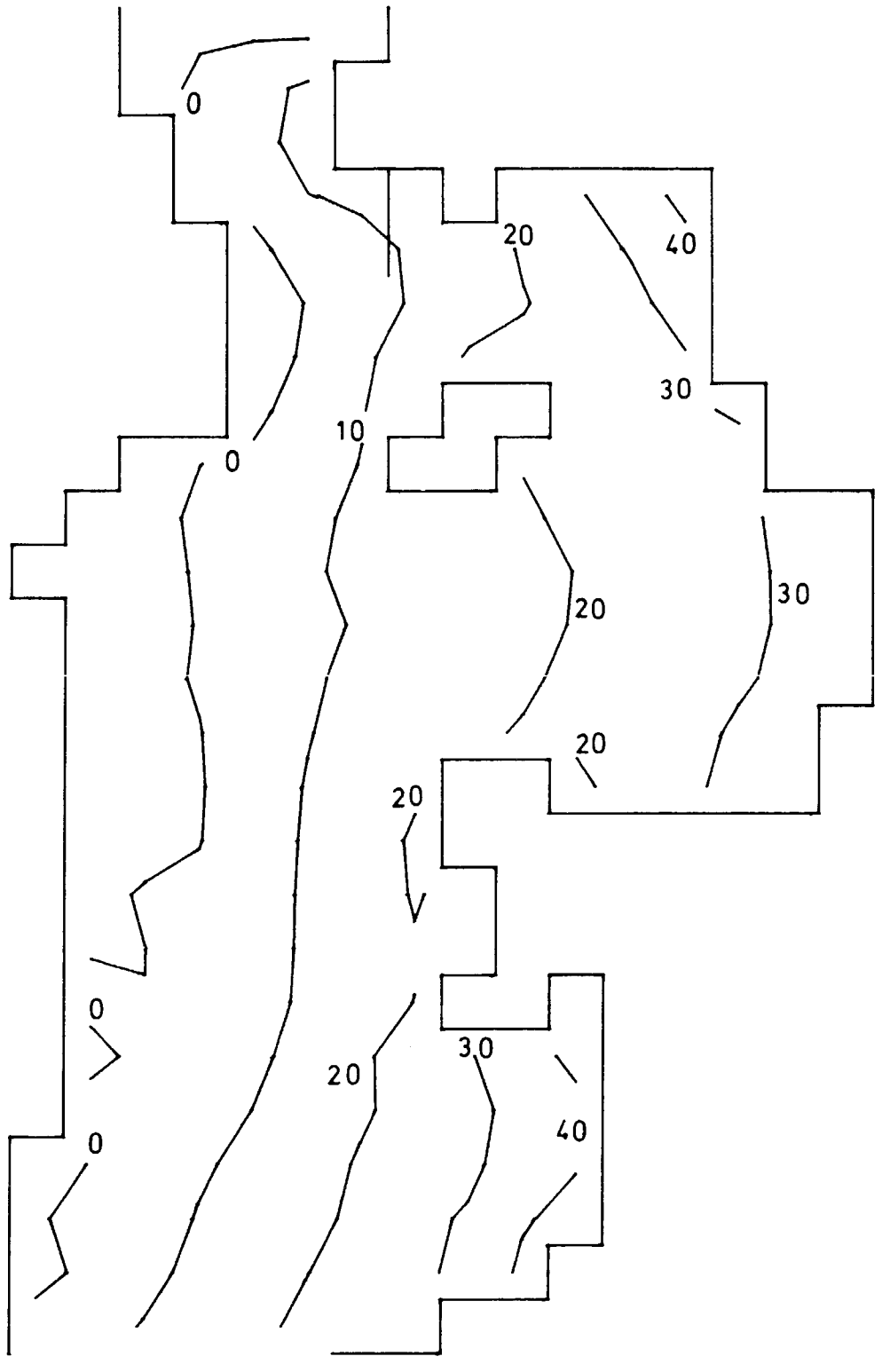

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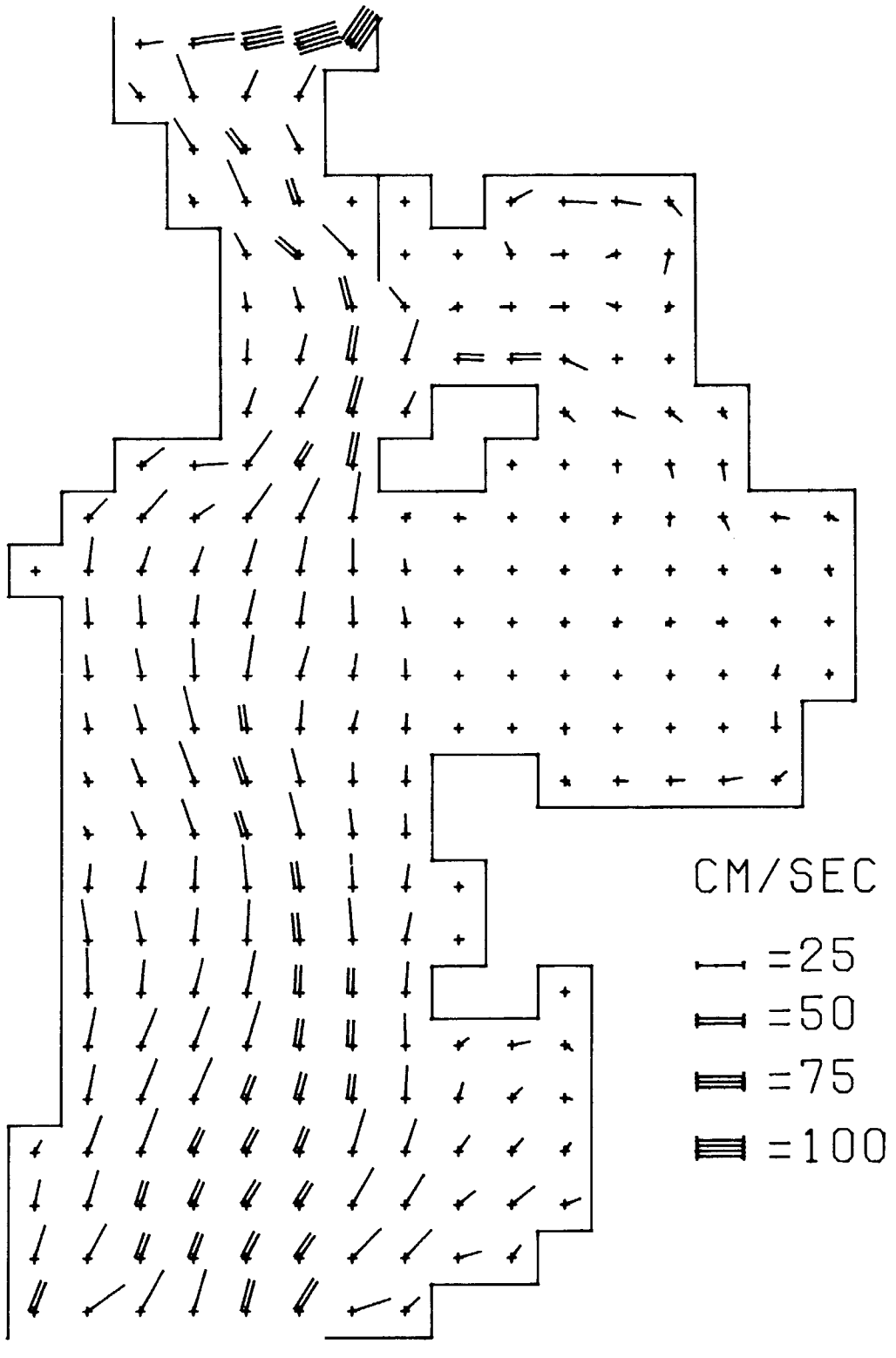

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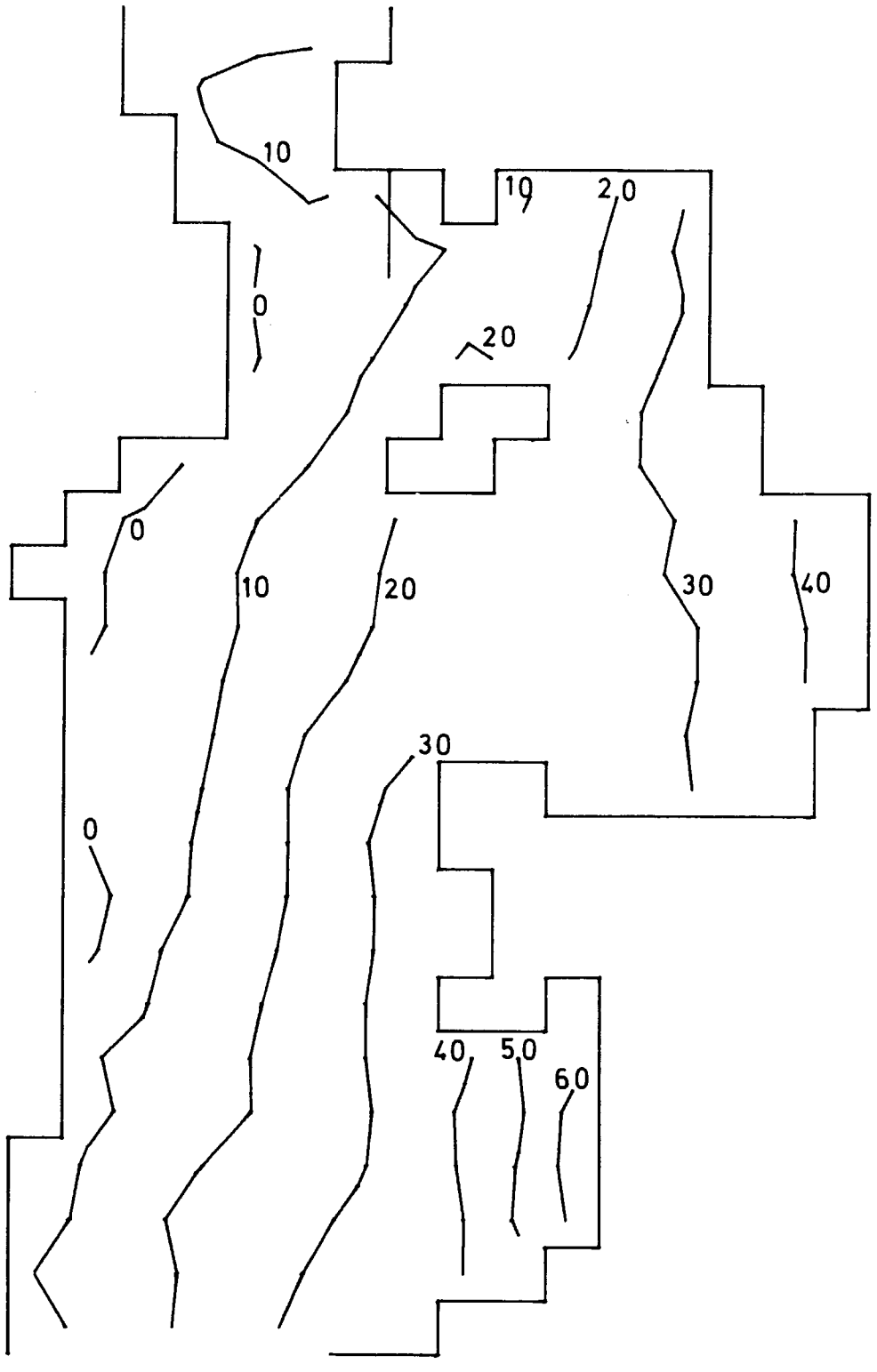

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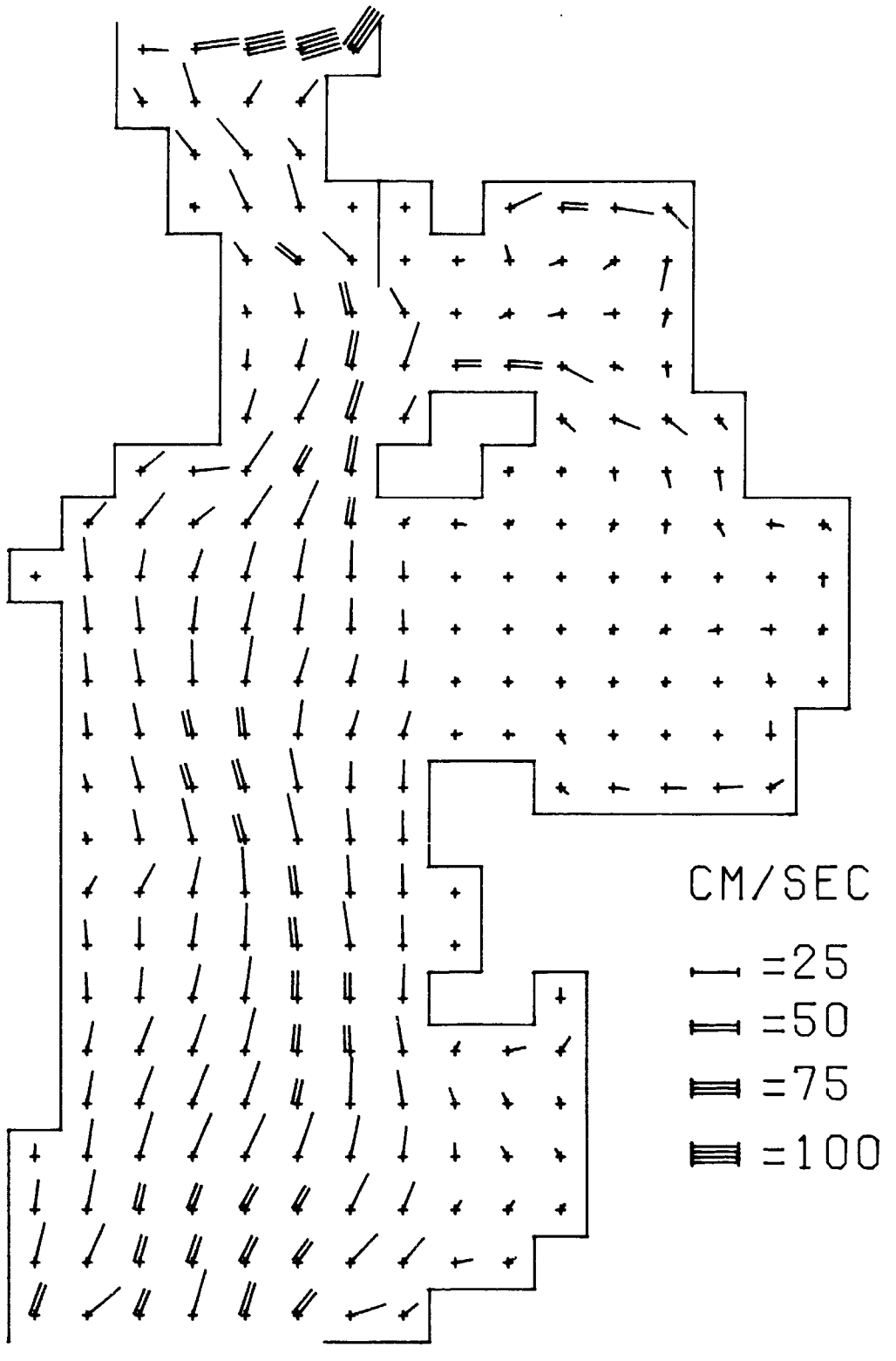

2 HRS 14TH

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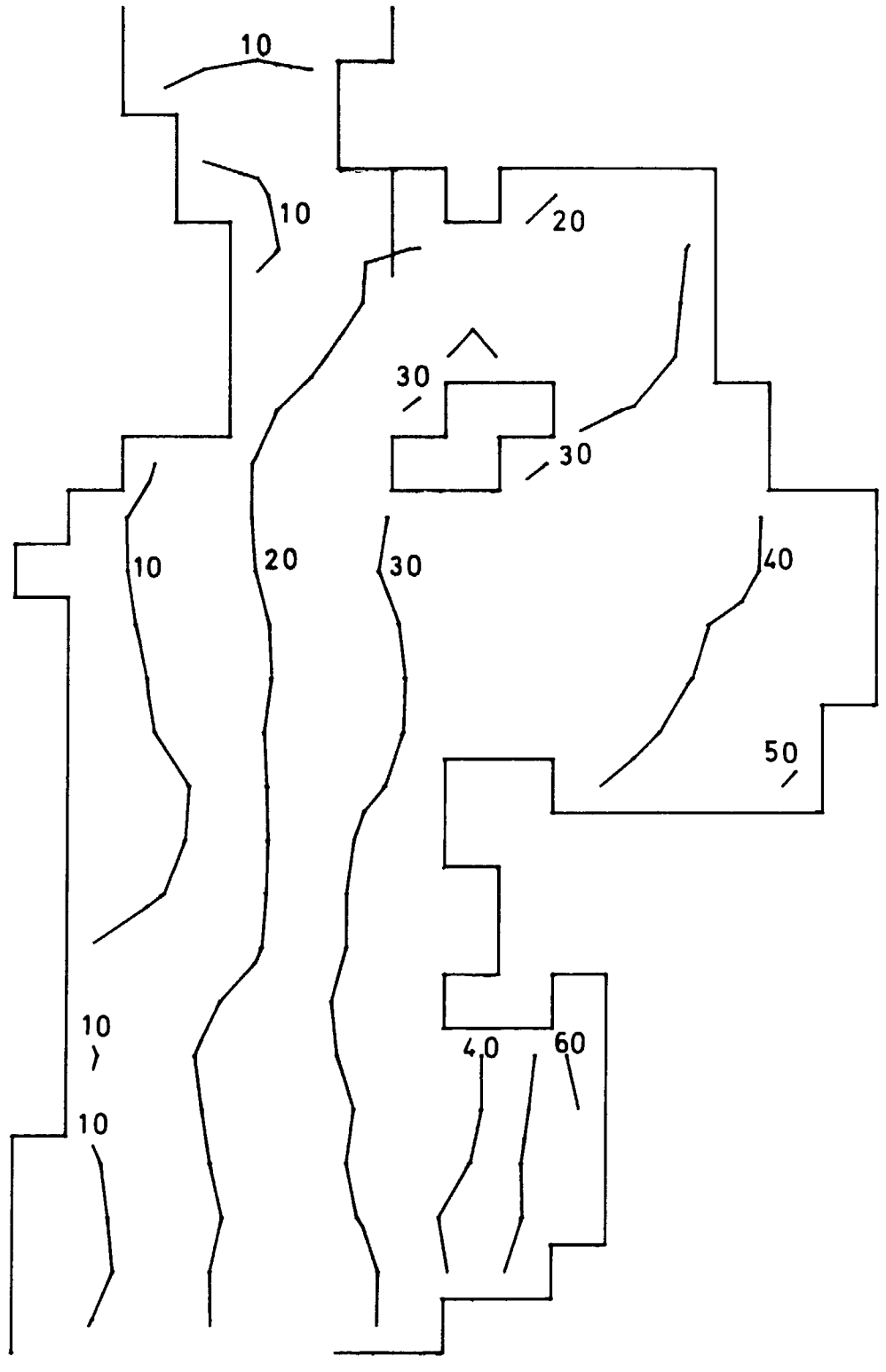

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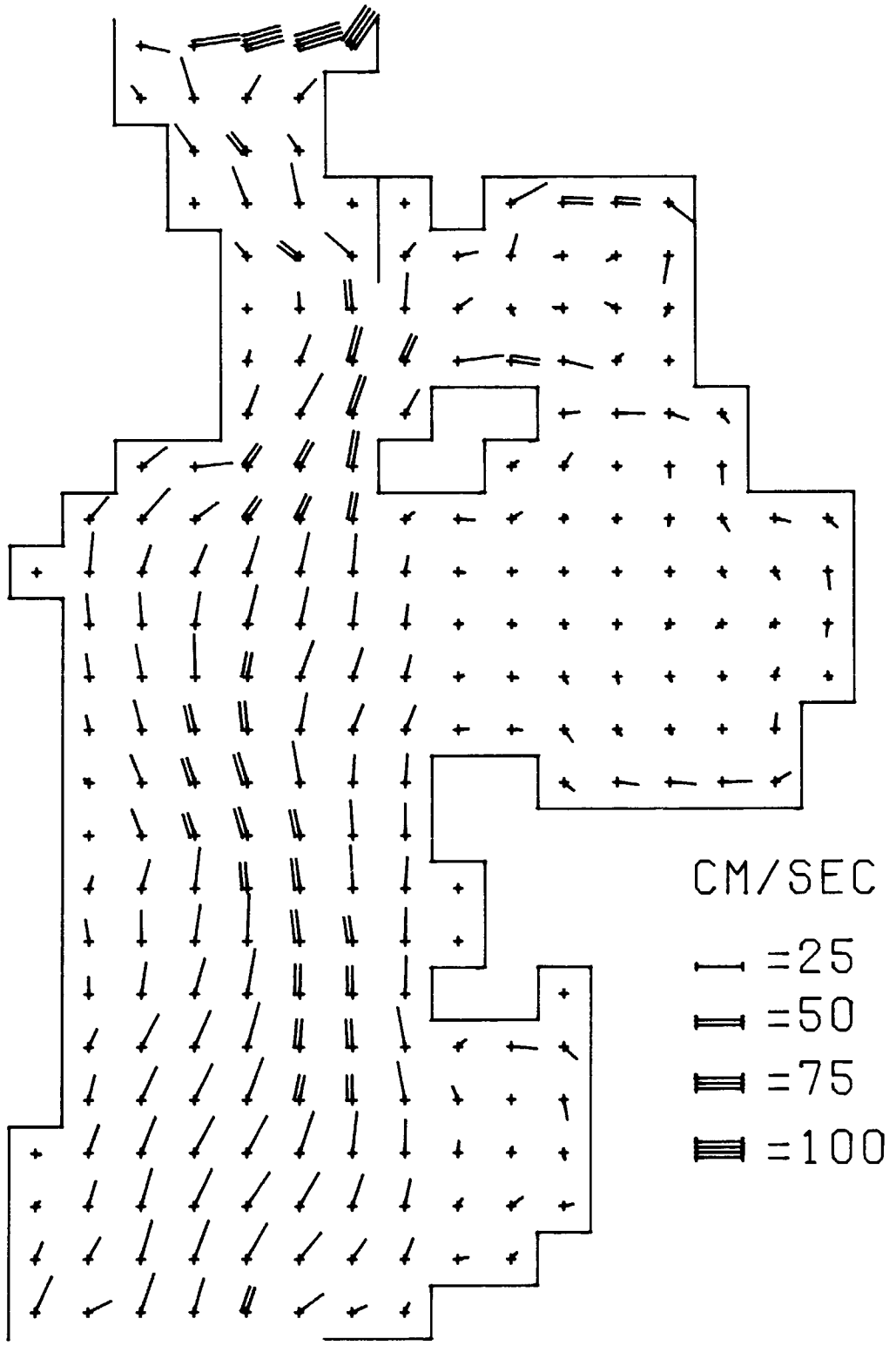

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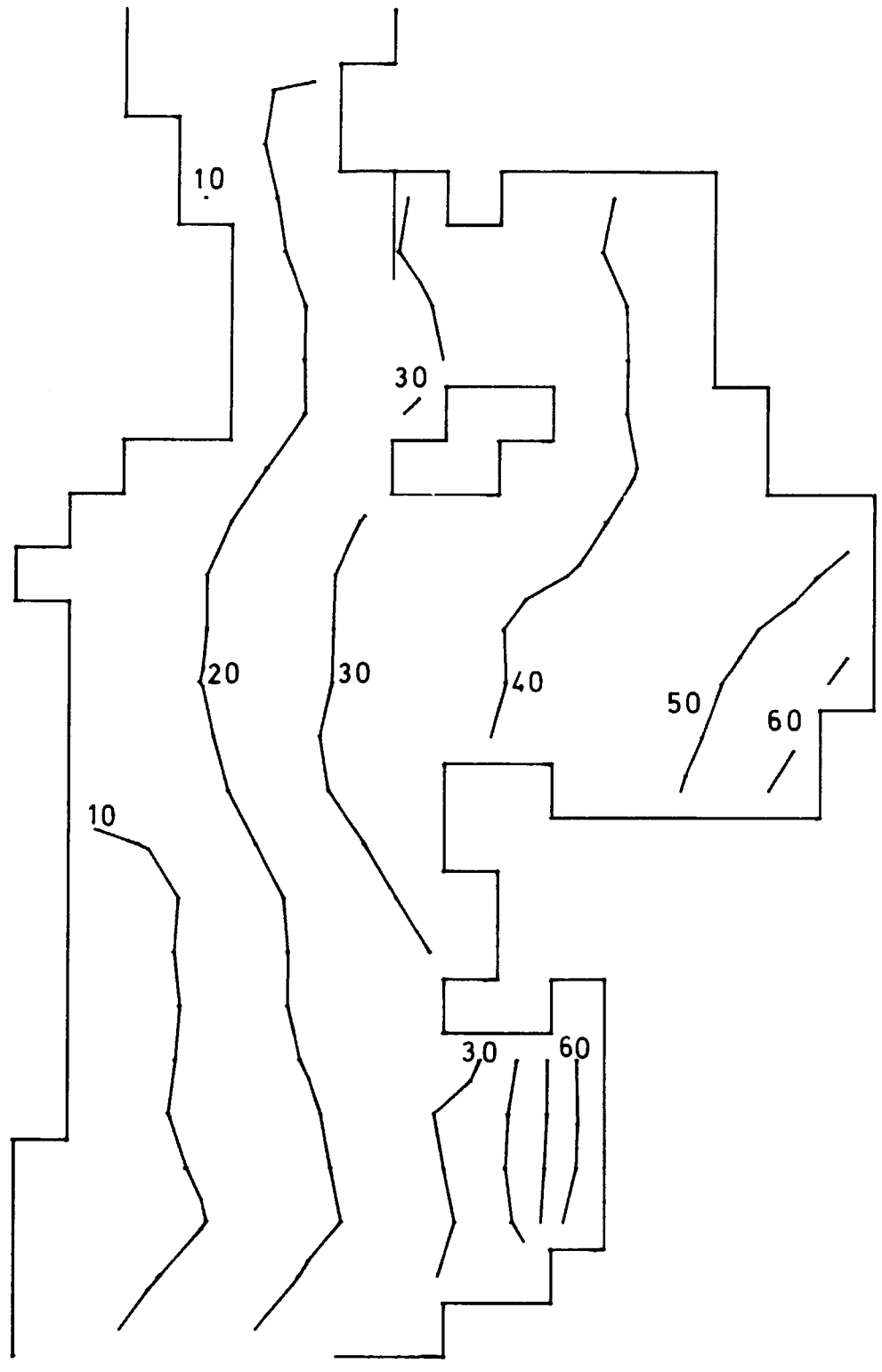

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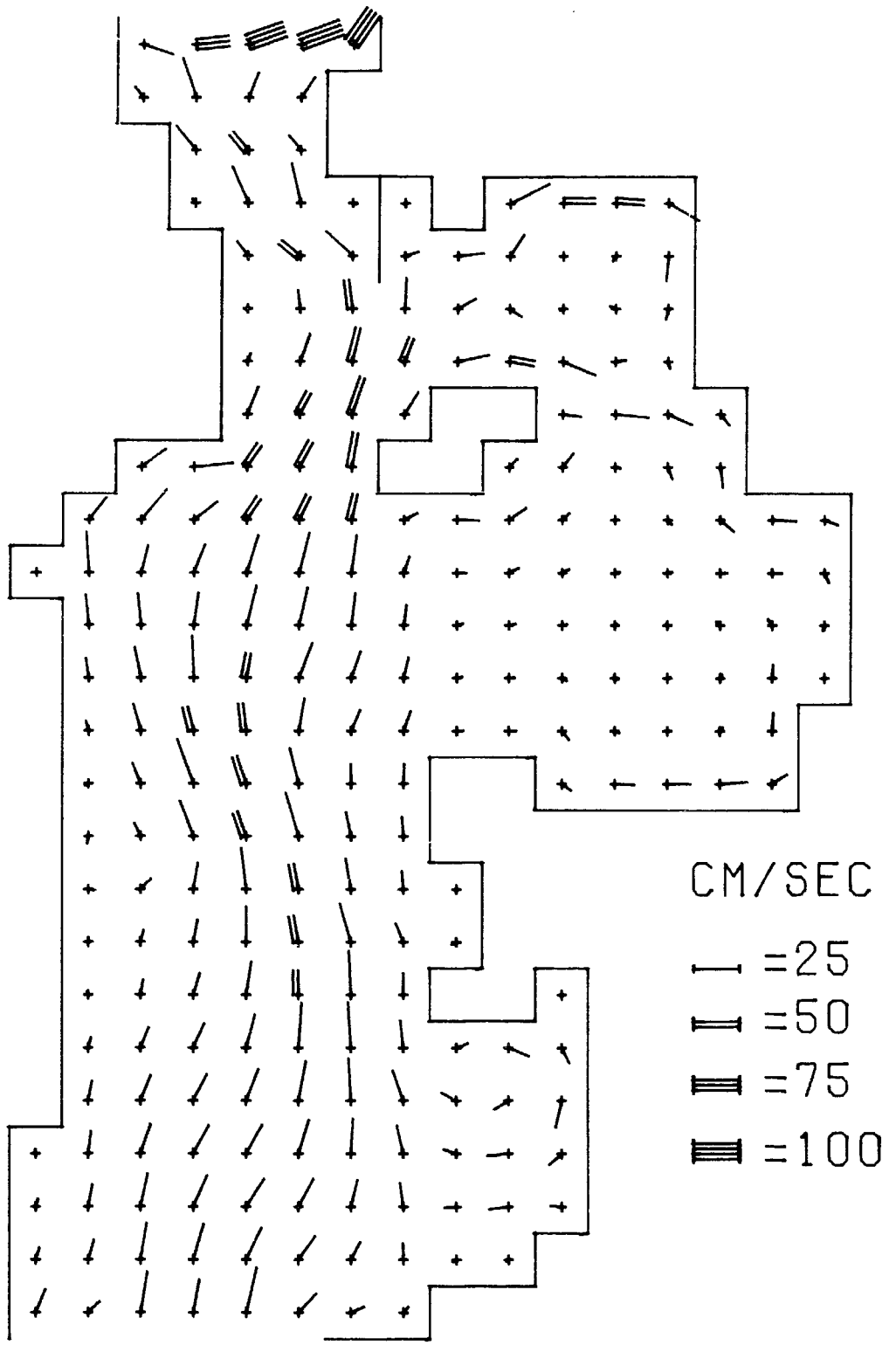

4 HRS 14TH

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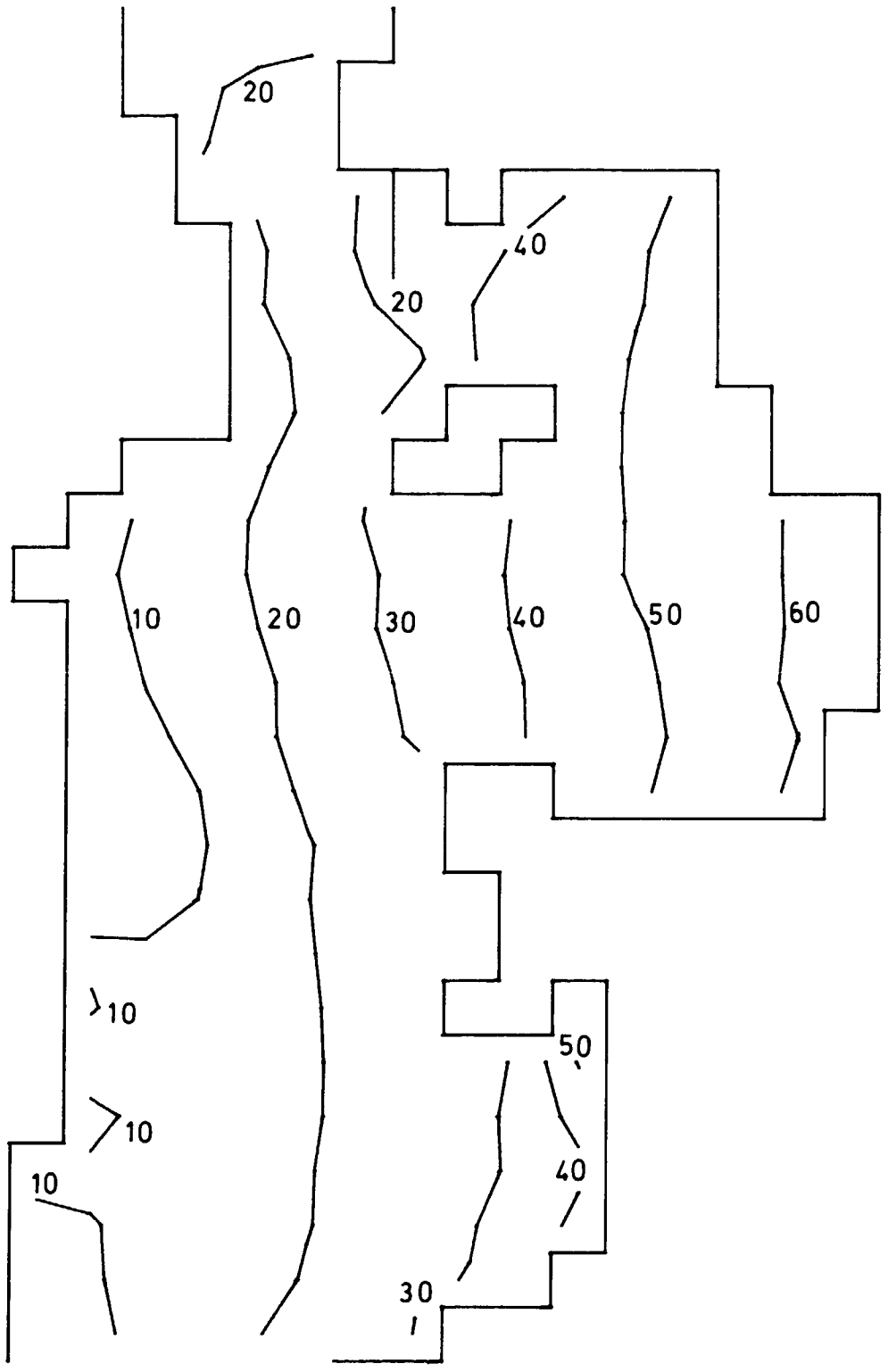

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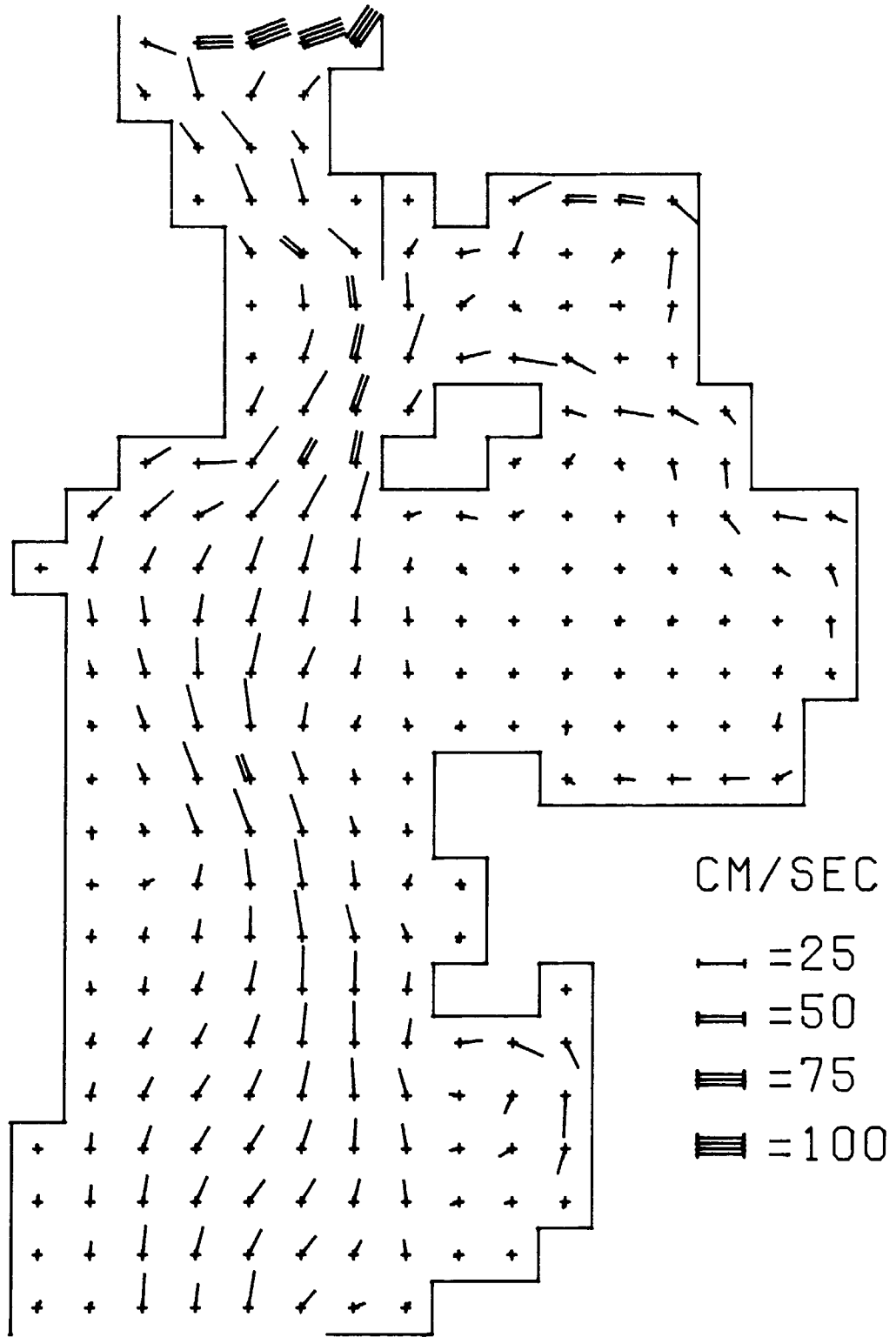

5 HRS 14TH

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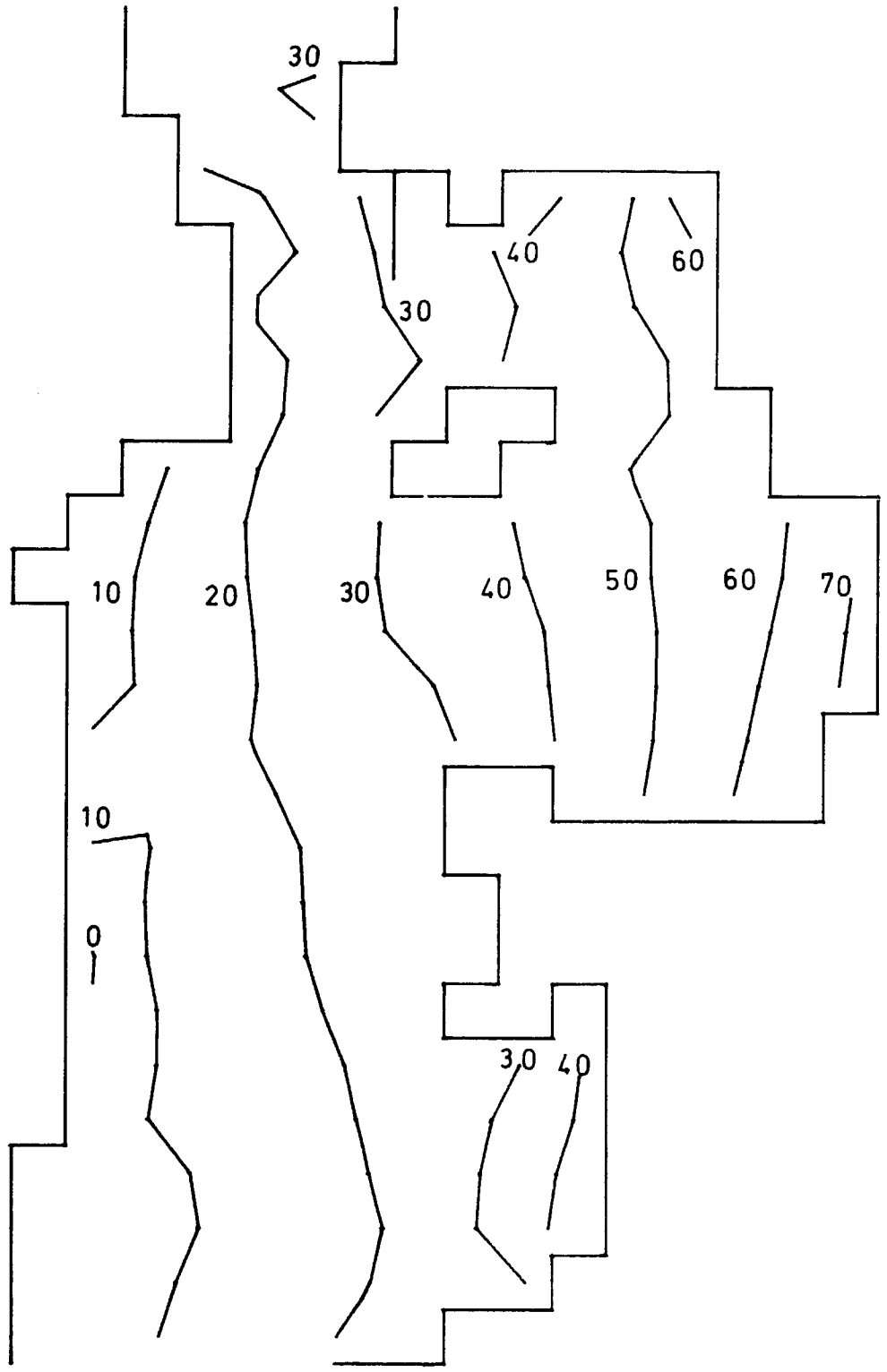

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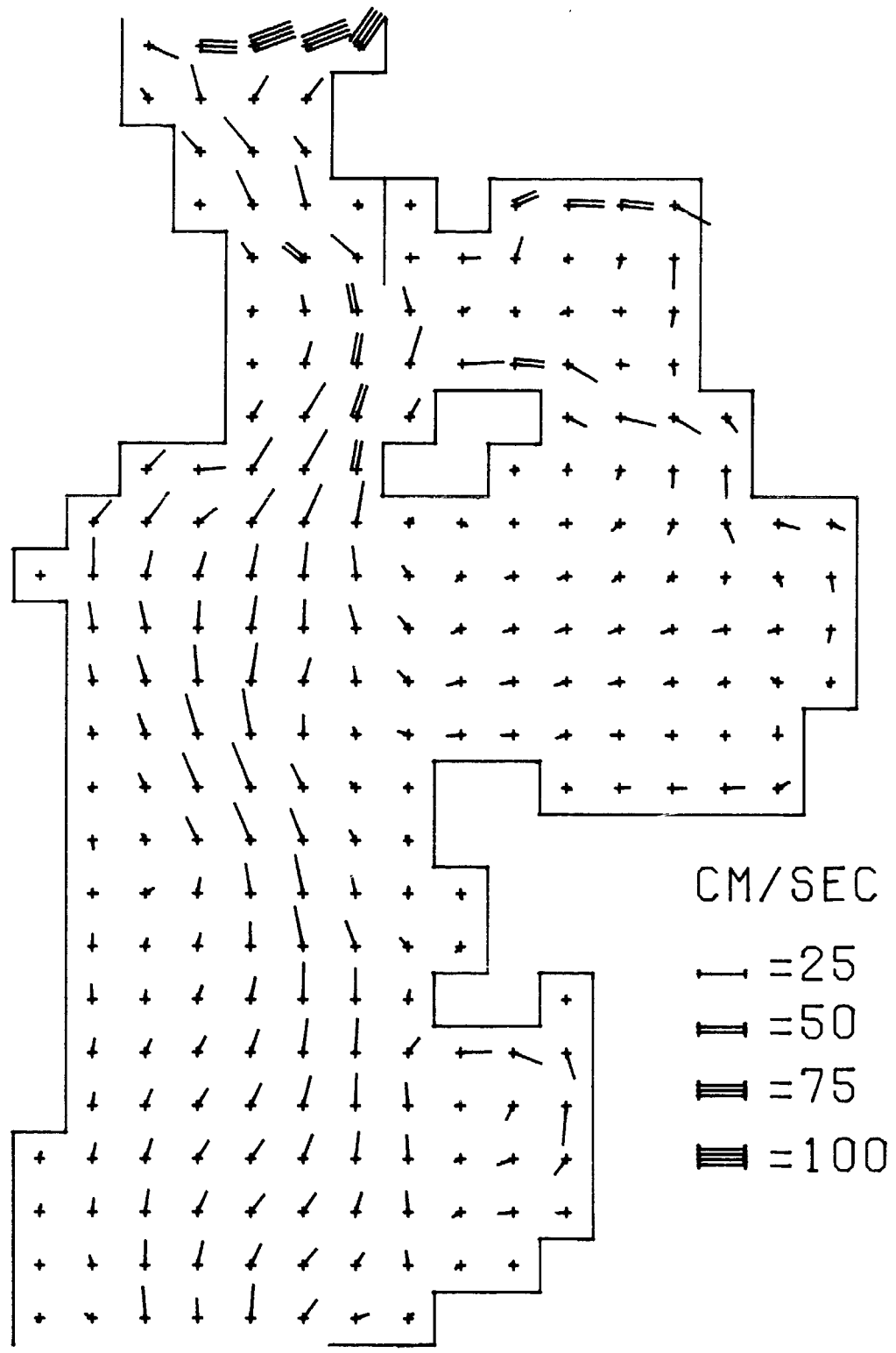

6 HRS 14TH

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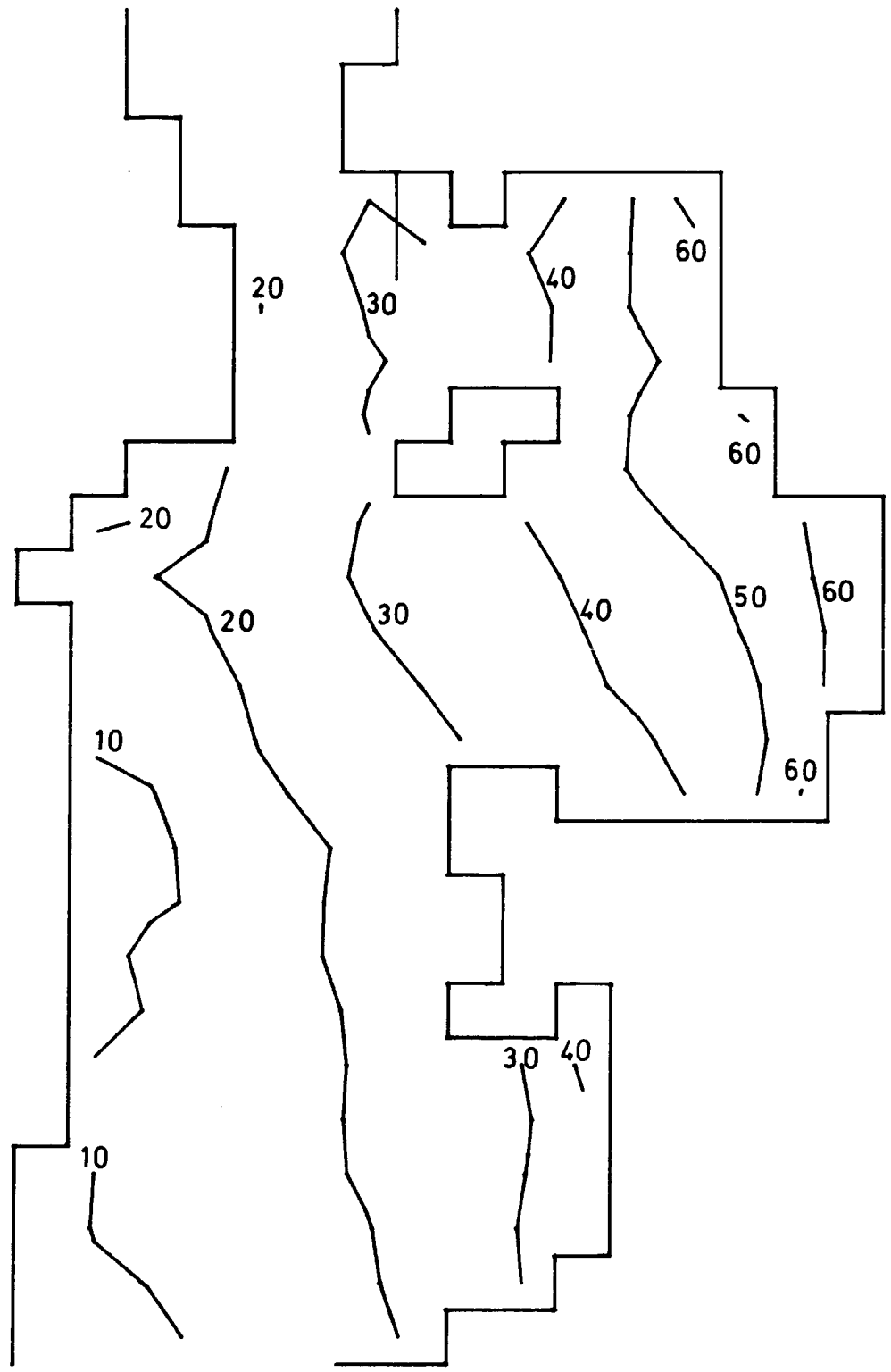

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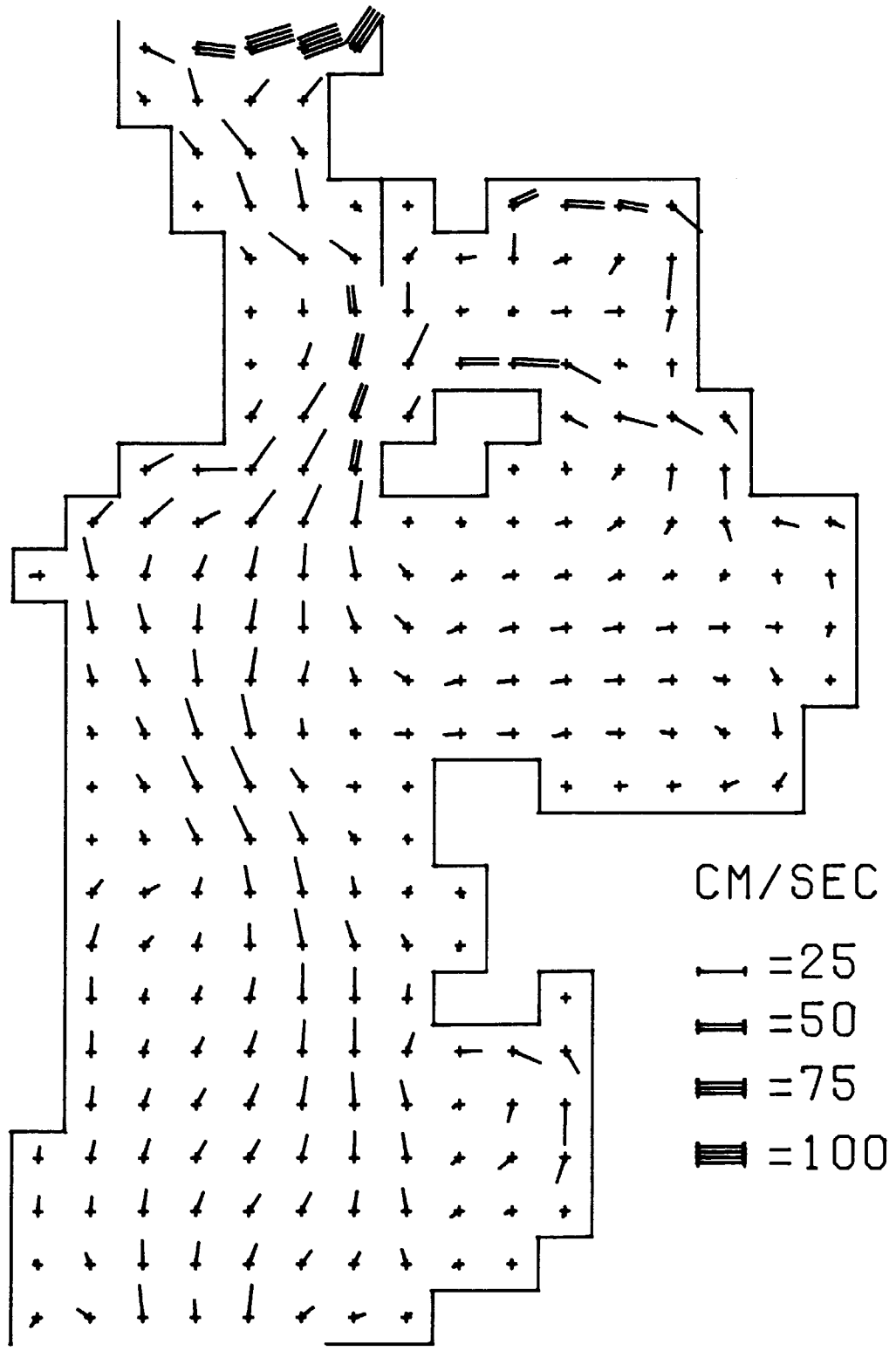

7 HRS 14TH

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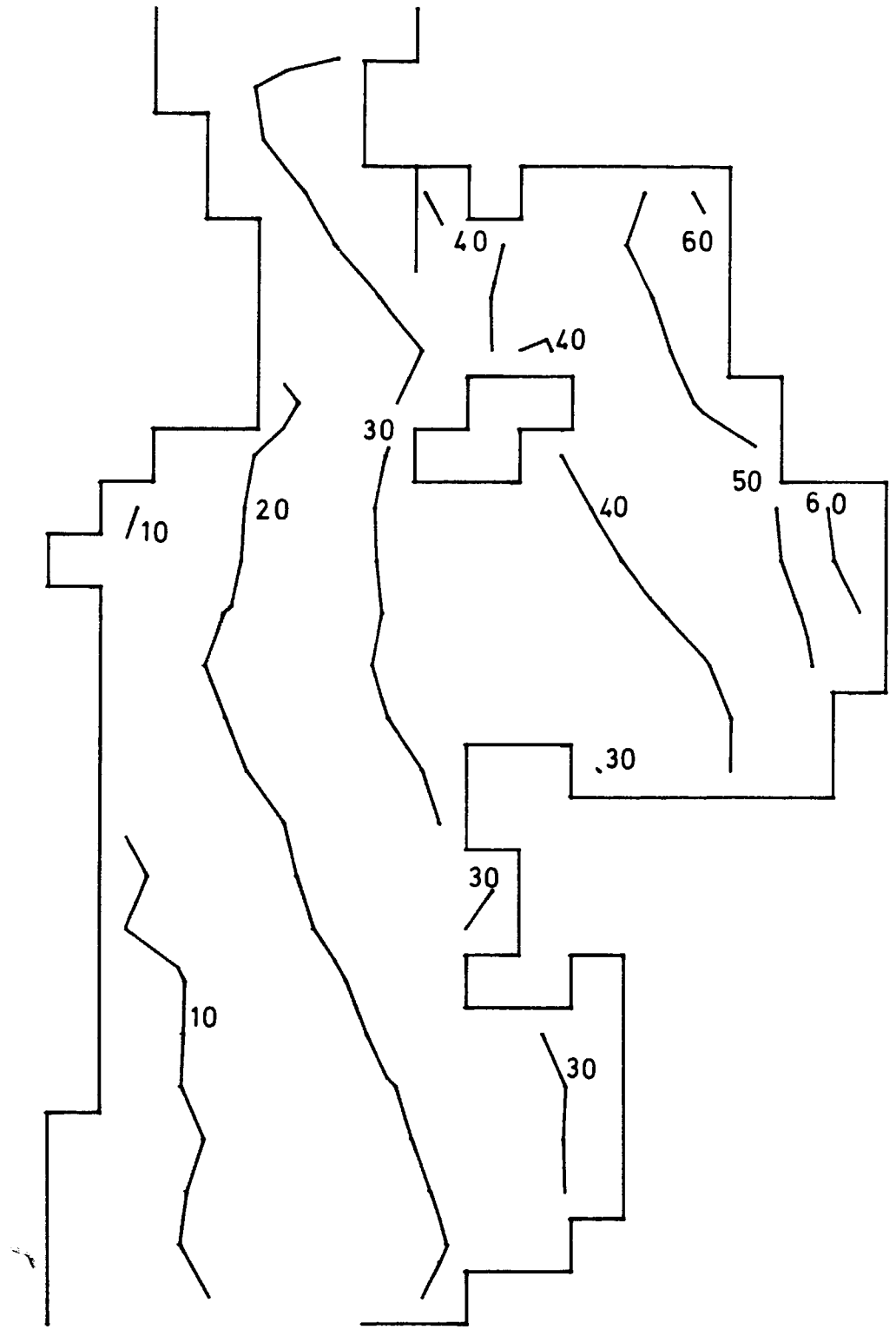

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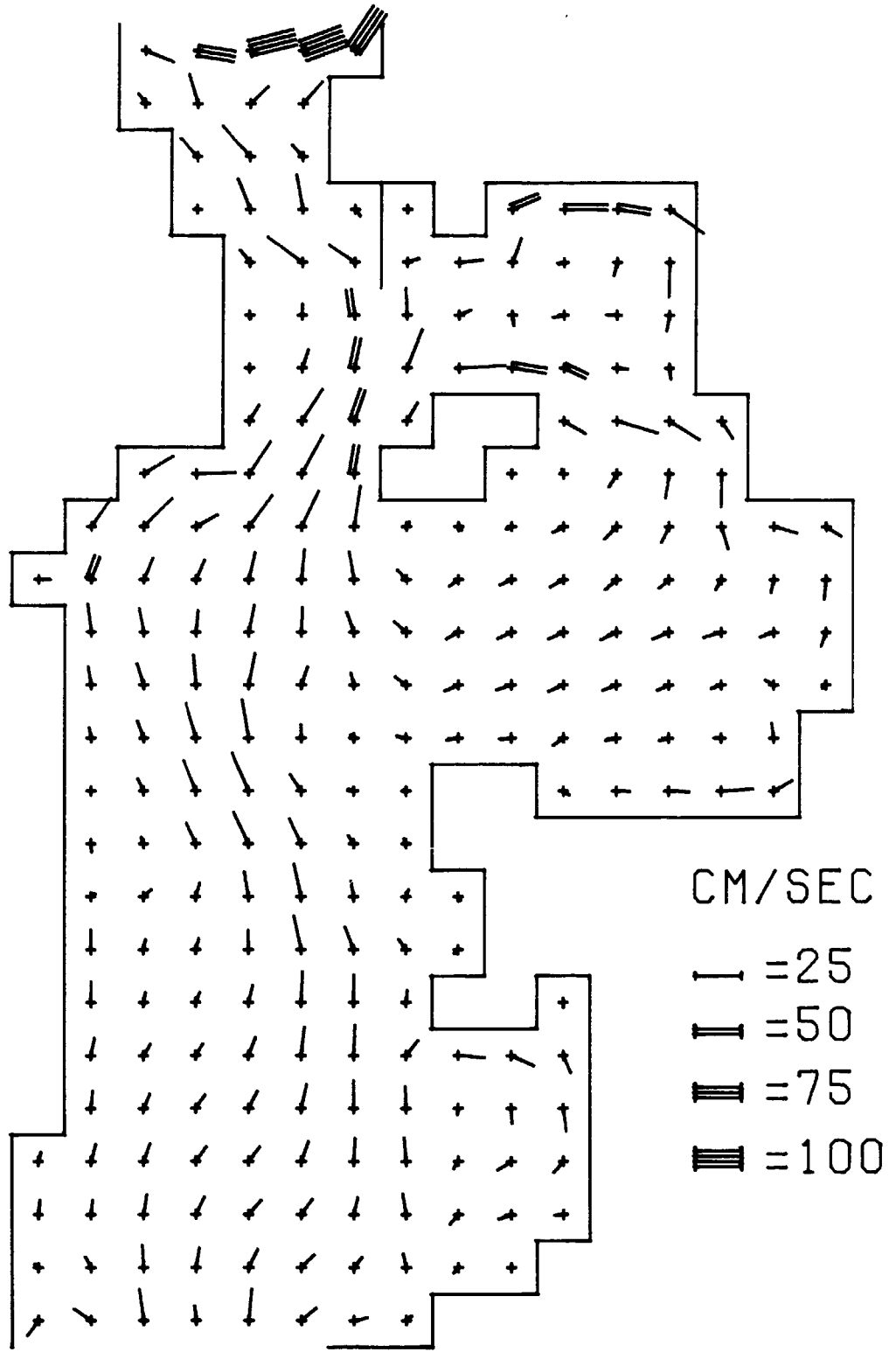

8 HRS 14TH

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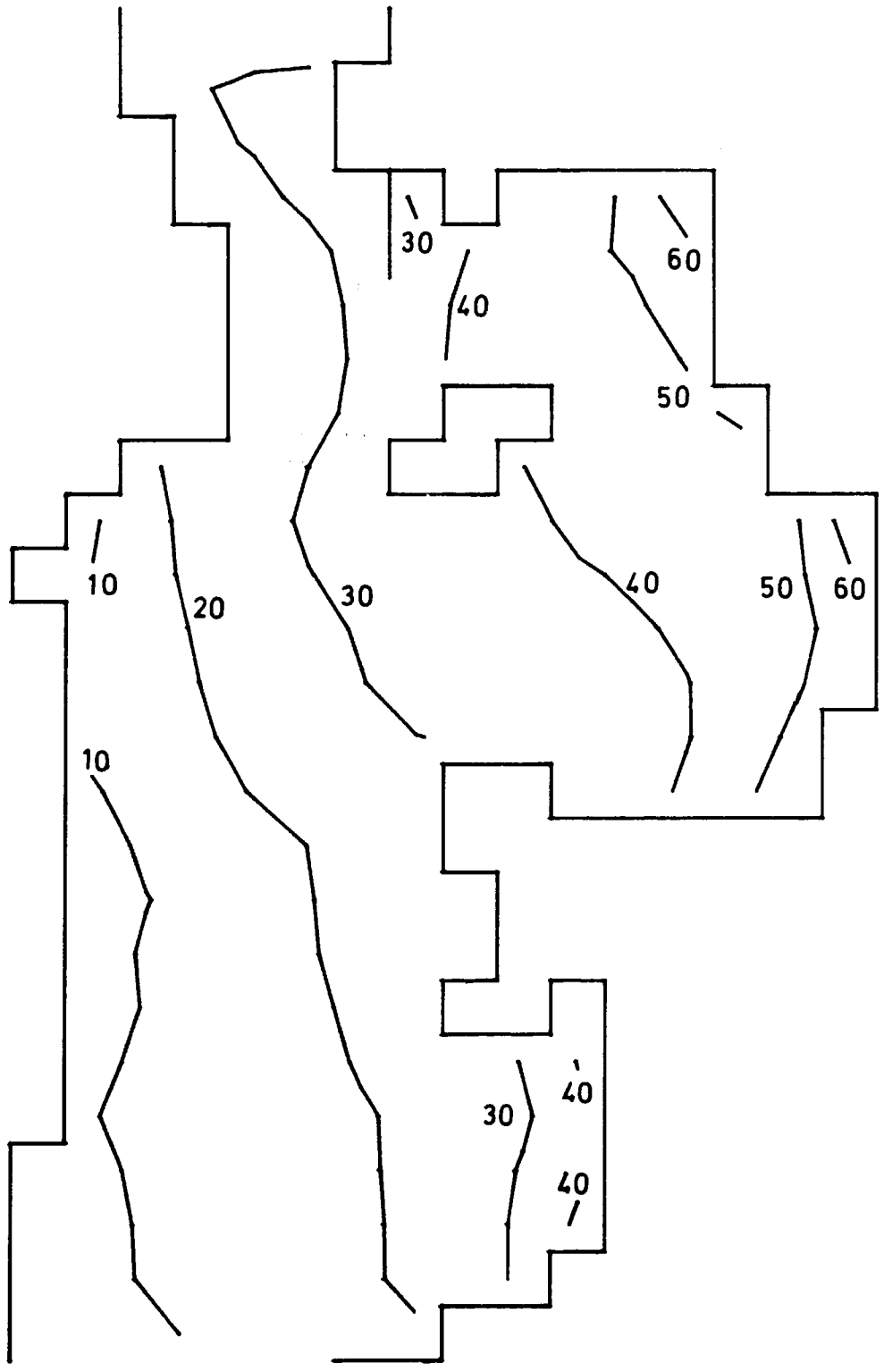

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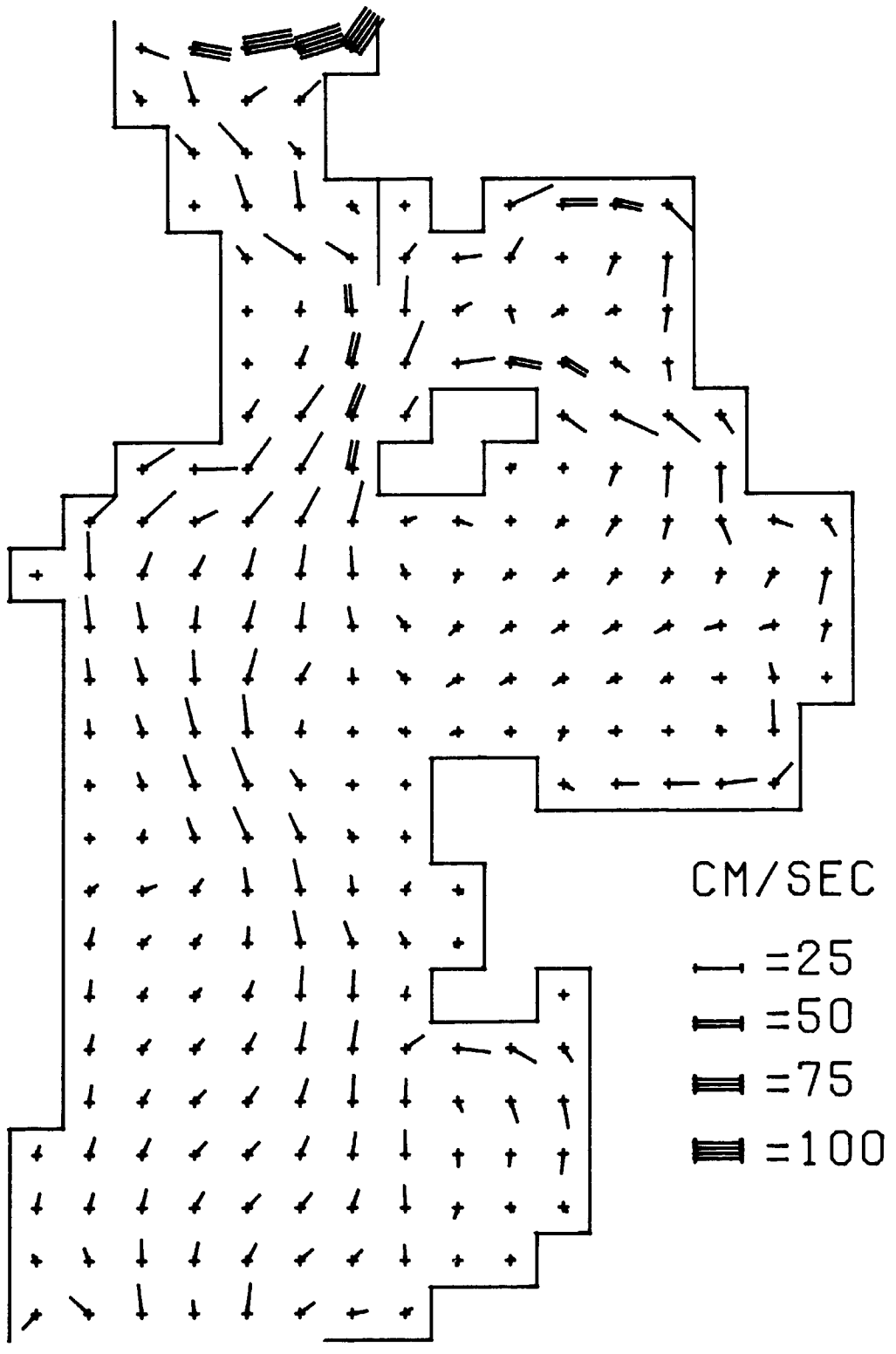

9 HRS 14TH

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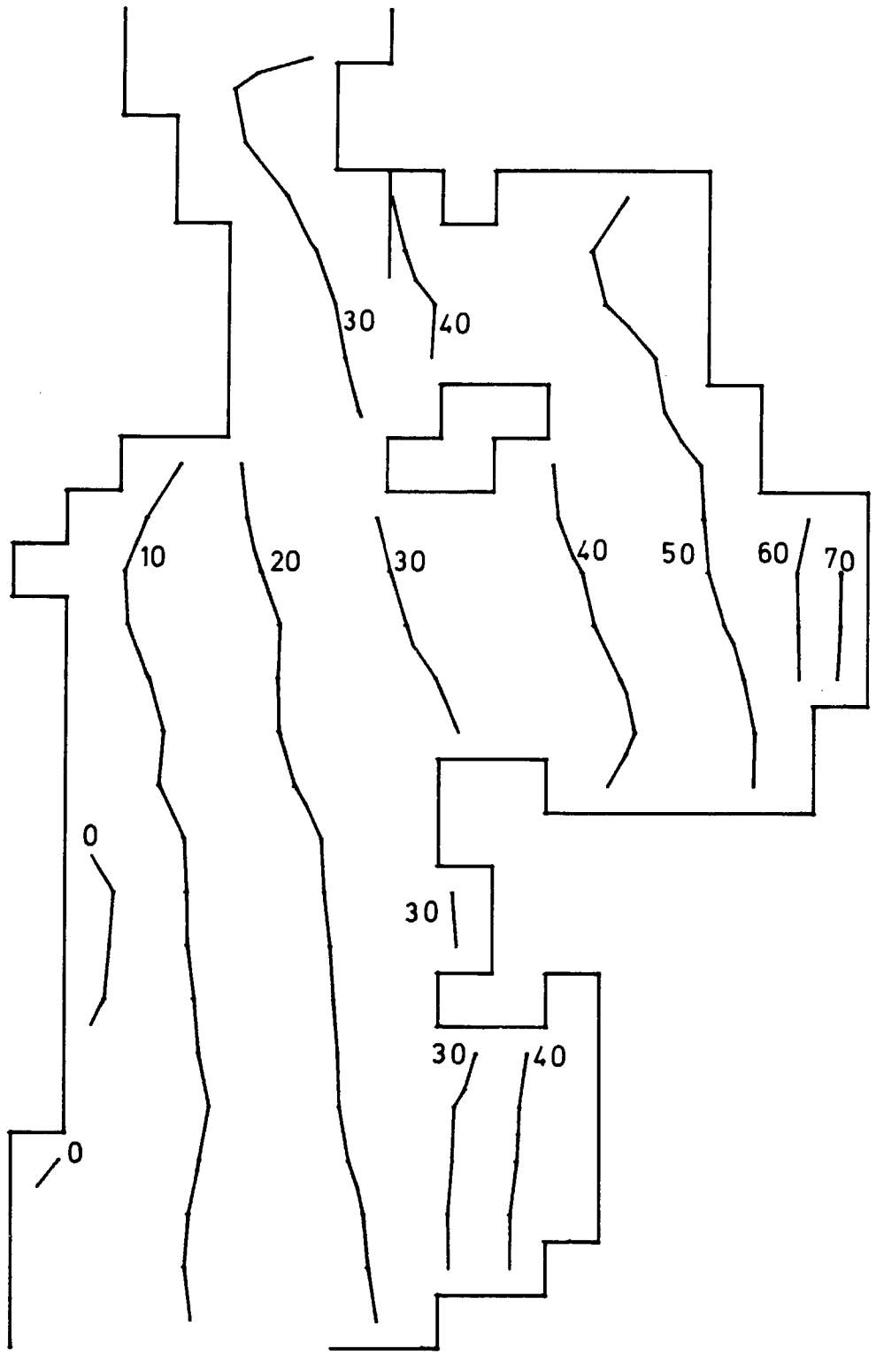

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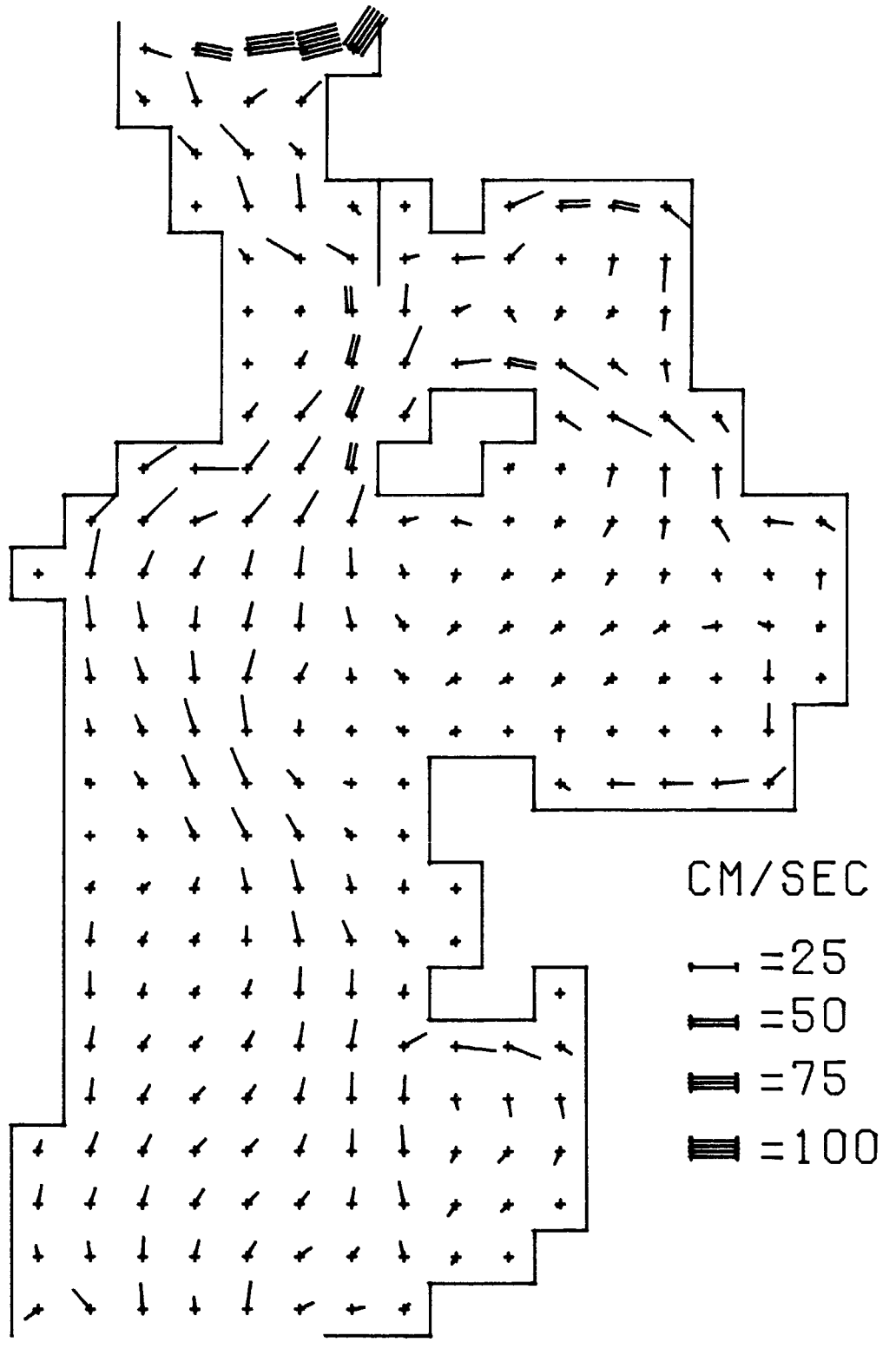

10 HRS 14TH

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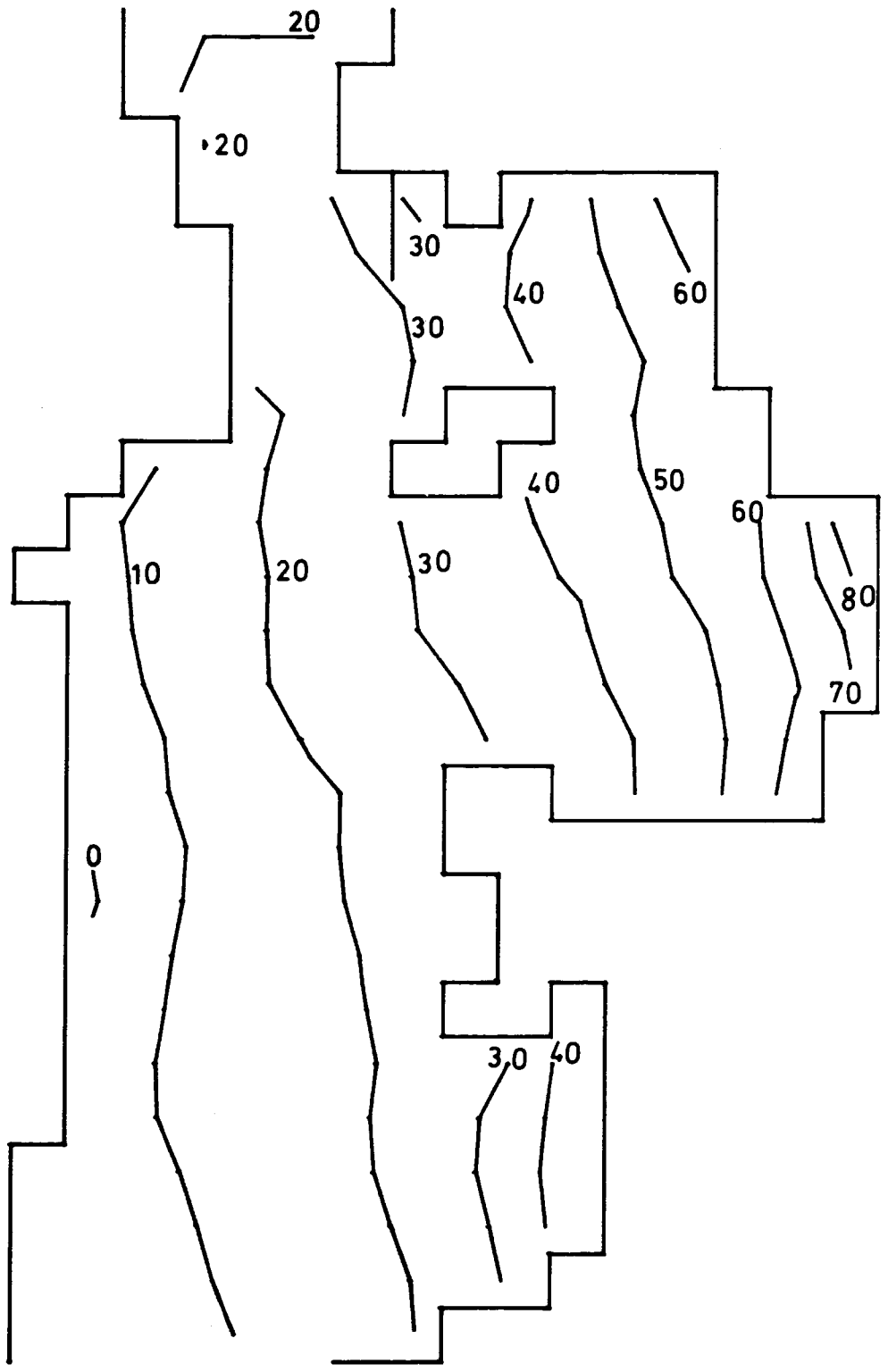

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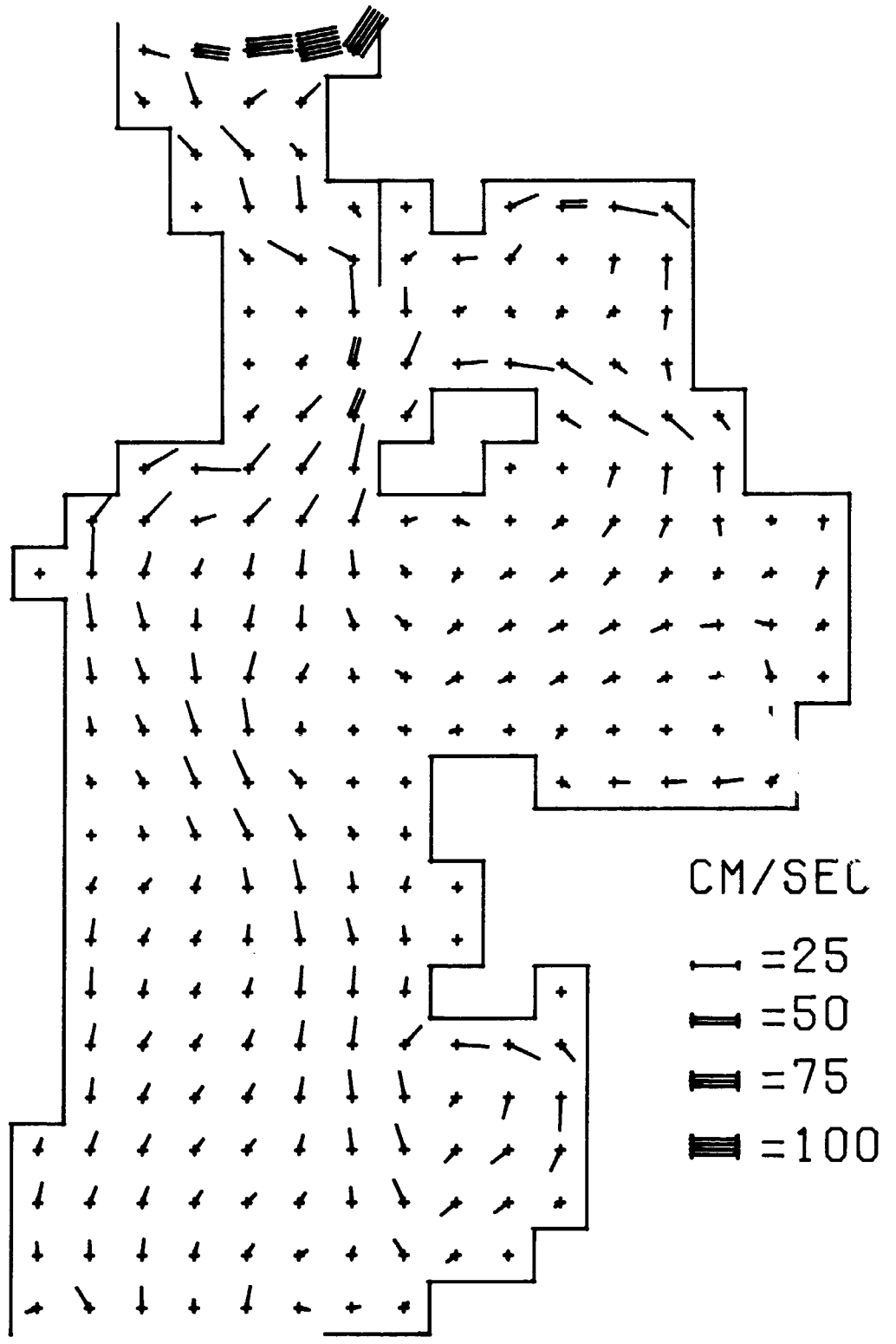

11 HRS 14TH

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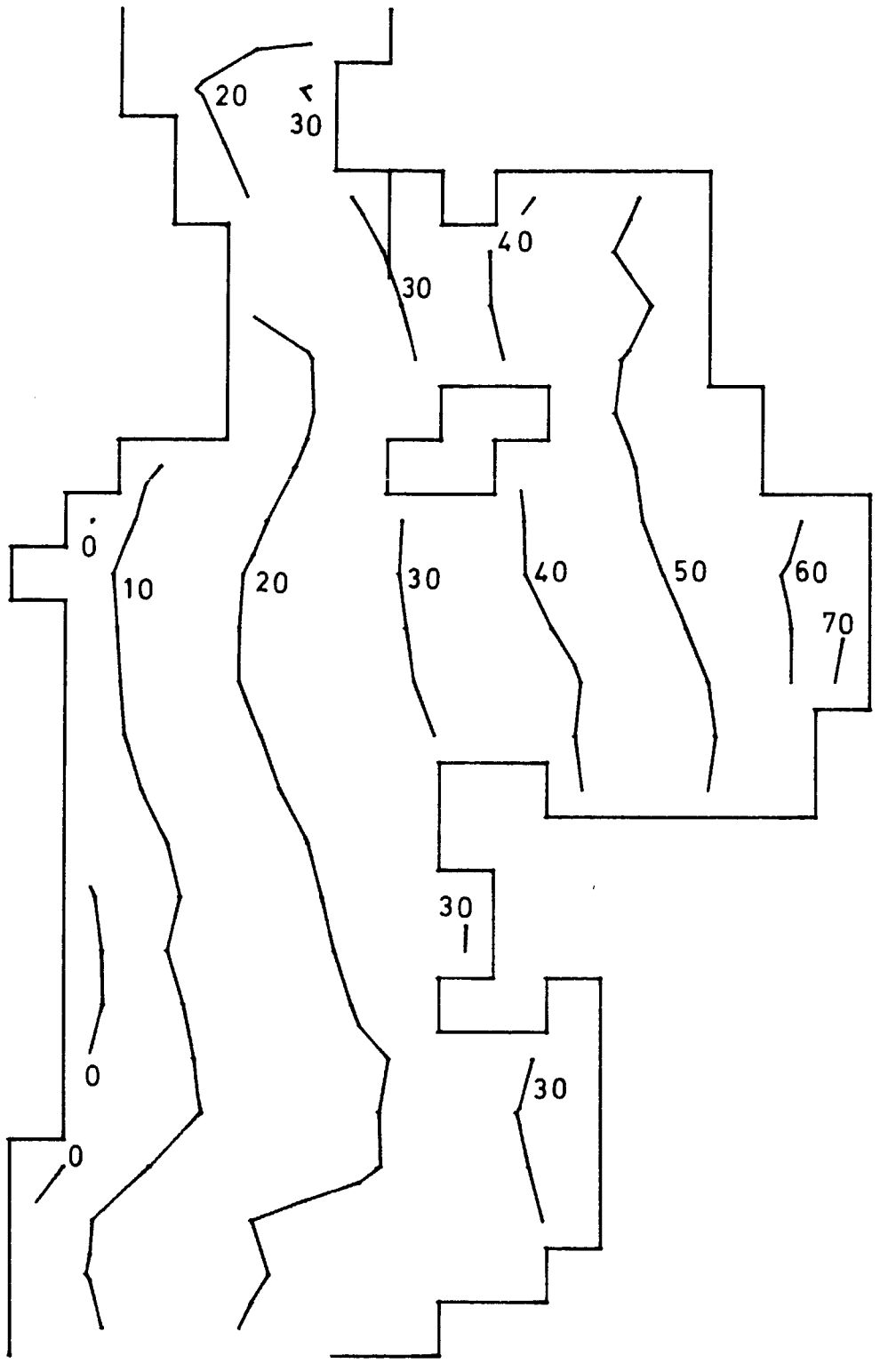

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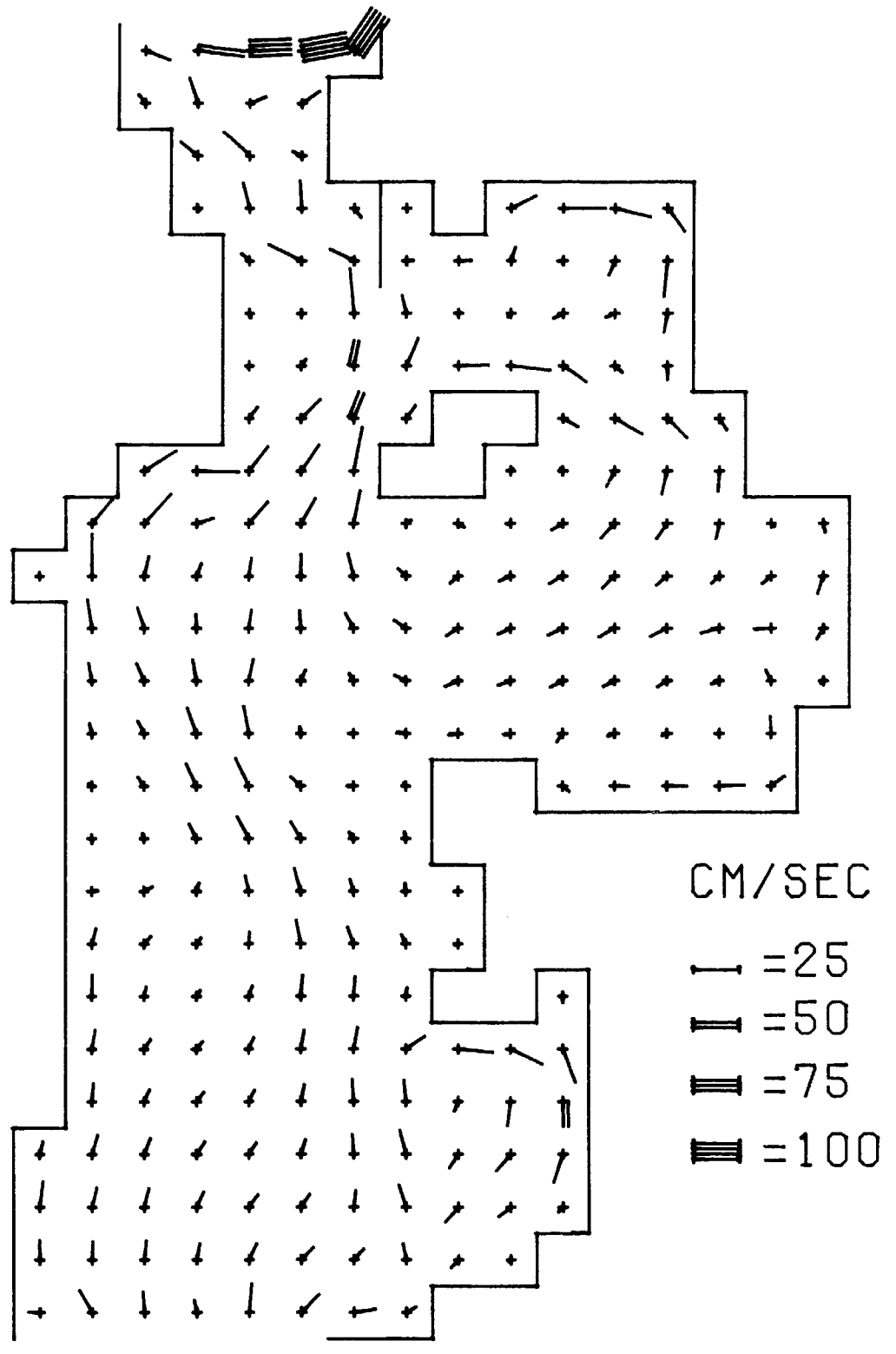

12 HRS 14TH

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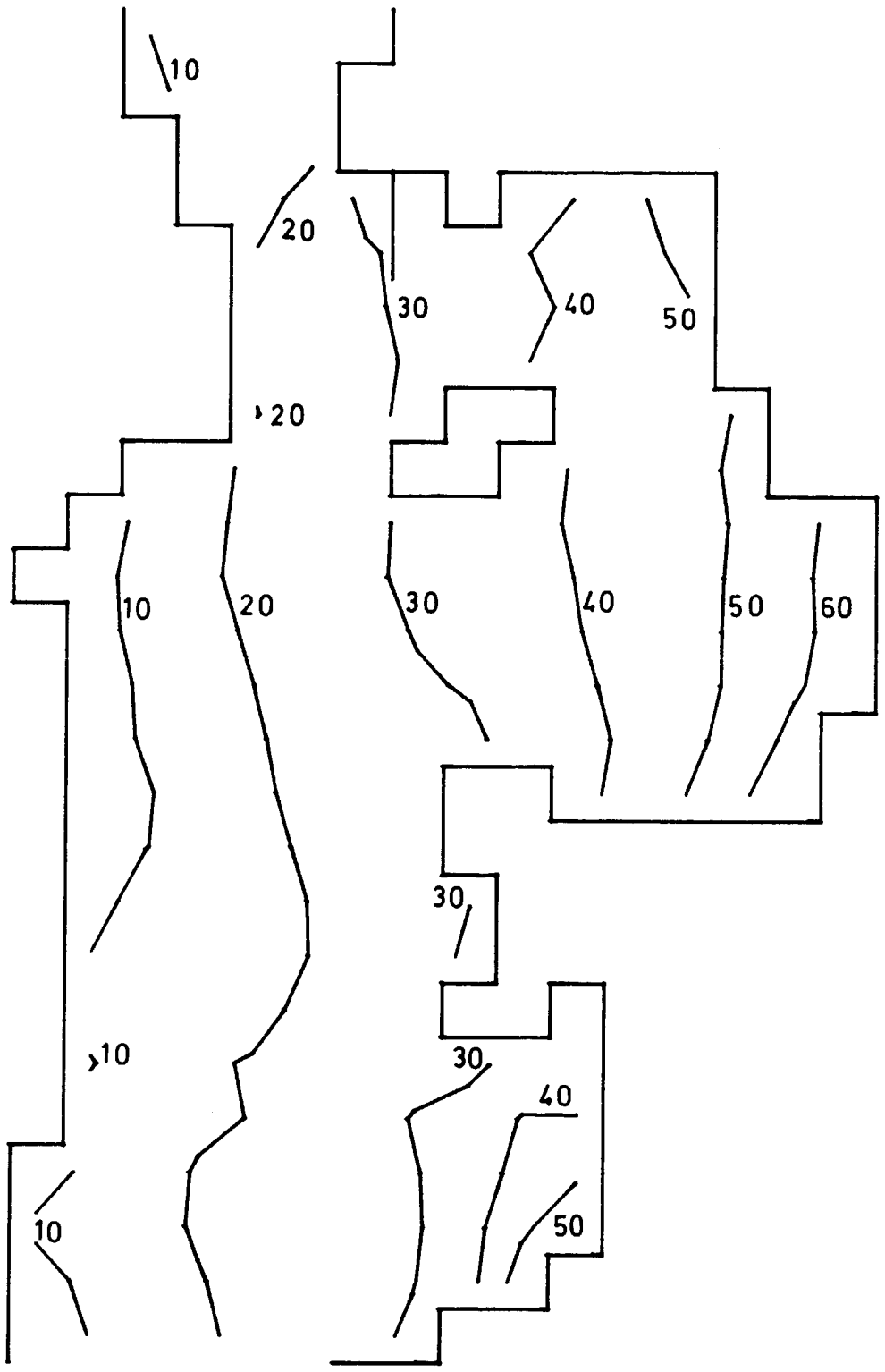

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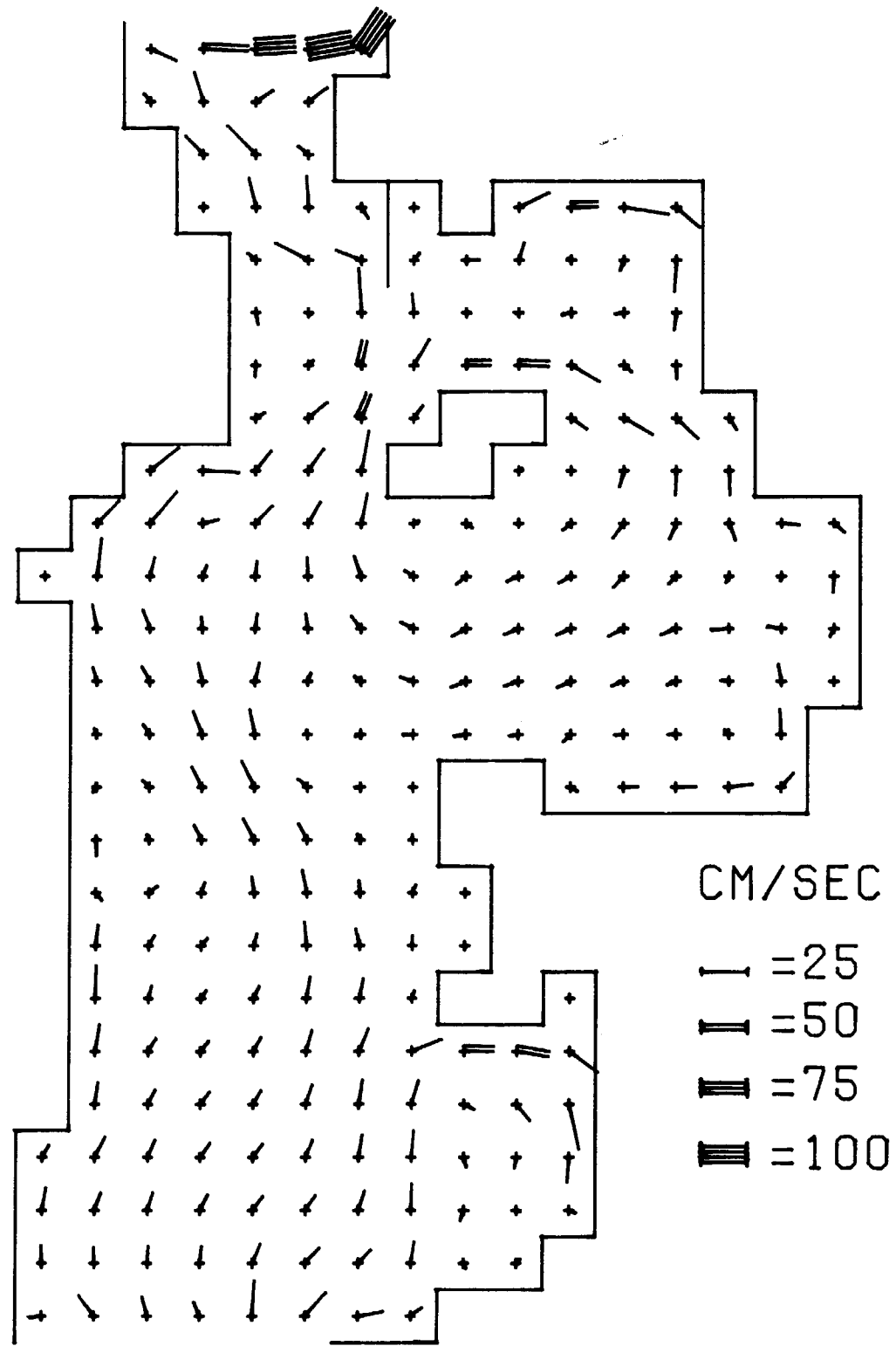

13 HRS 14TH

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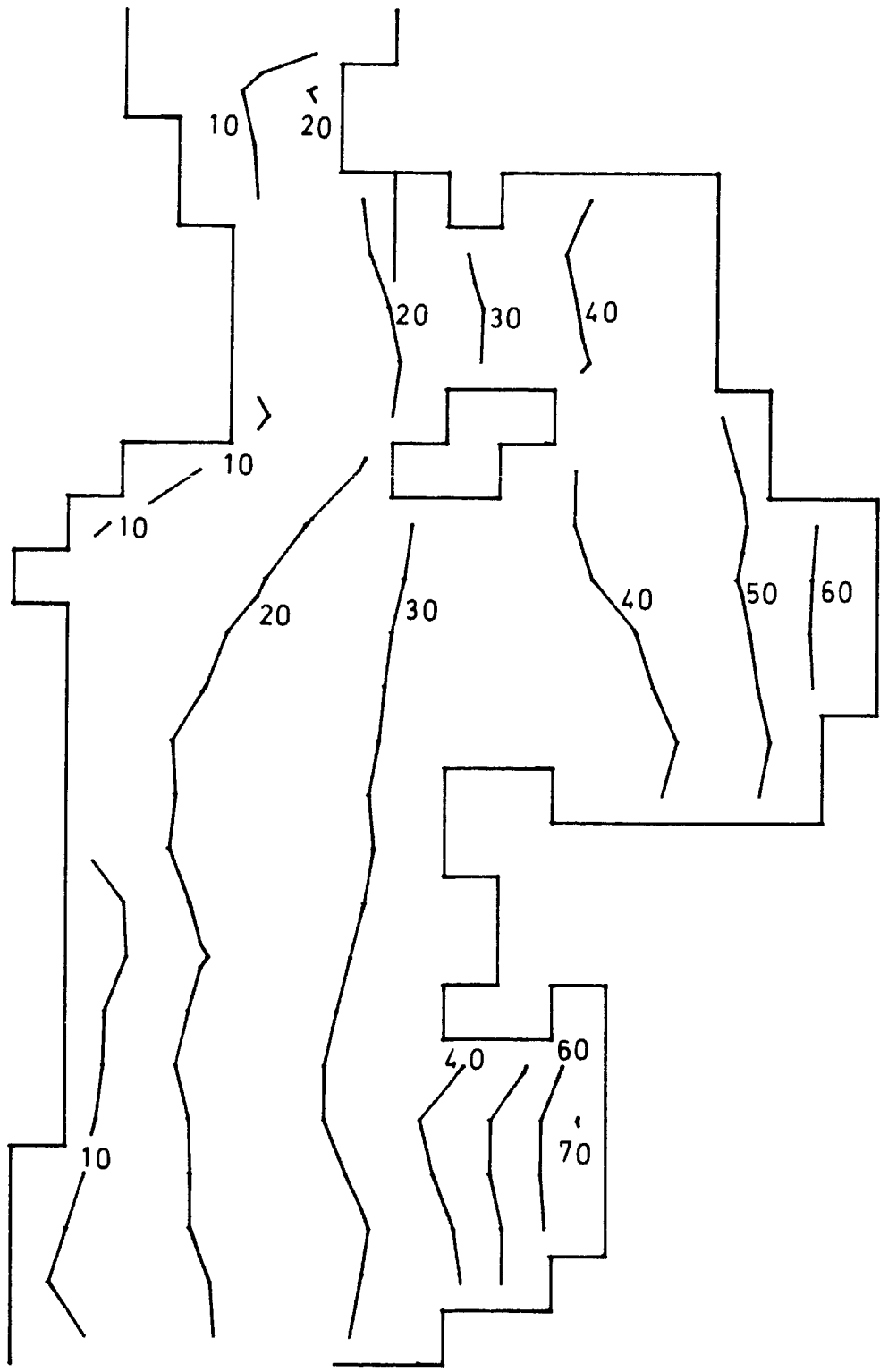

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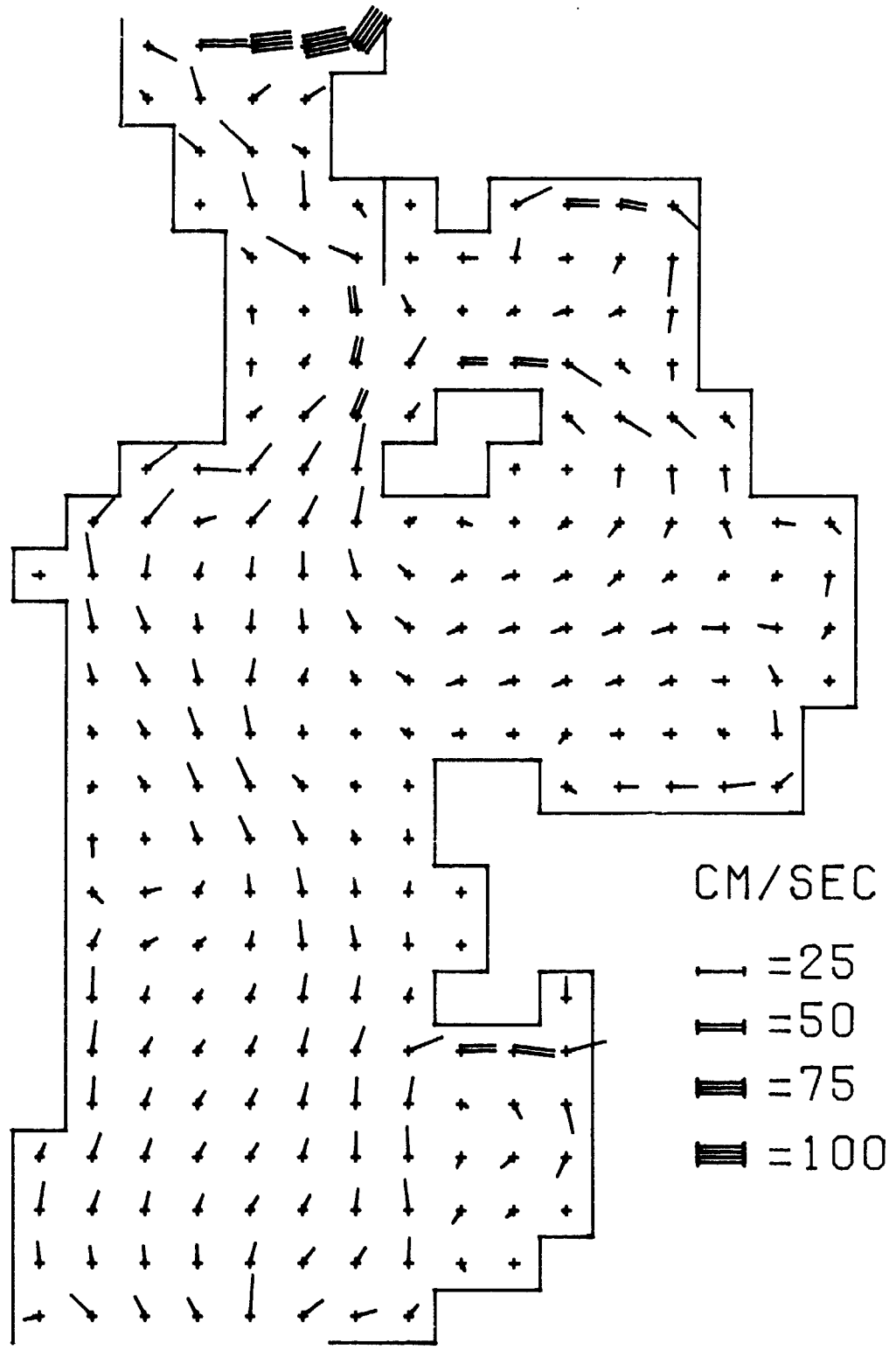

14 HRS 14TH

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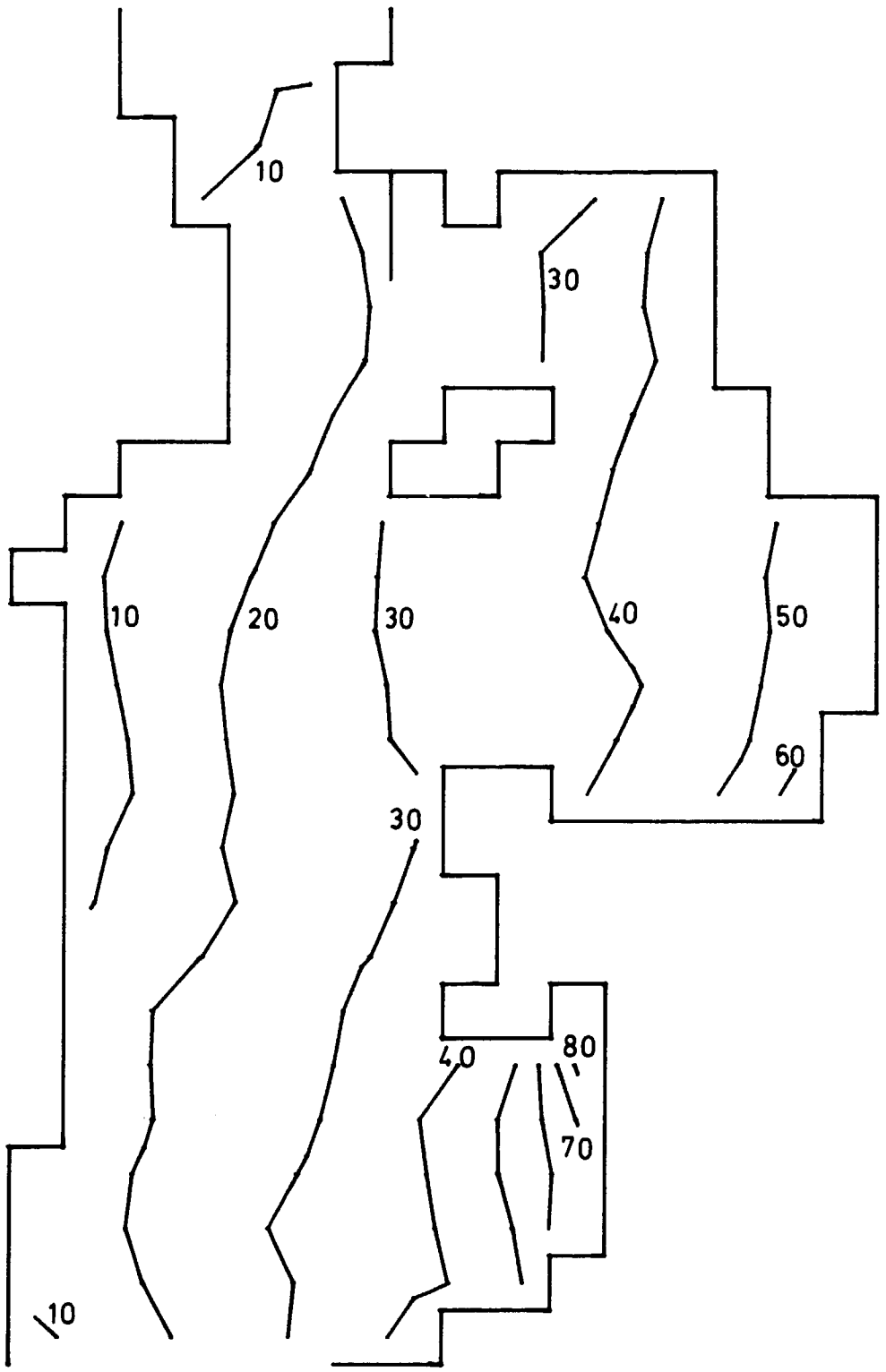

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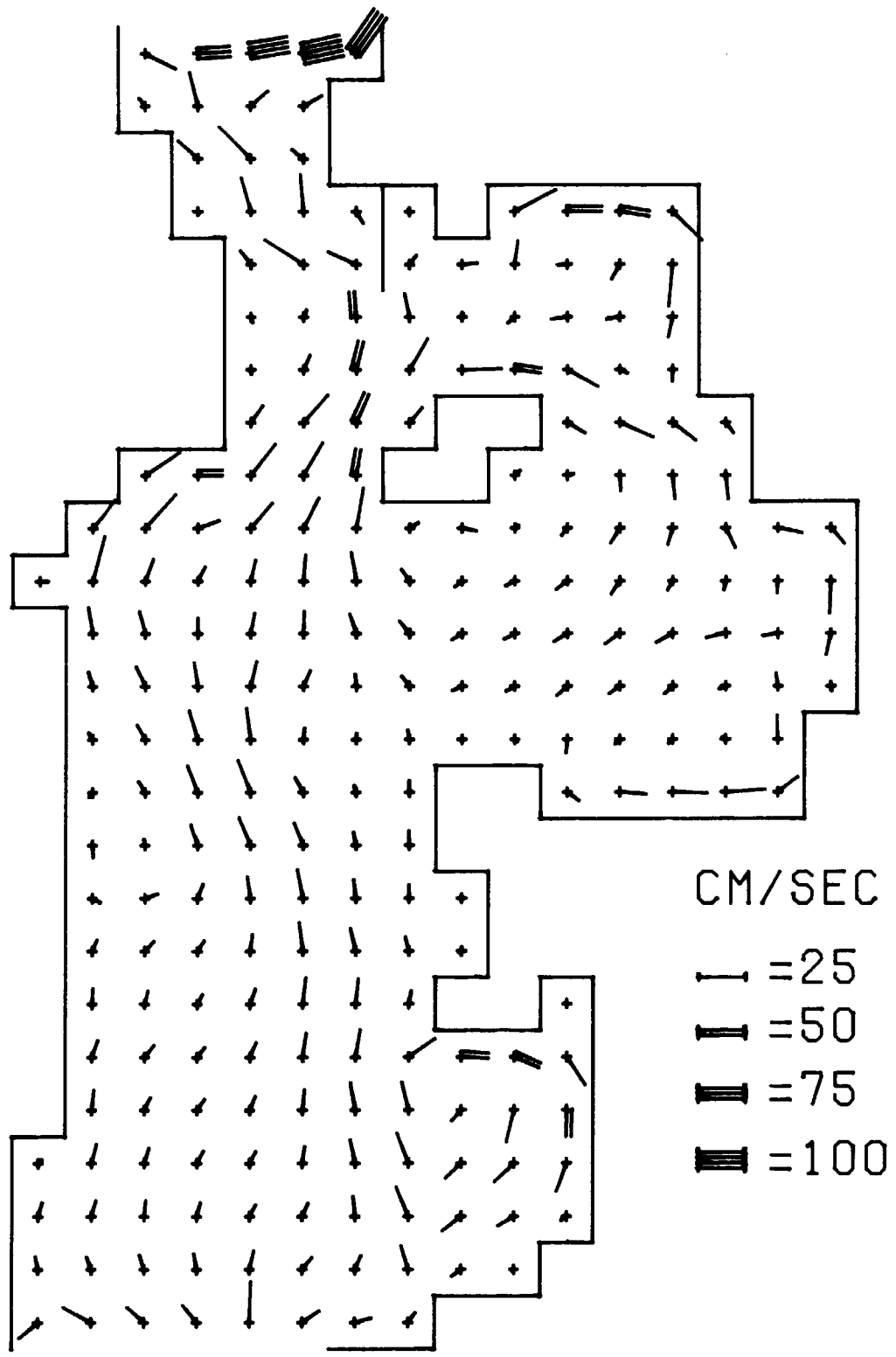

15 HRS 14TH

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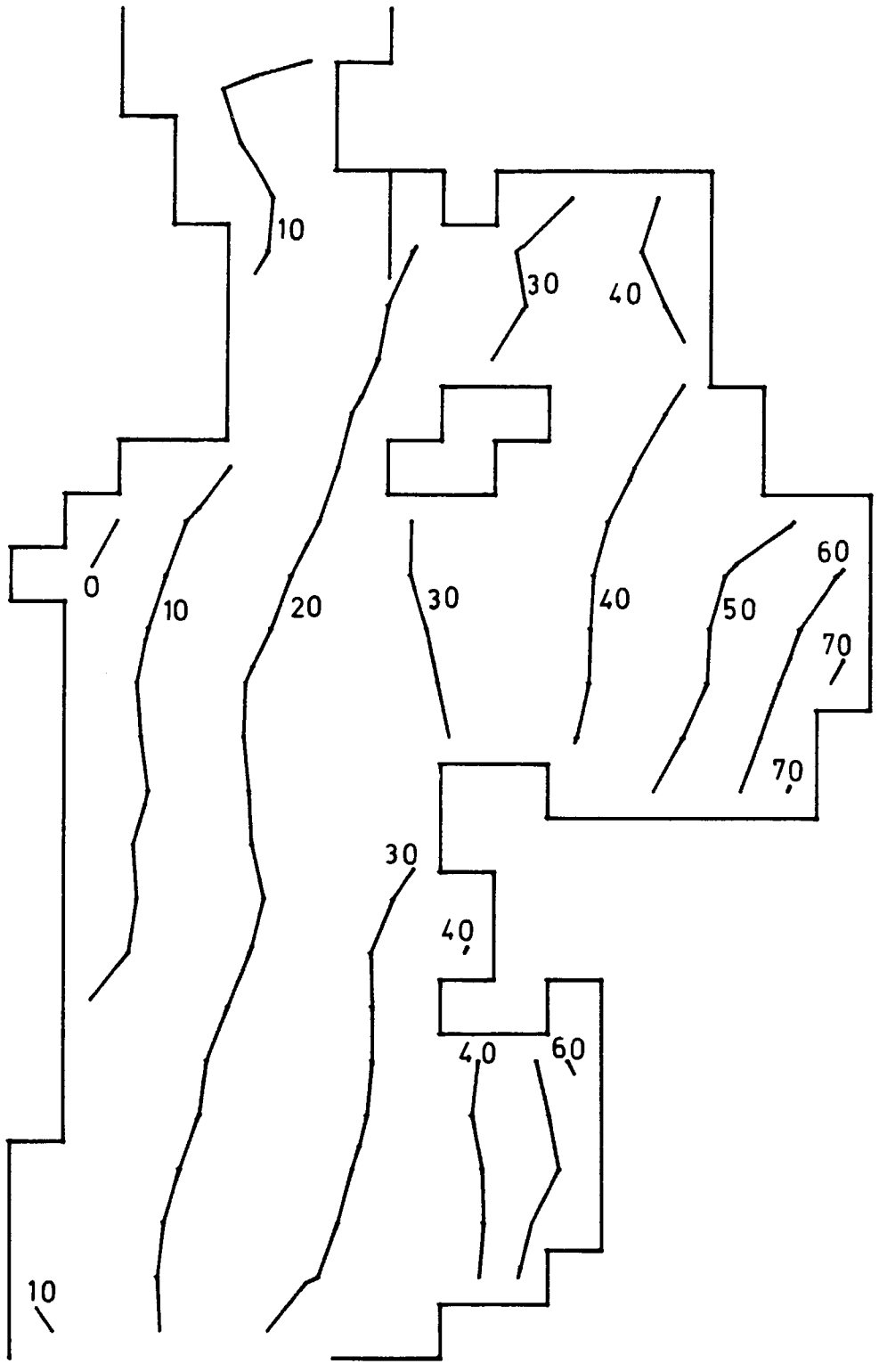

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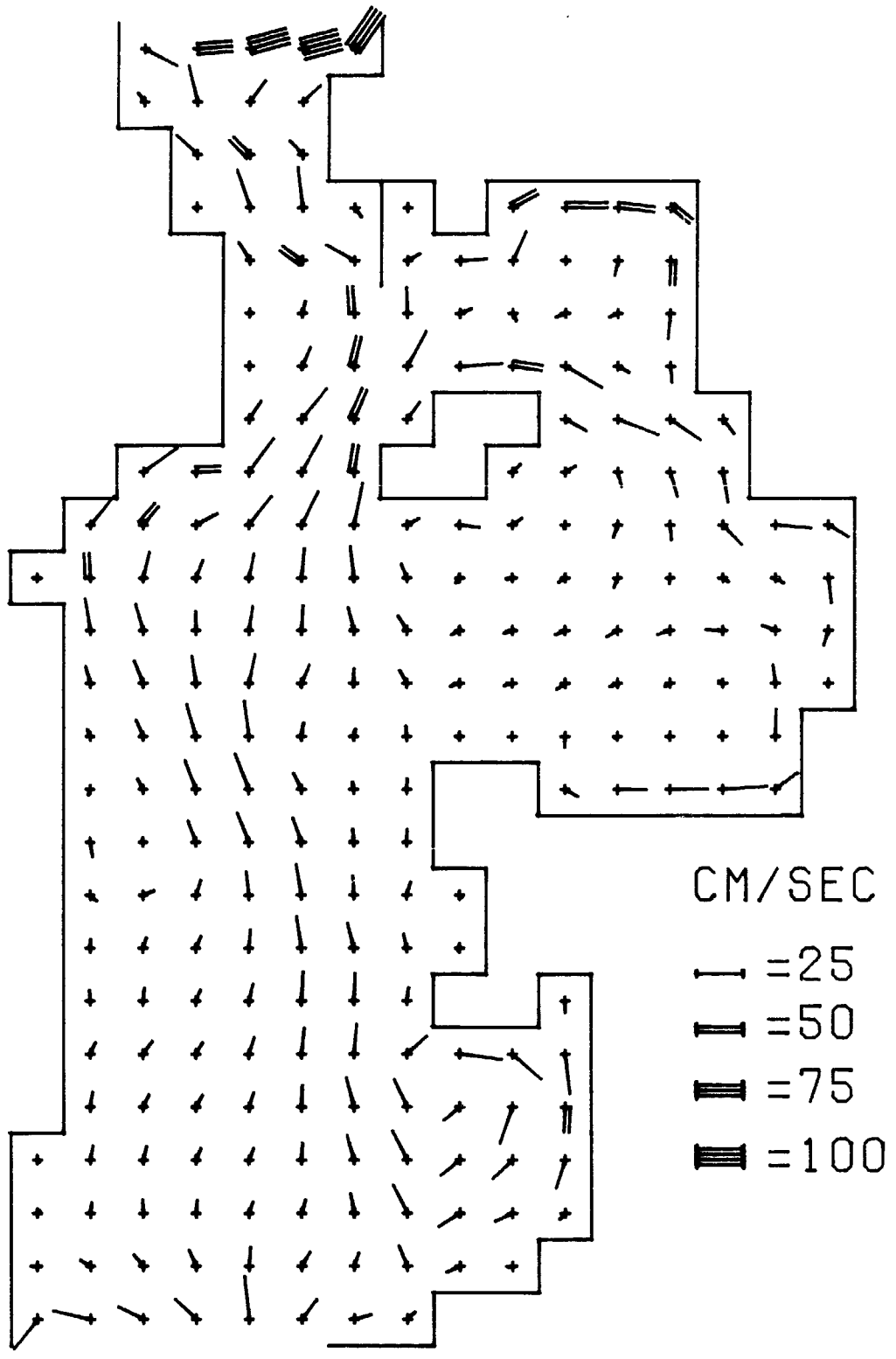

16 HRS 14TH

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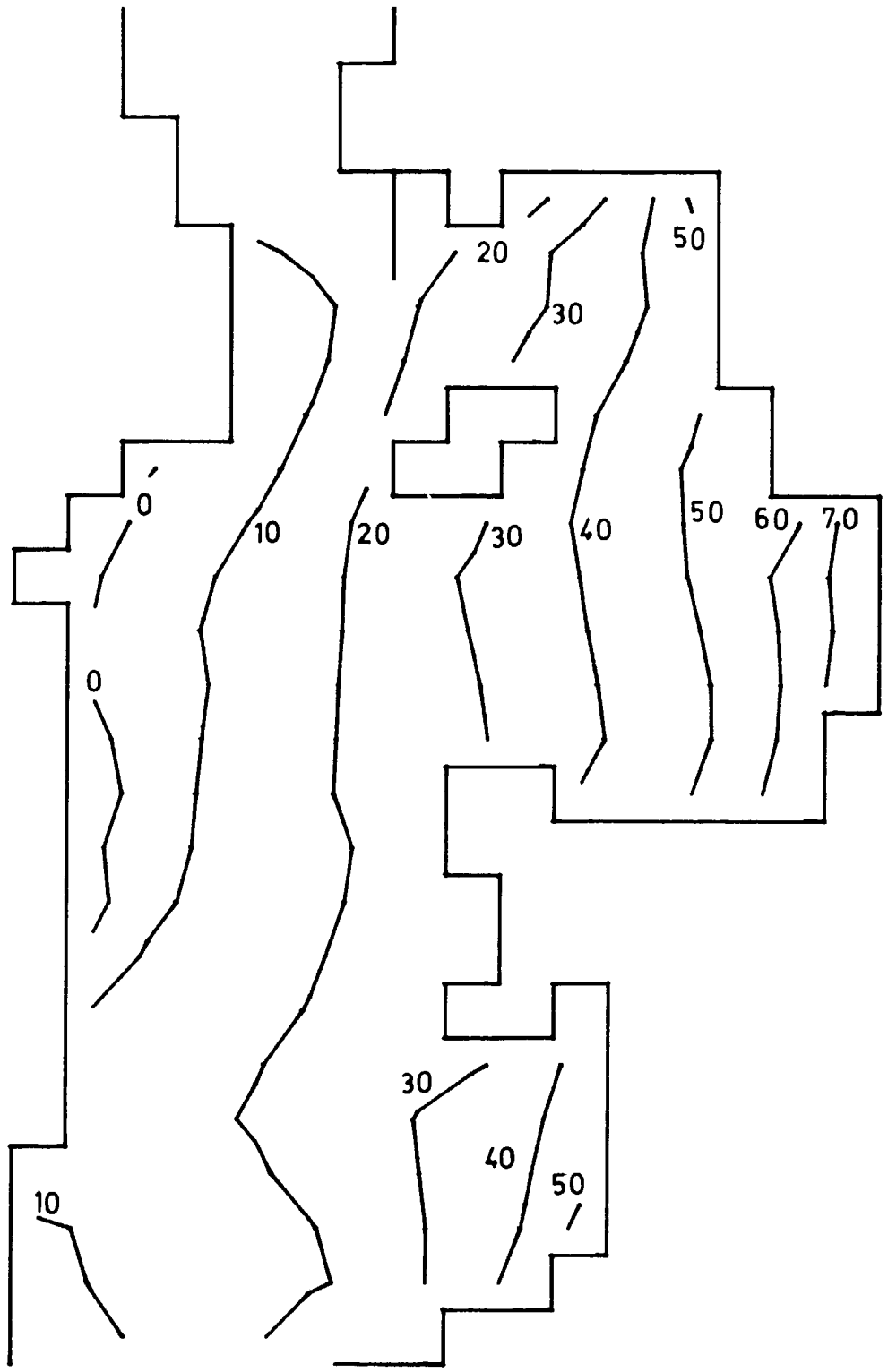

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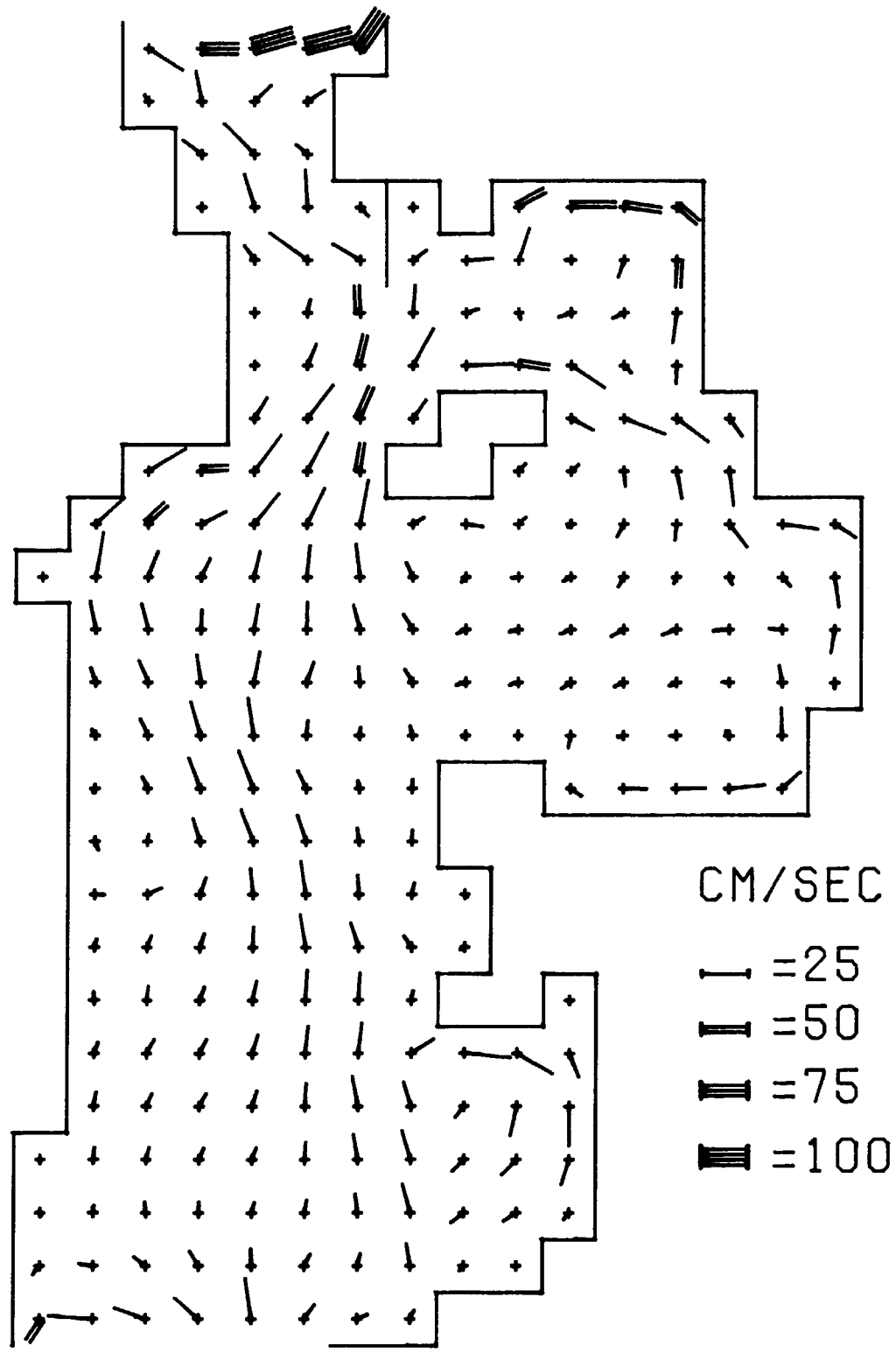

17 HRS 14TH

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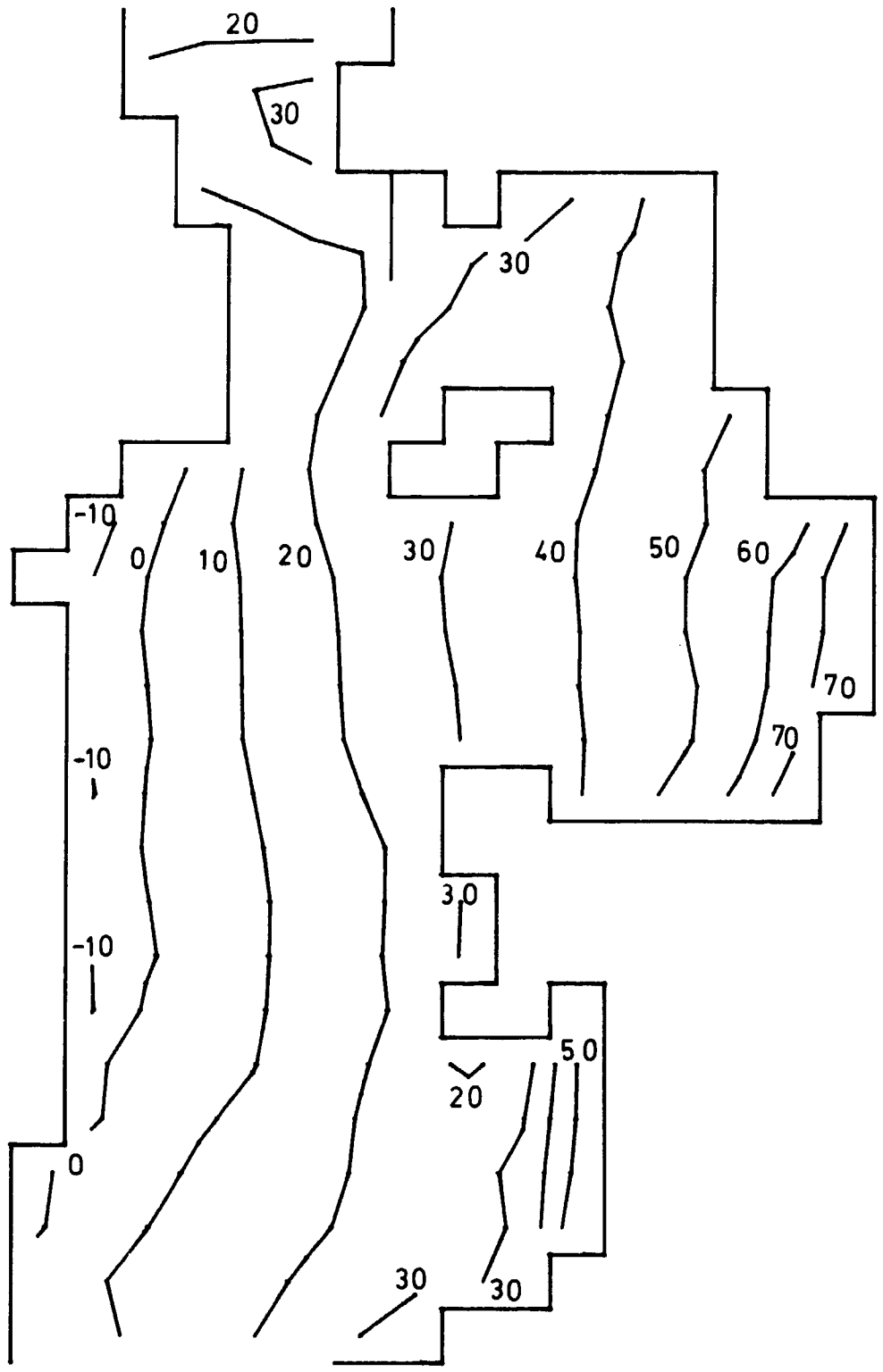

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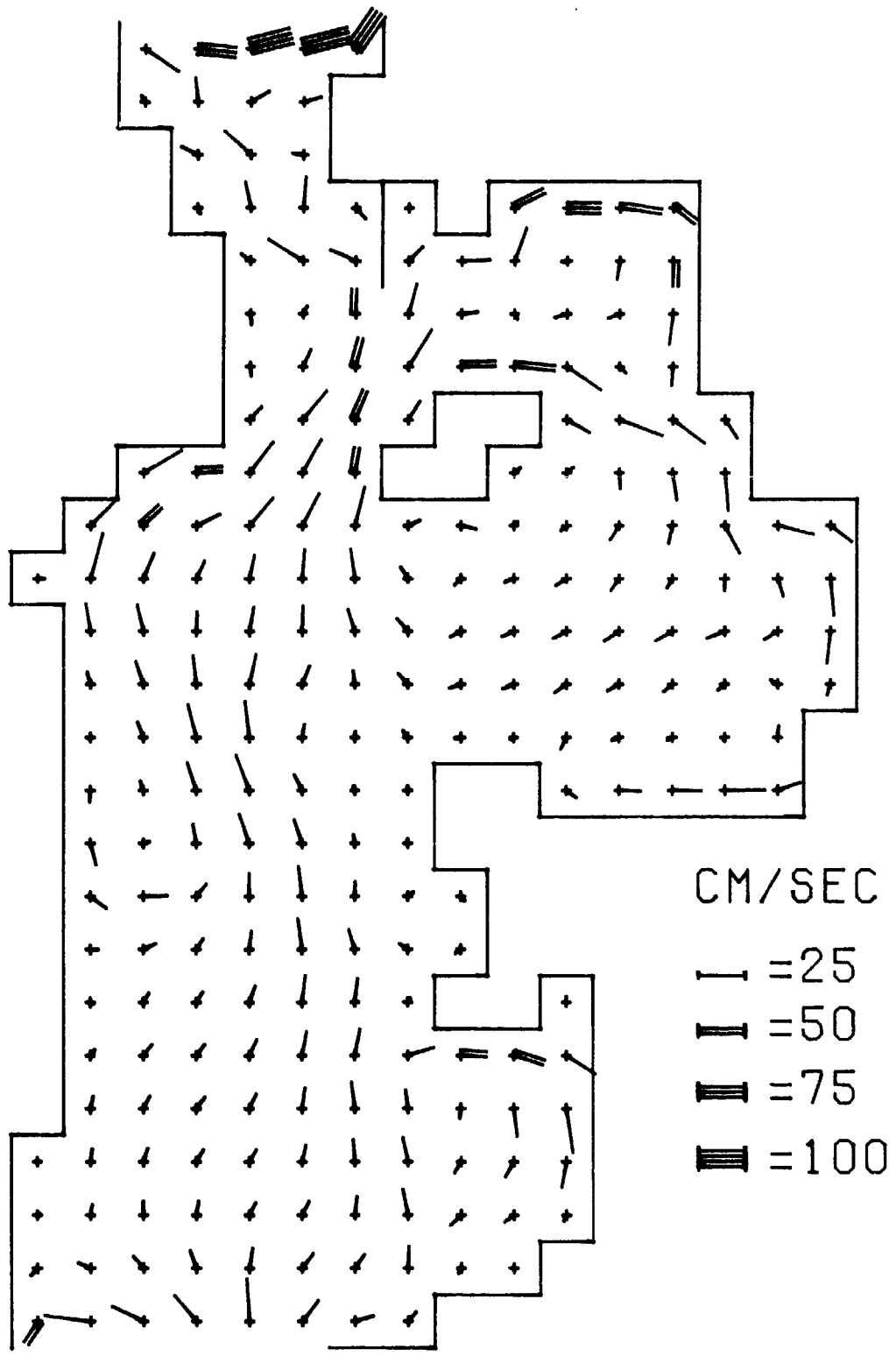

18 HRS 14TH

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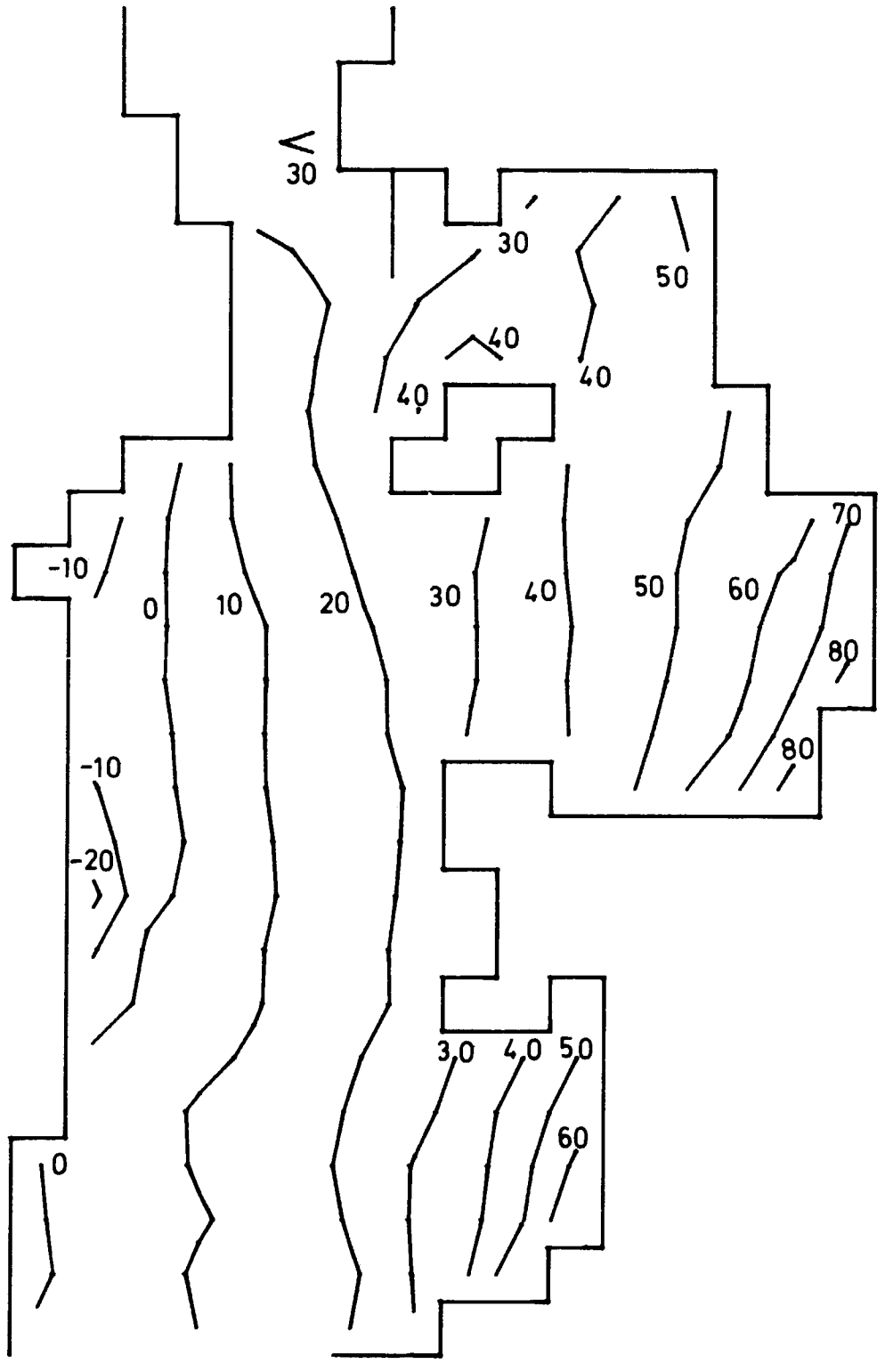

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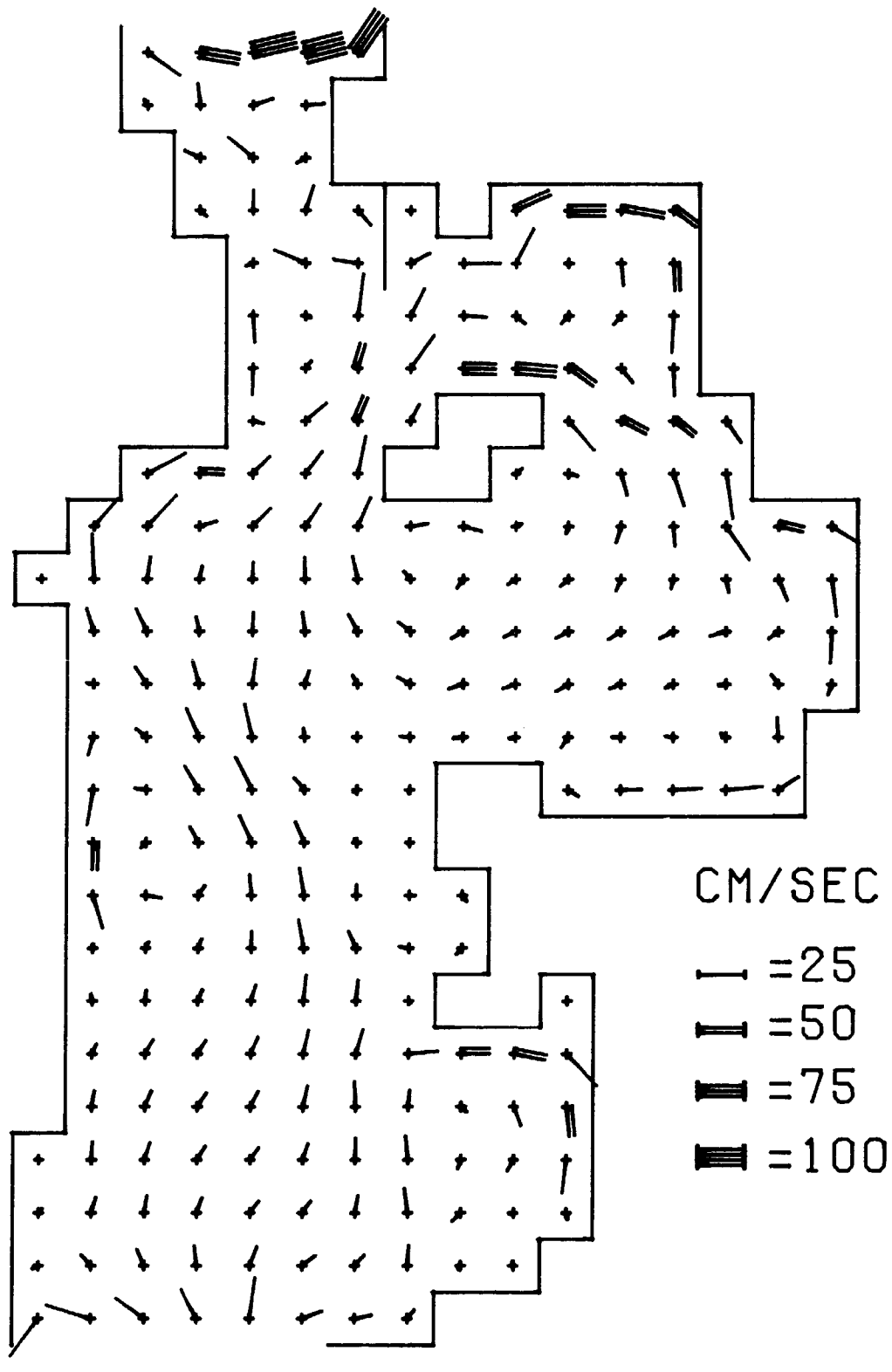

19 HRS 14TH

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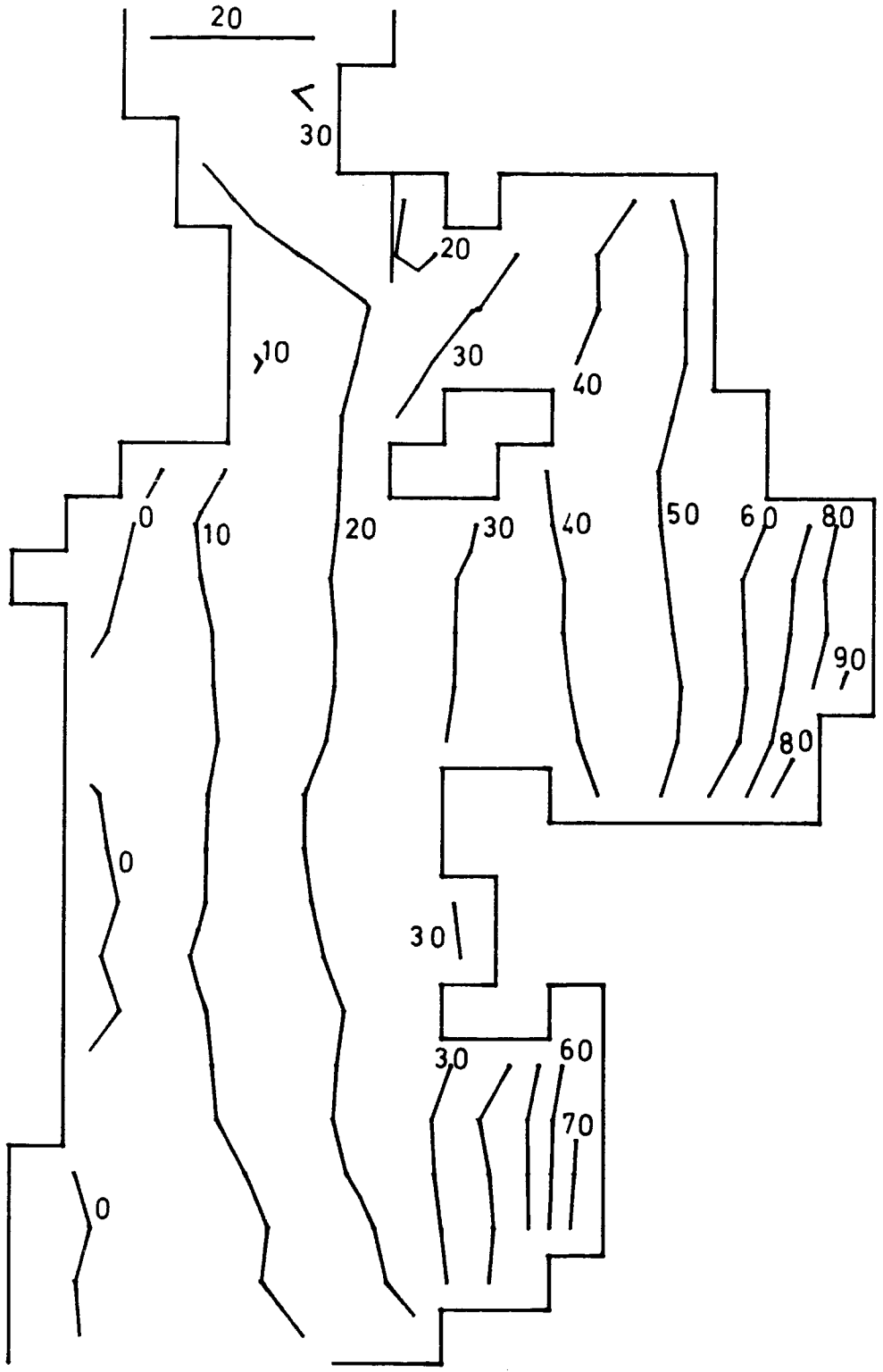

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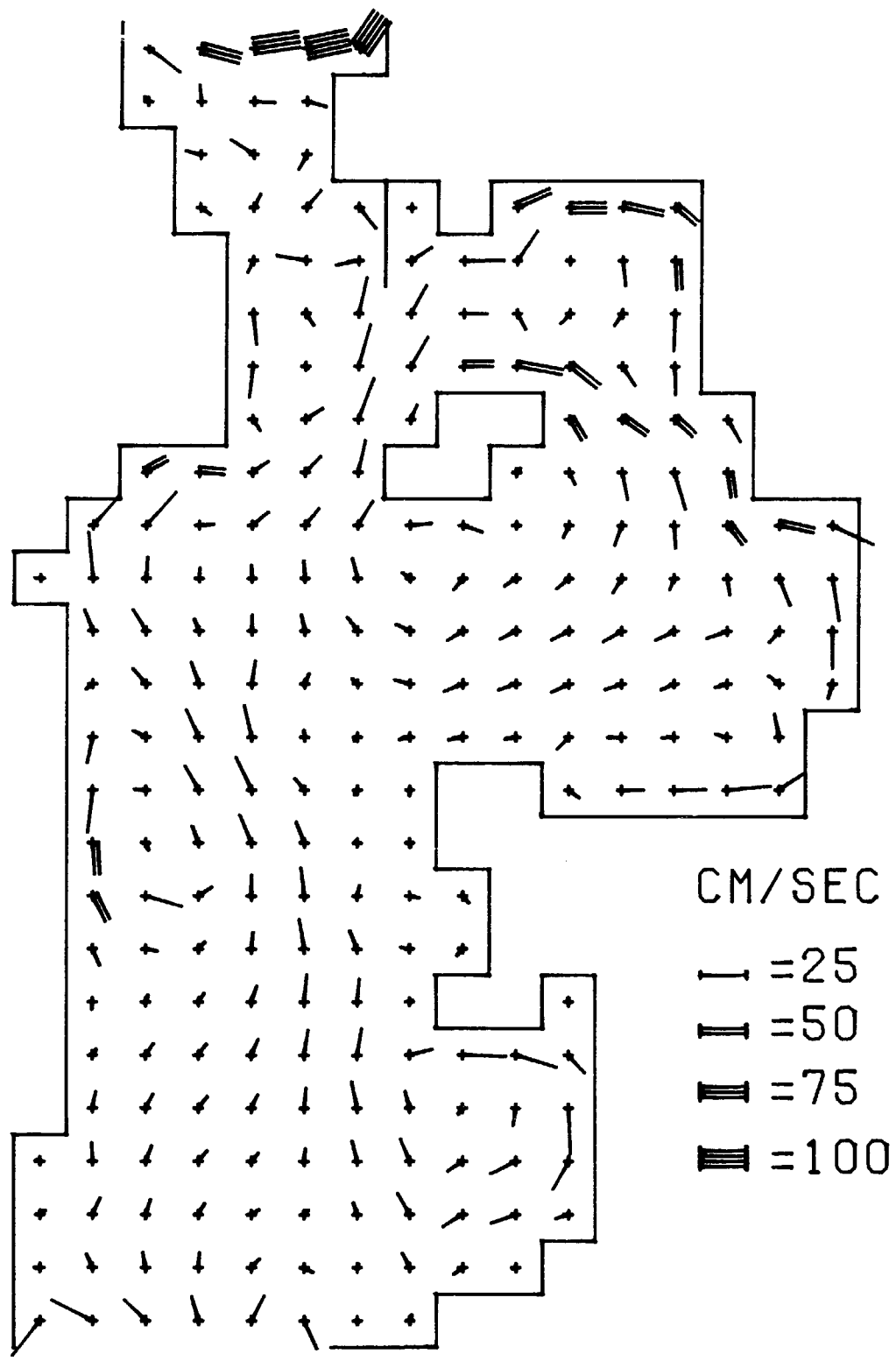

20 HRS 14TH

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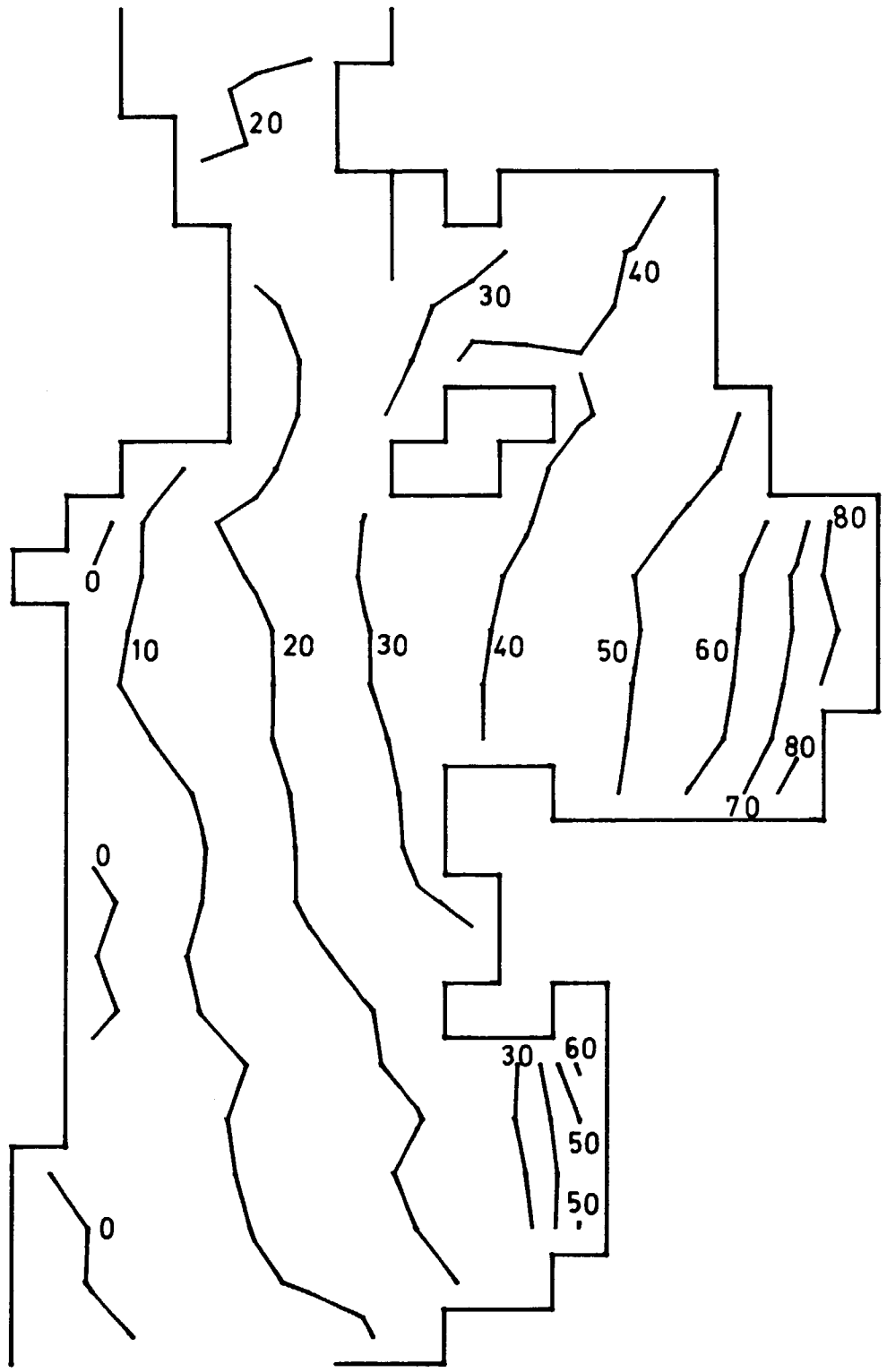

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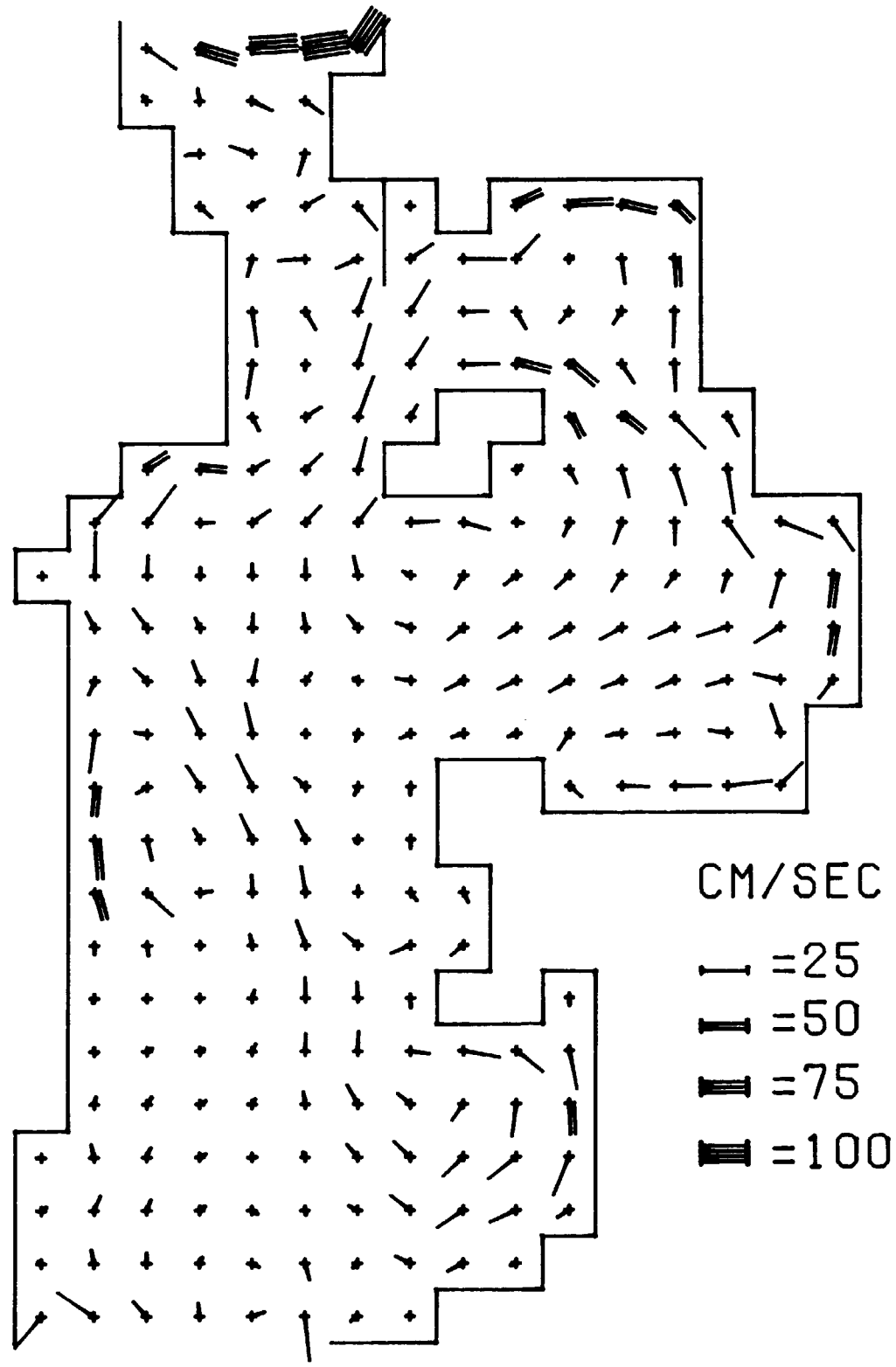

21 HRS 14TH

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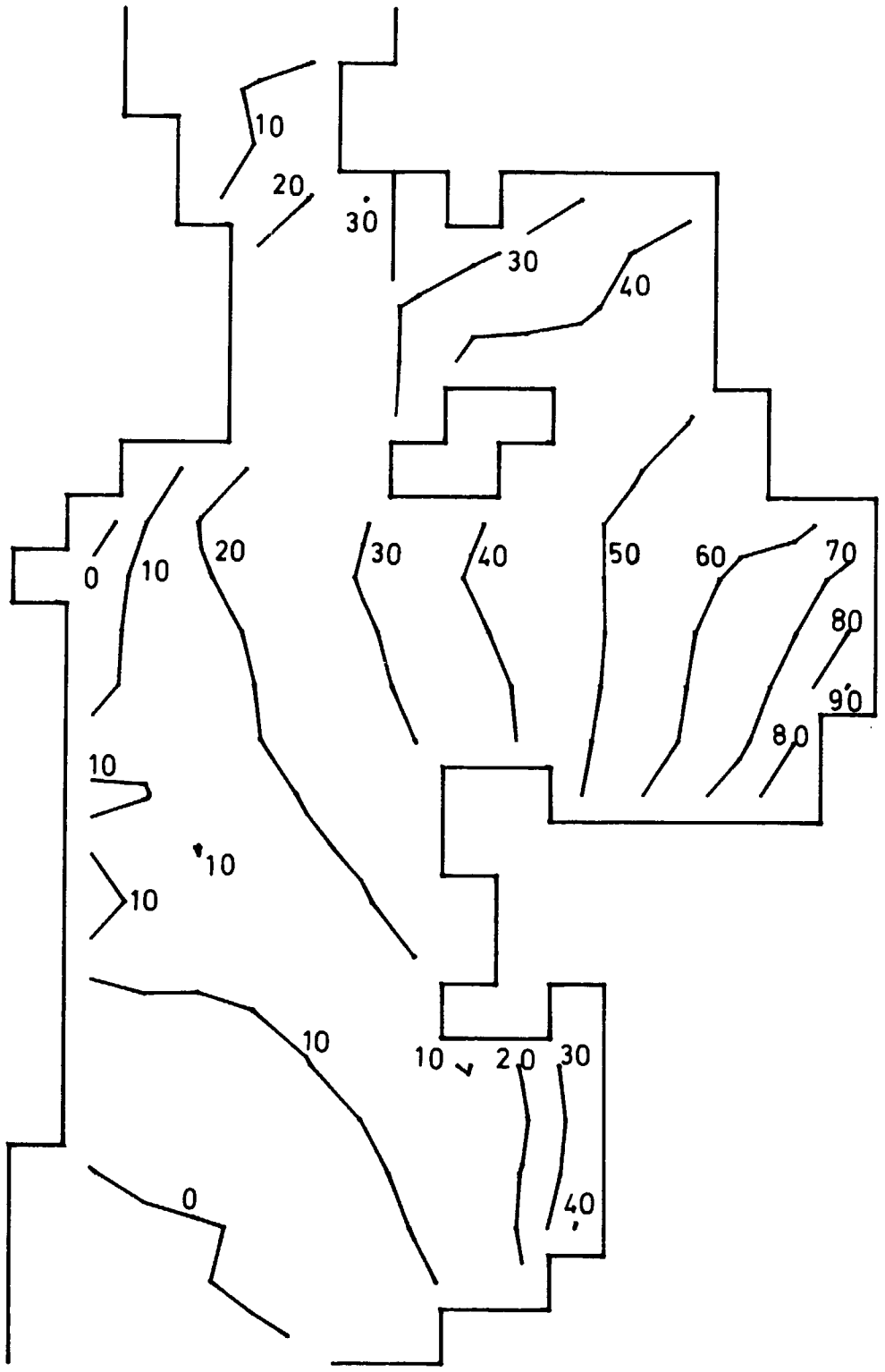

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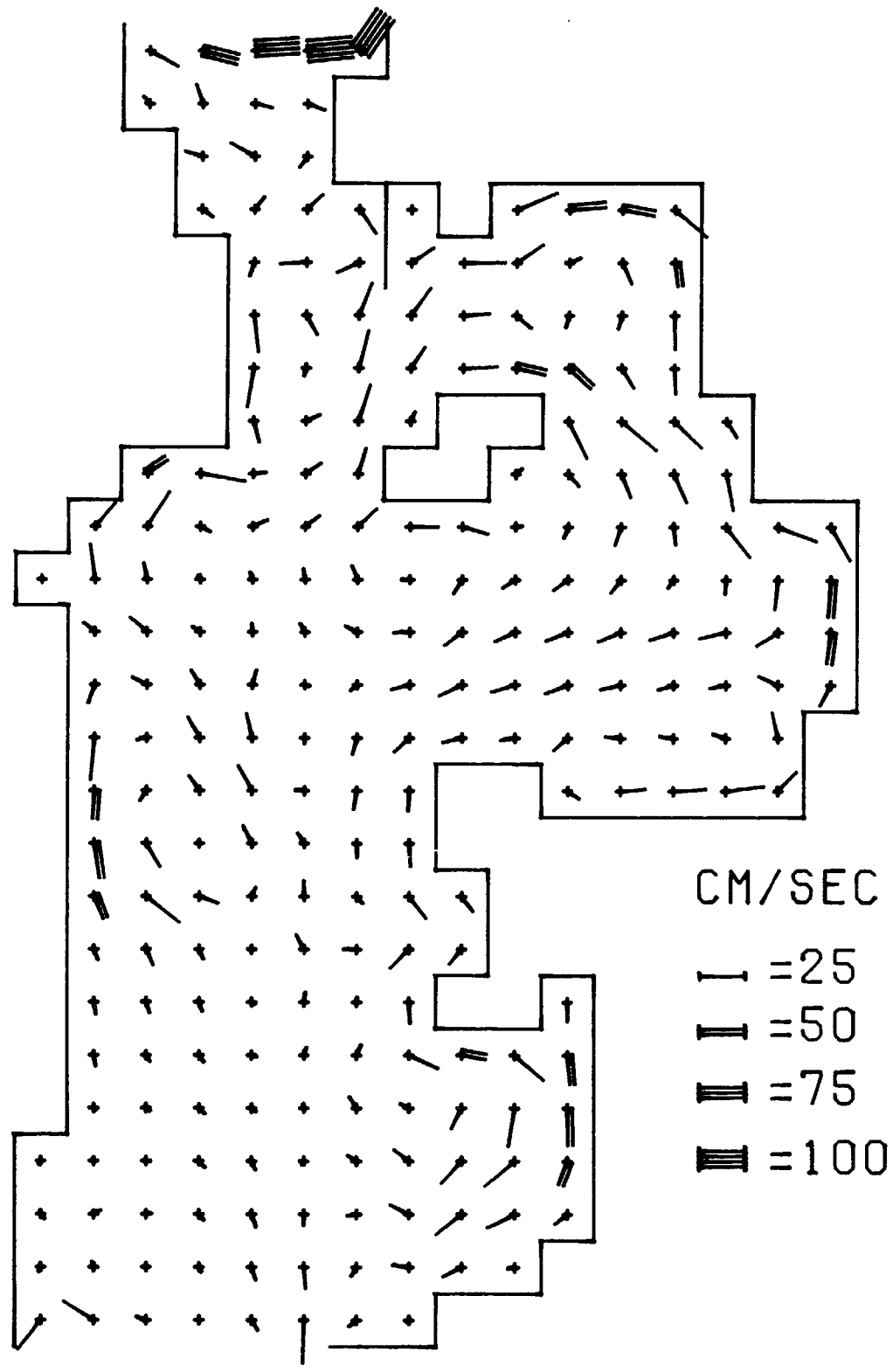

22 HRS 14TH

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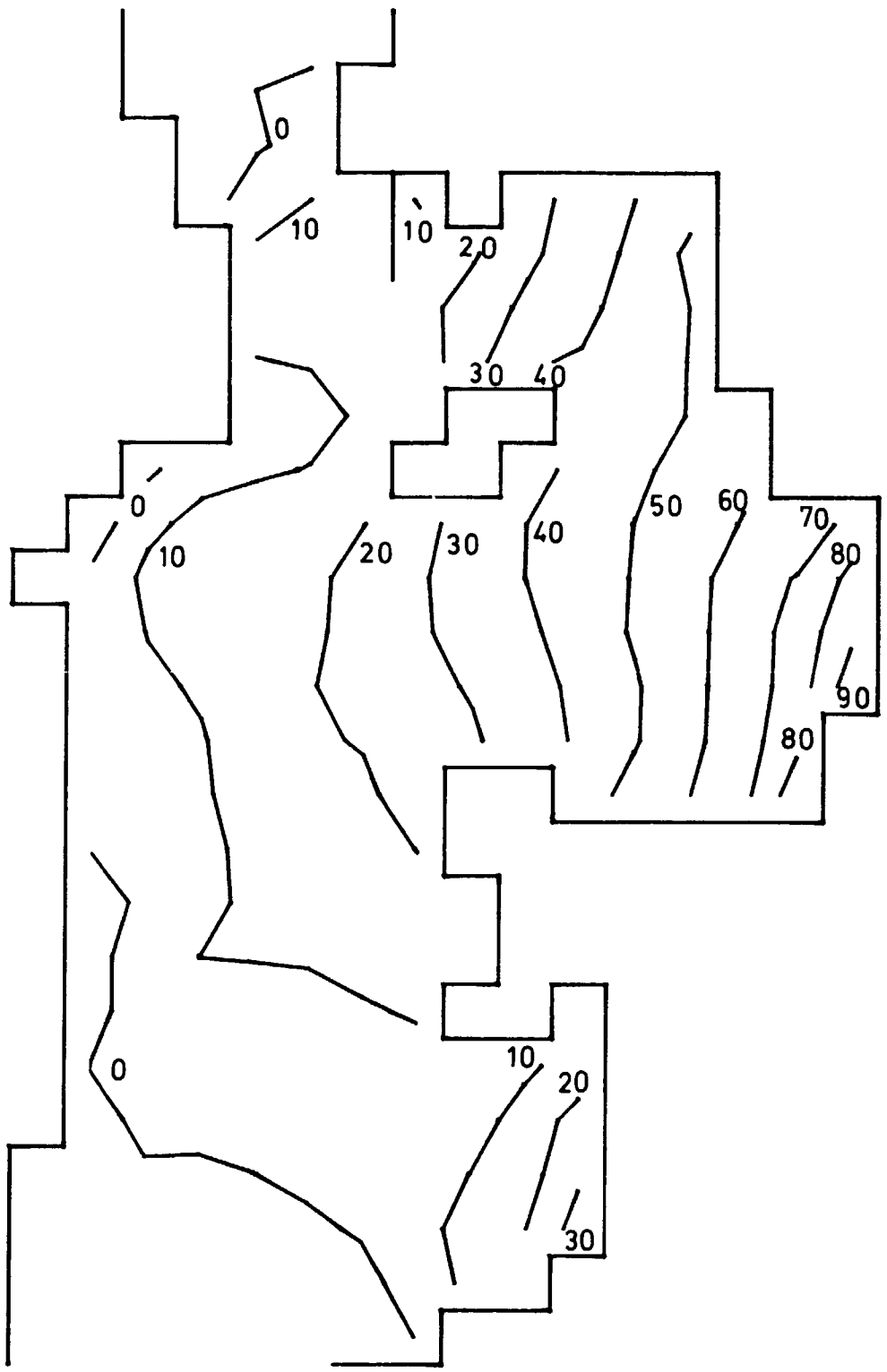

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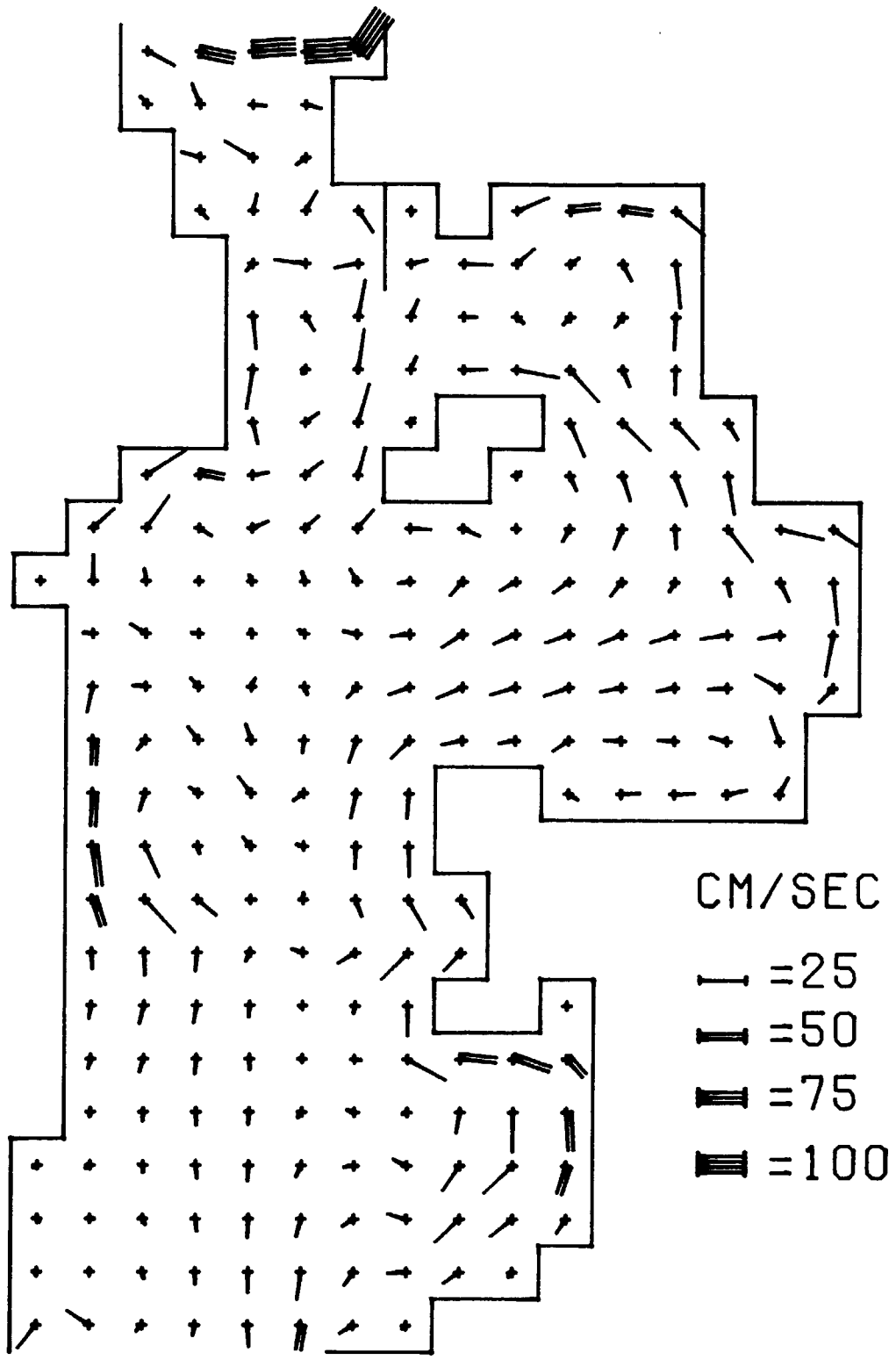

23 HRS 14TH

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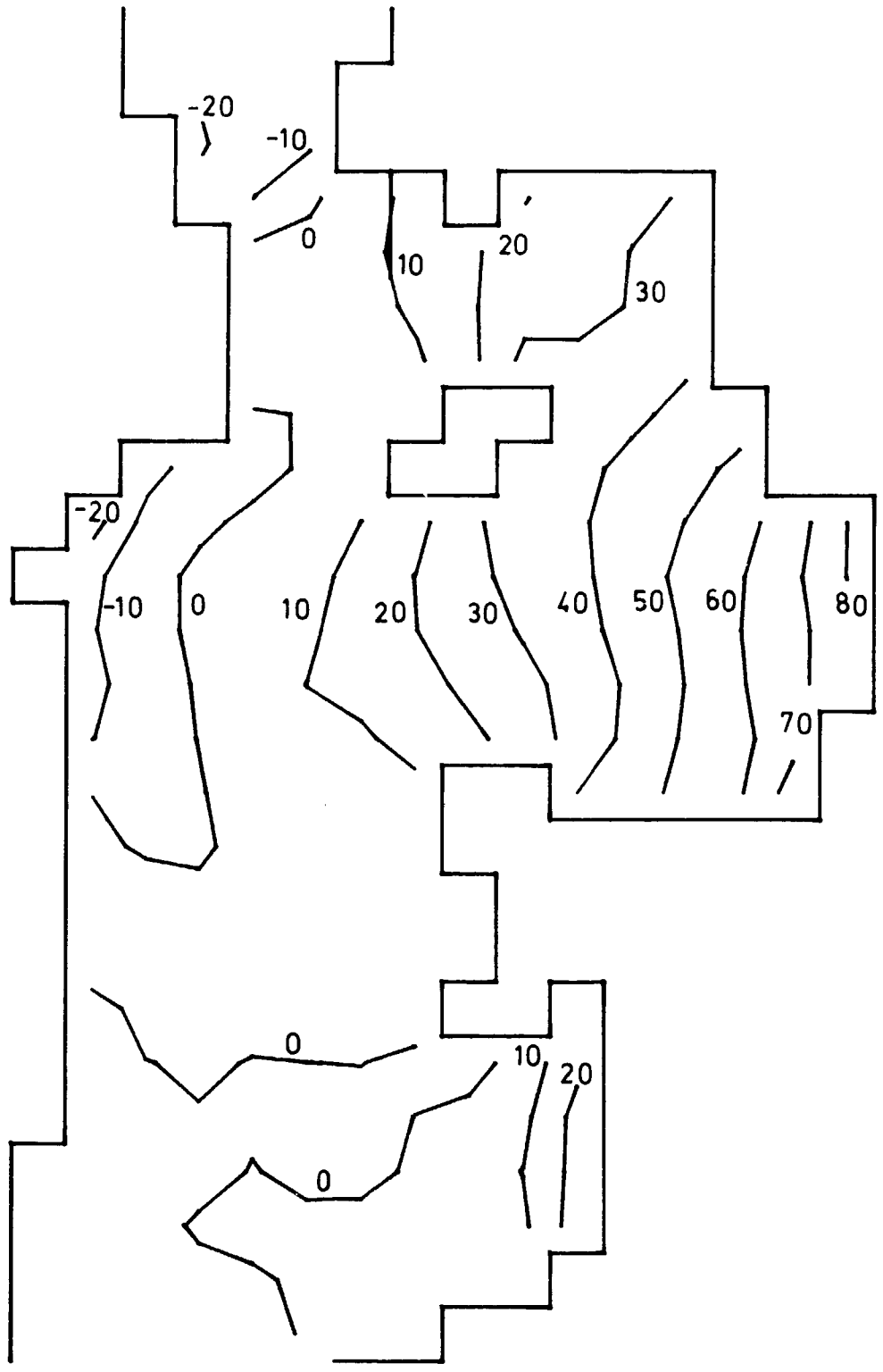

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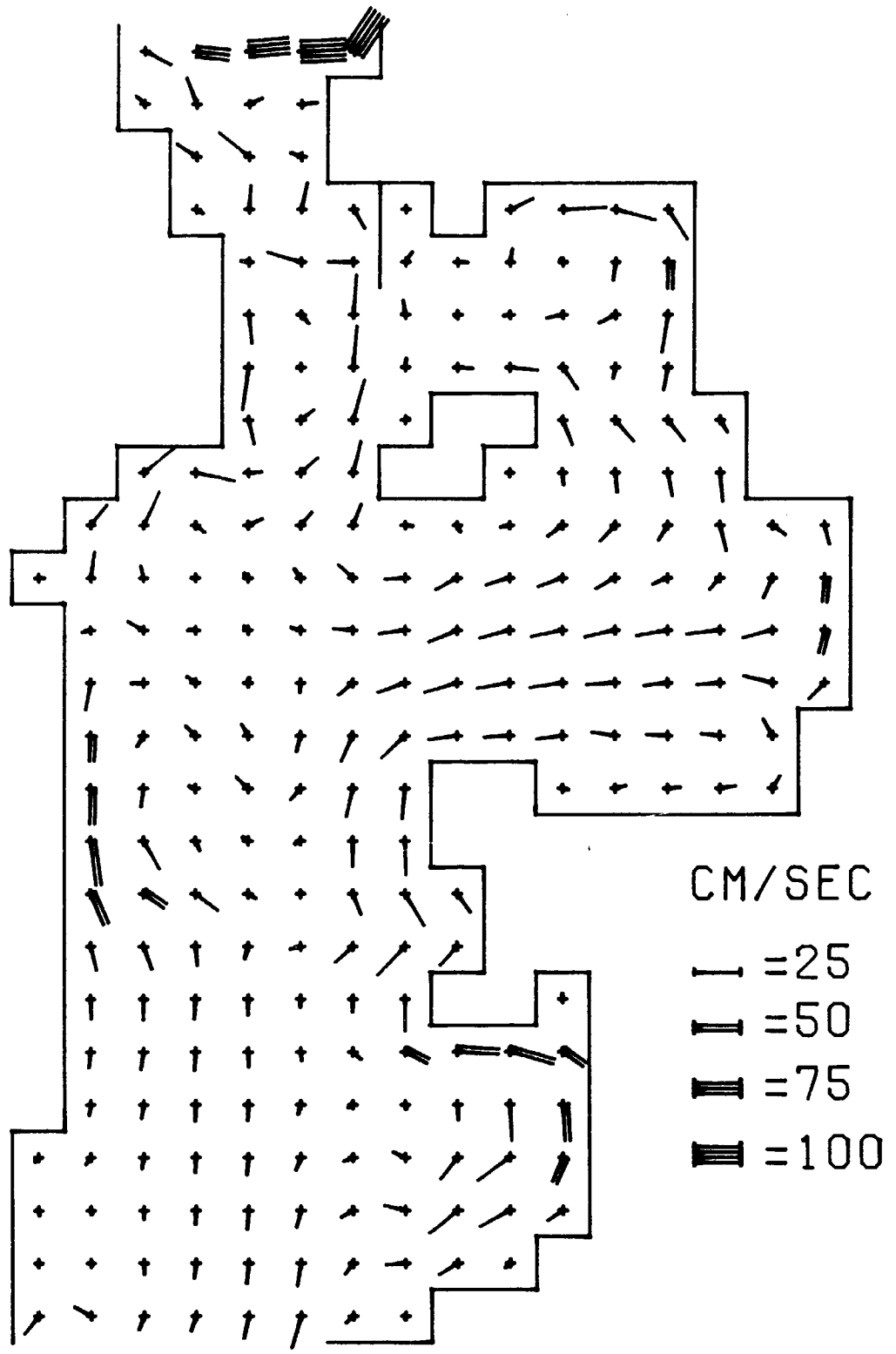

0 HRS 15TH

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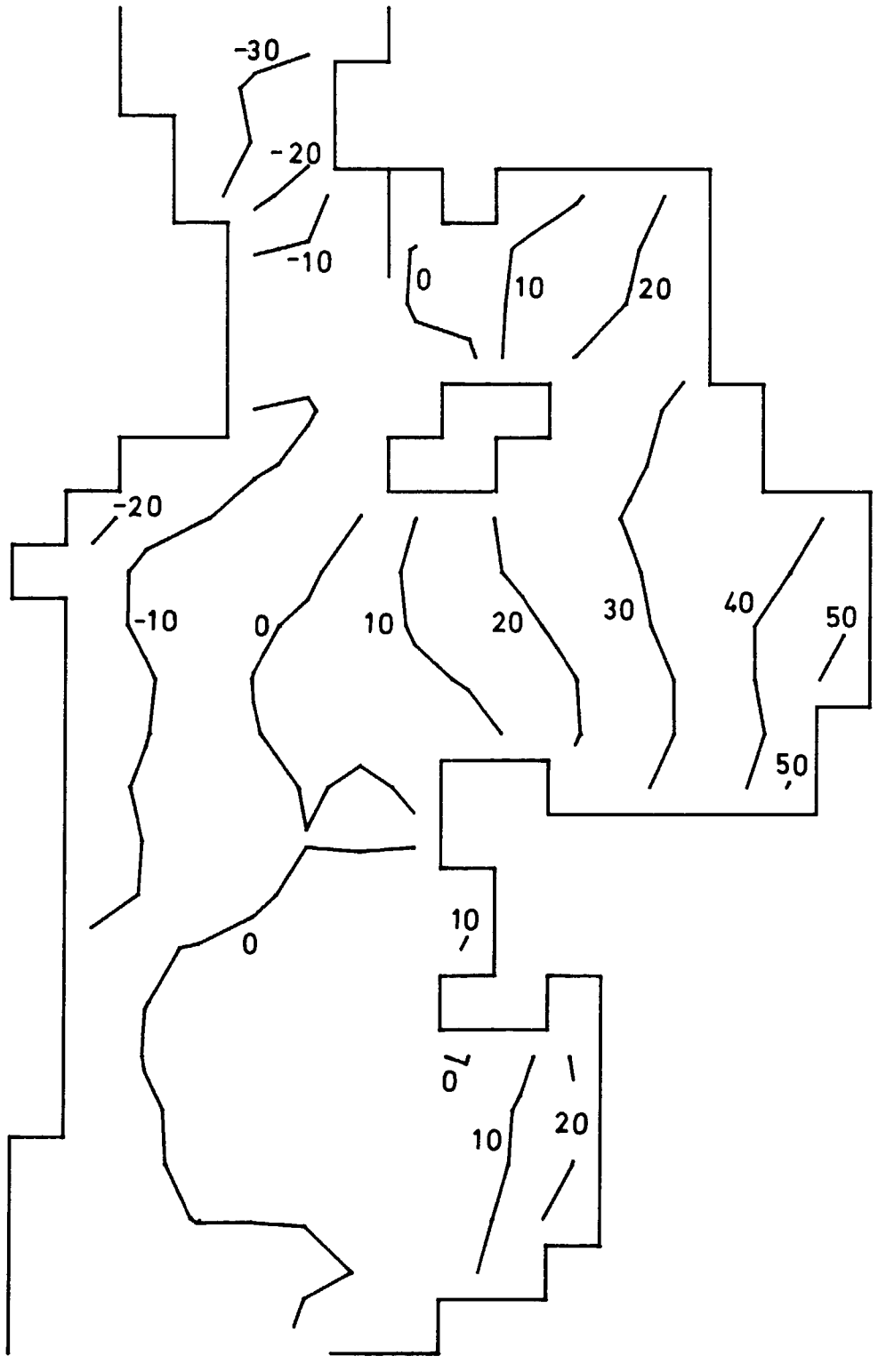

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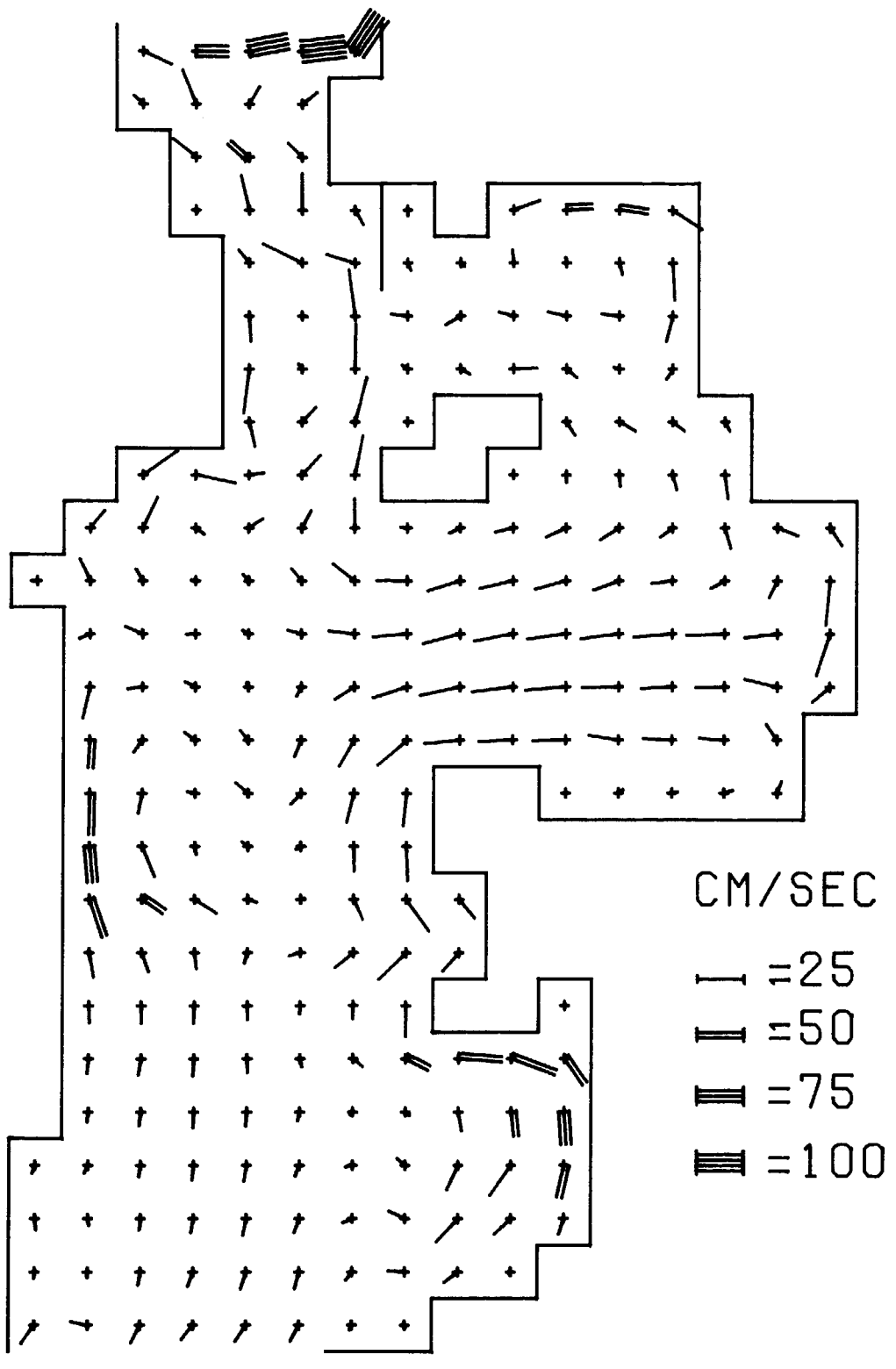

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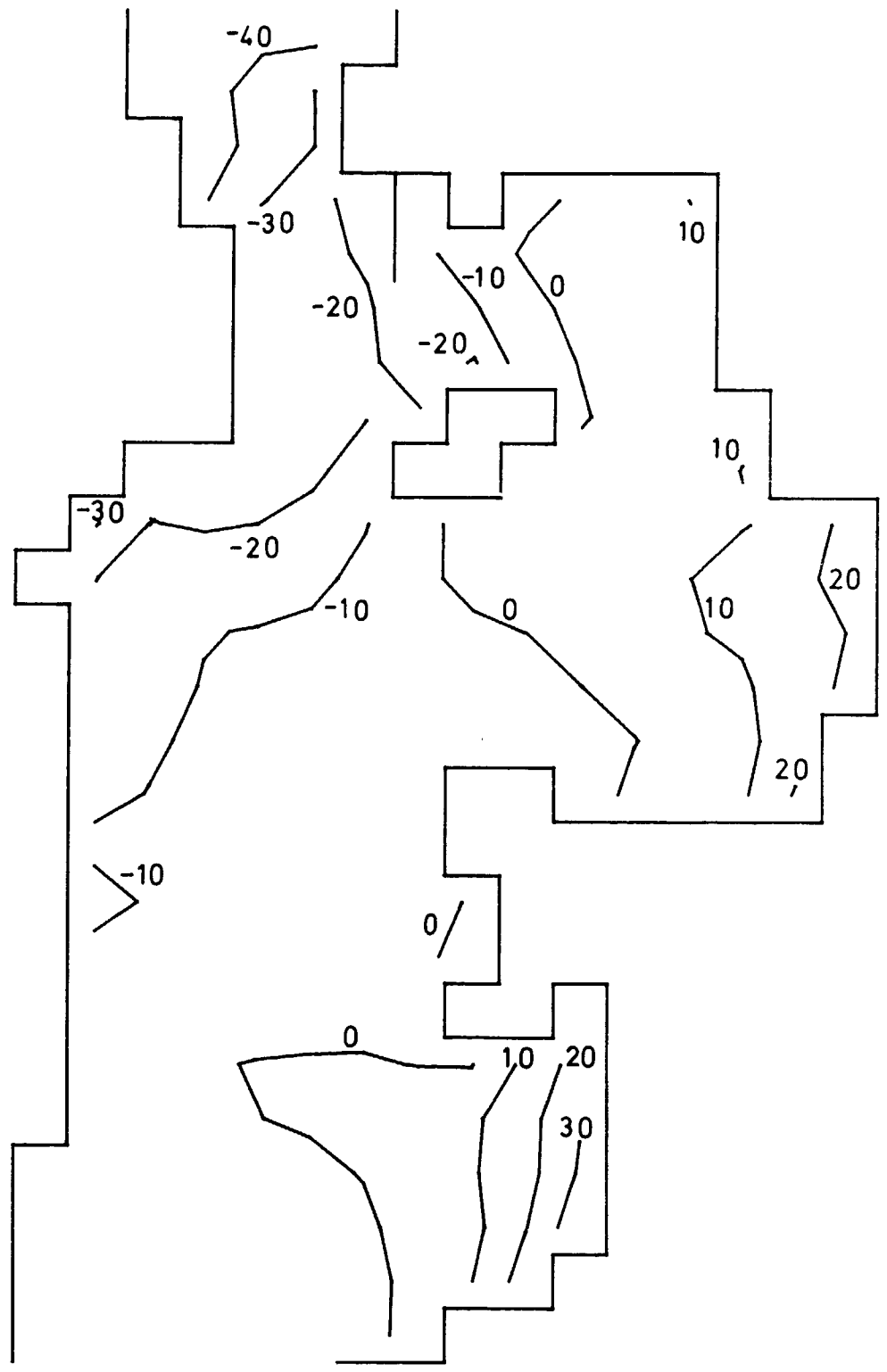

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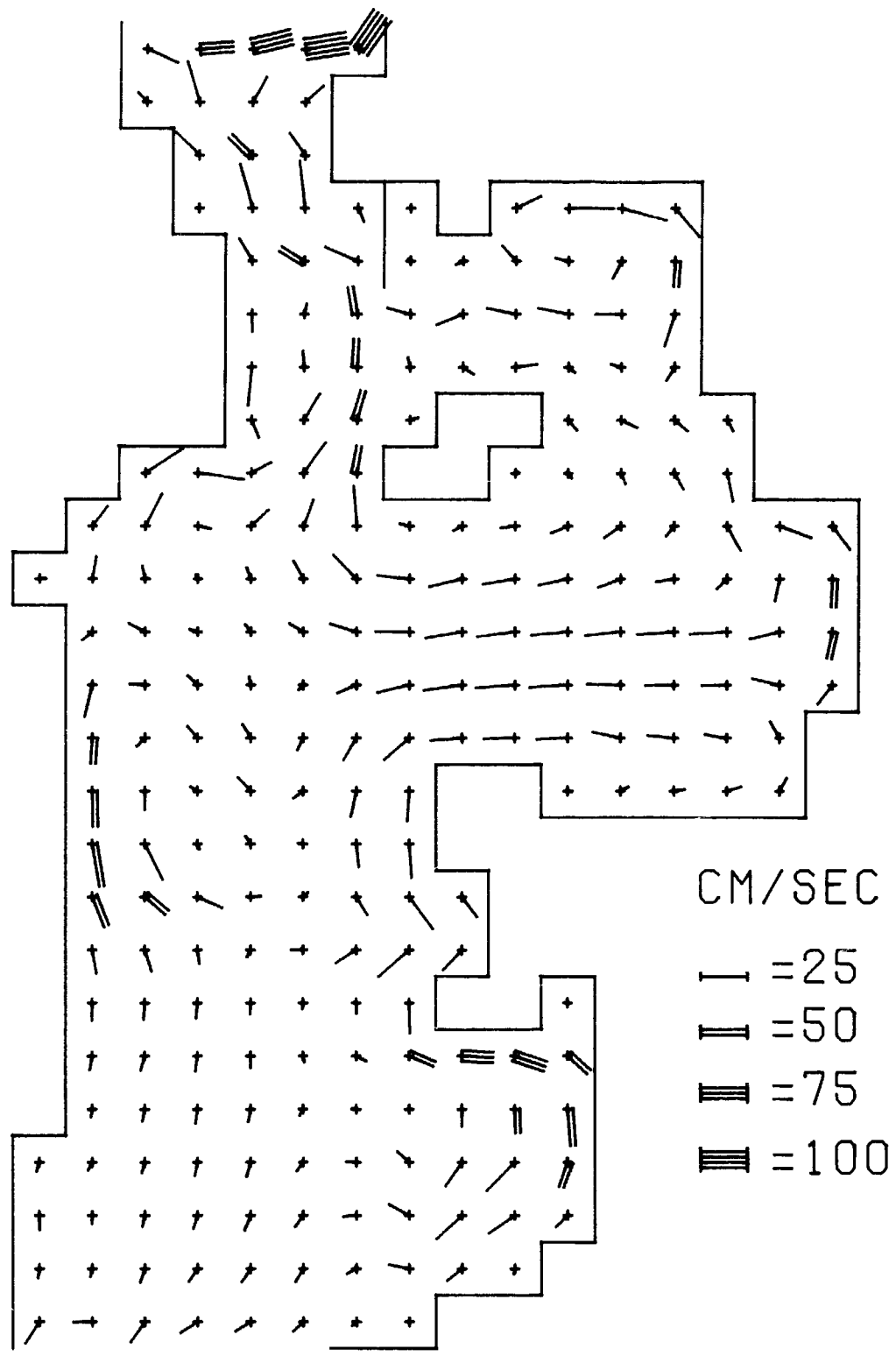

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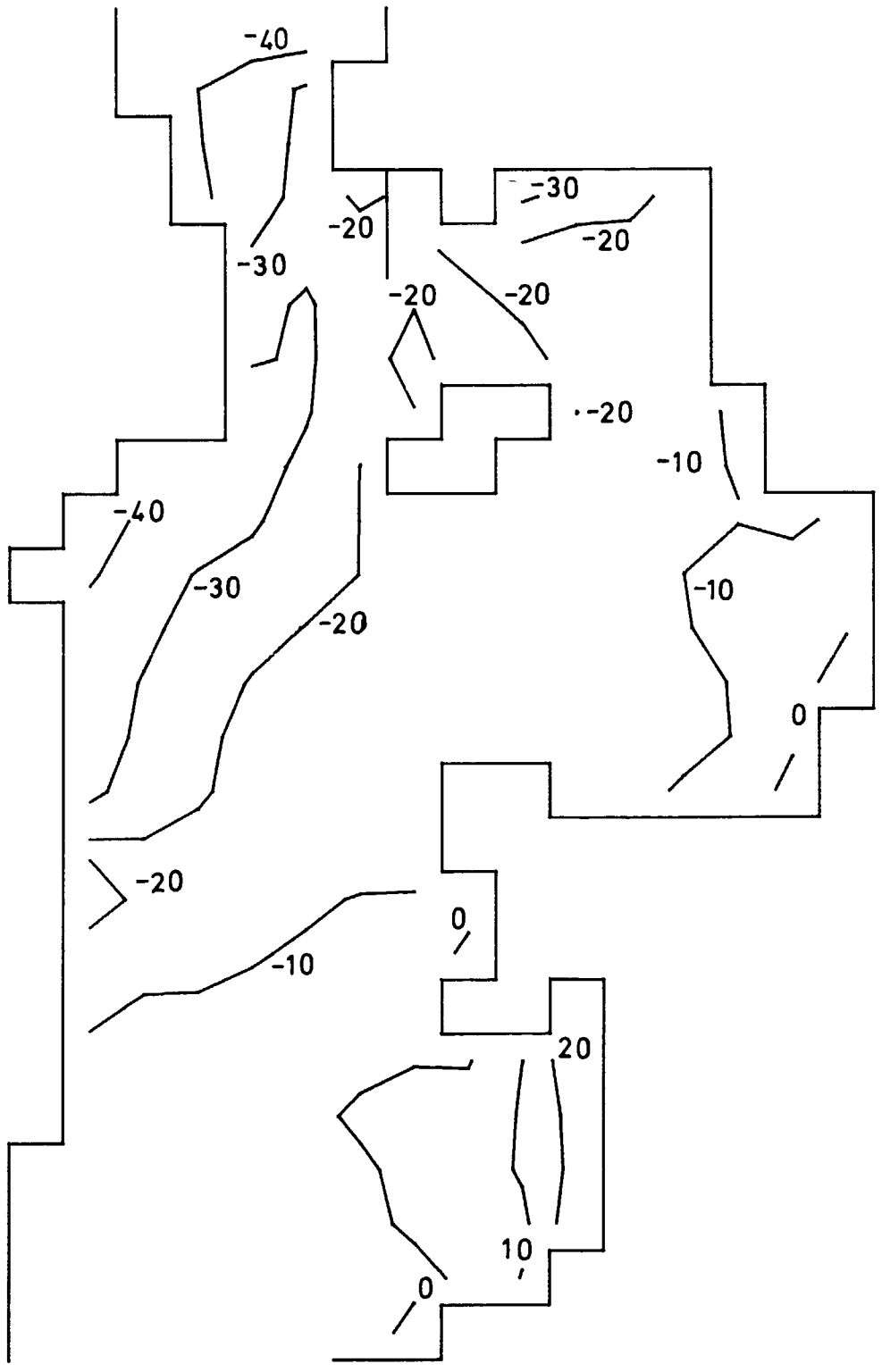

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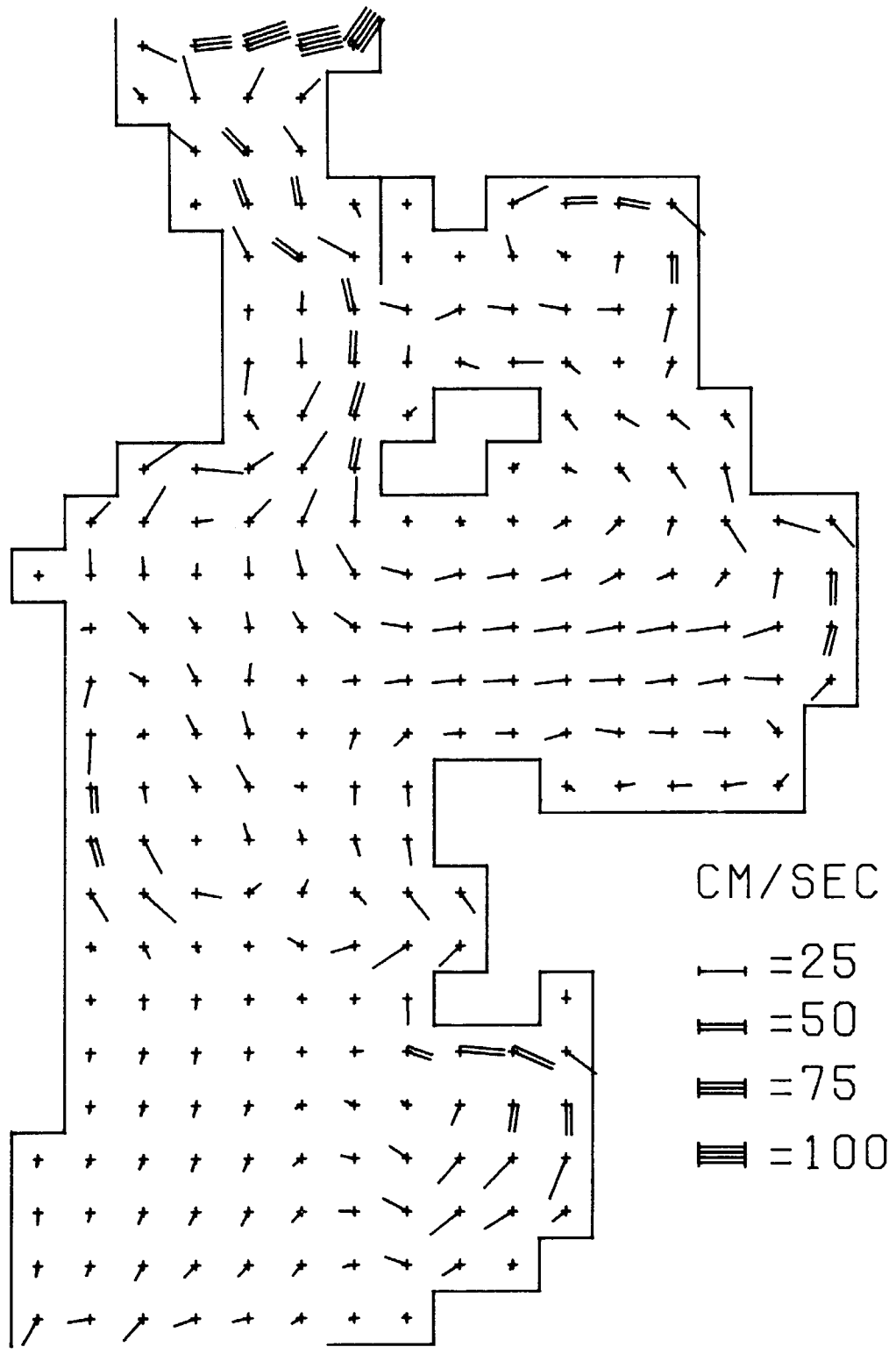

3 HRS 15TH

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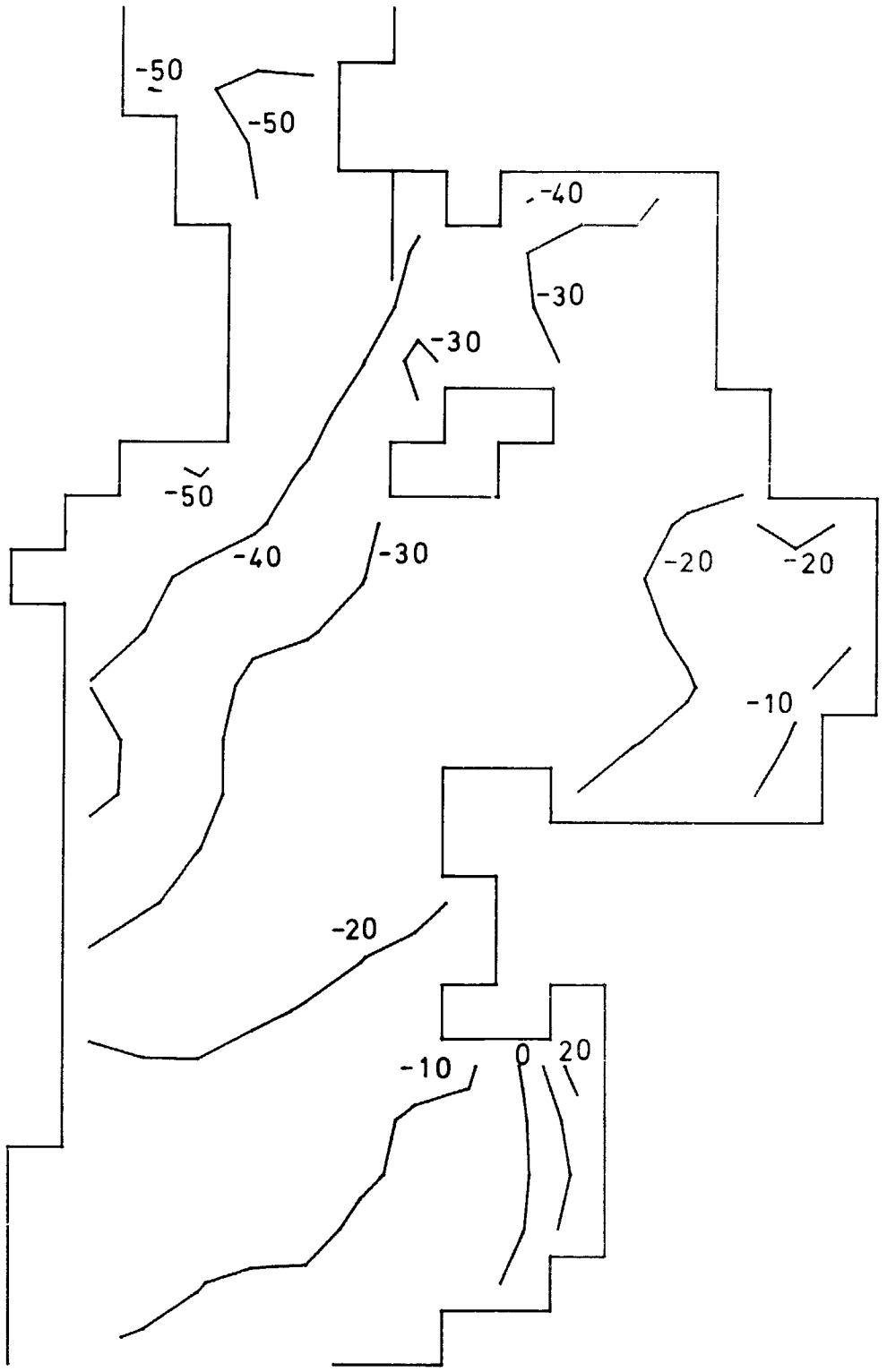

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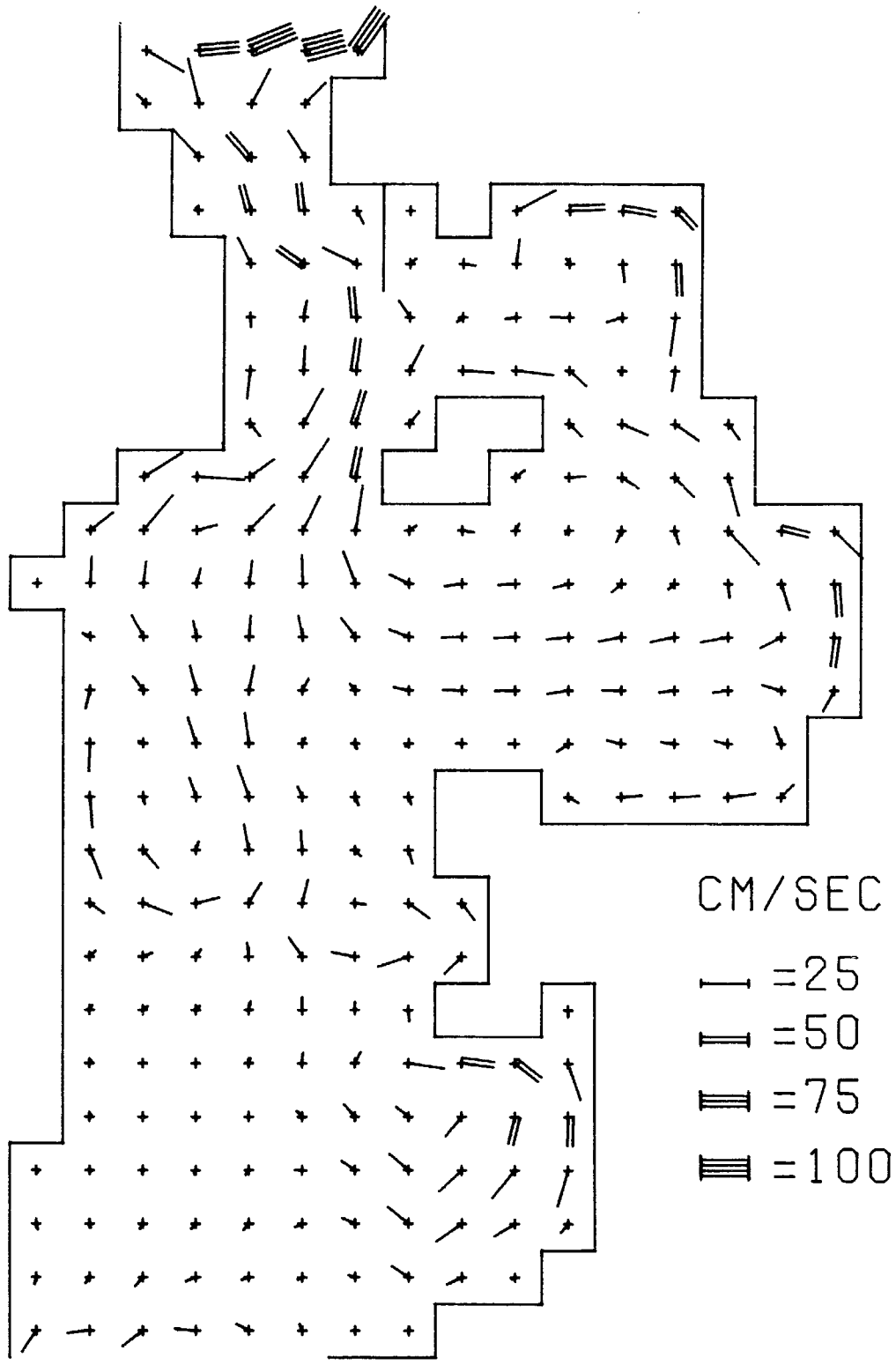

4 HRS 15TH

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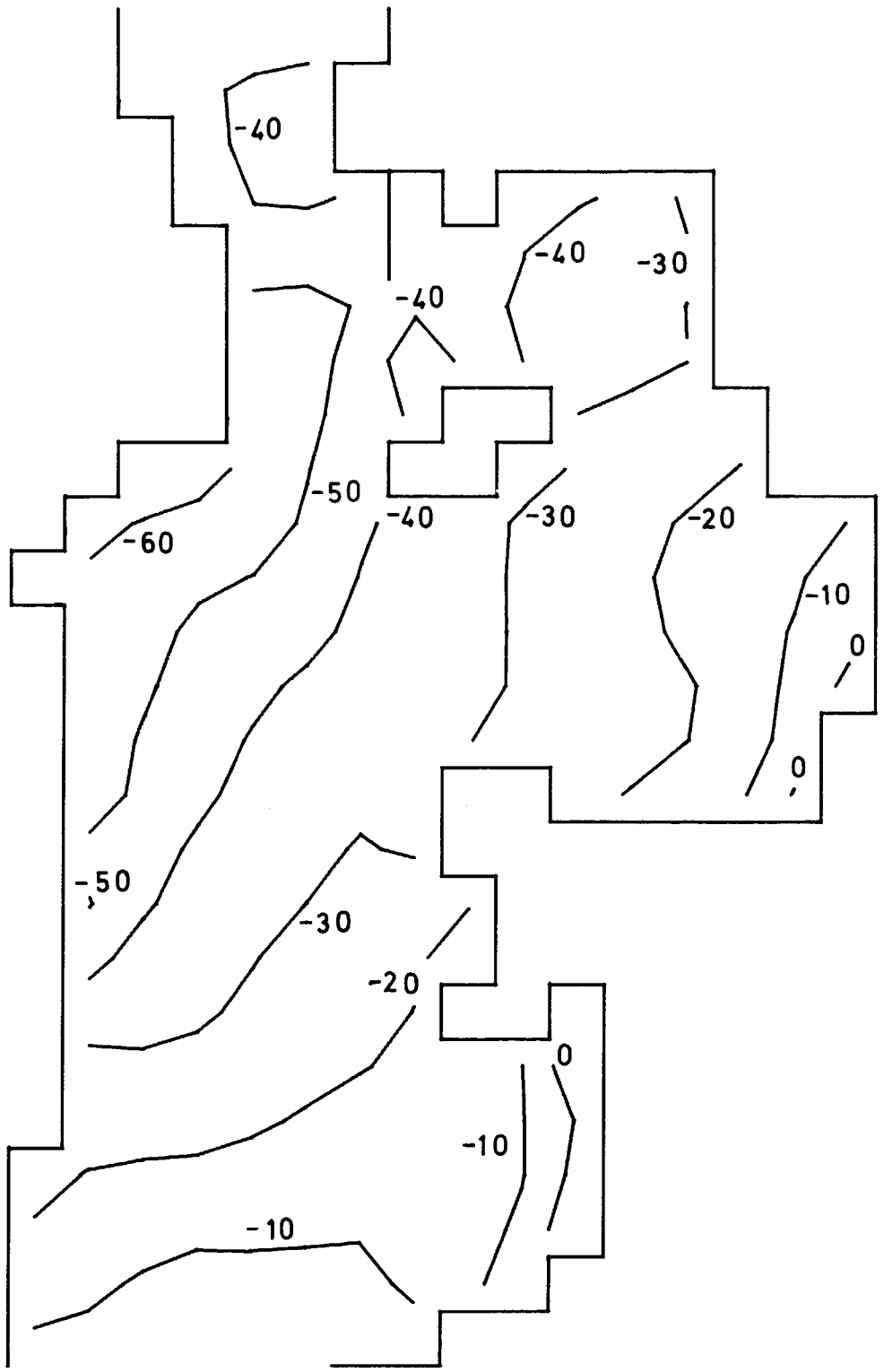

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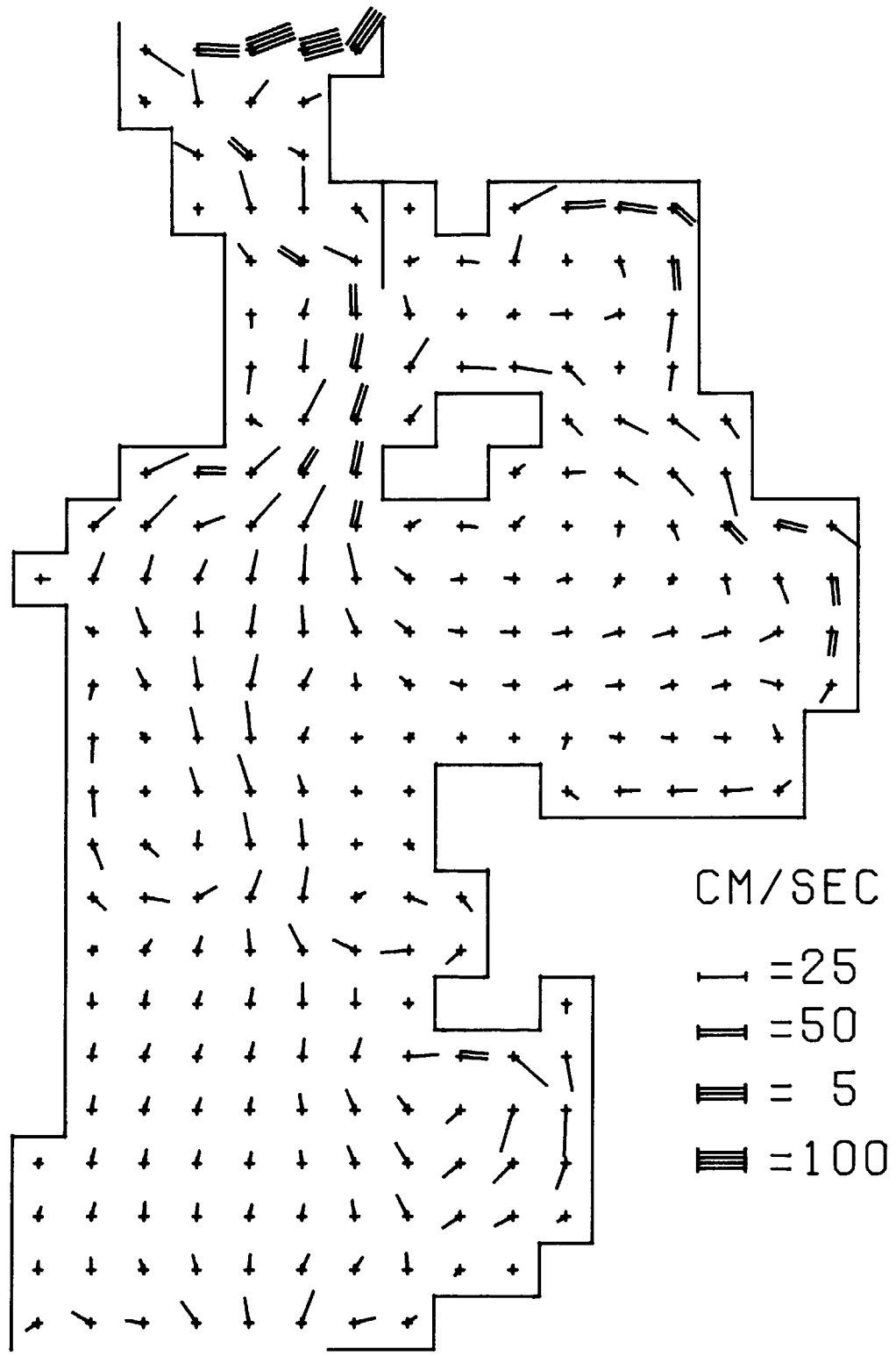

5 HRS 15TH

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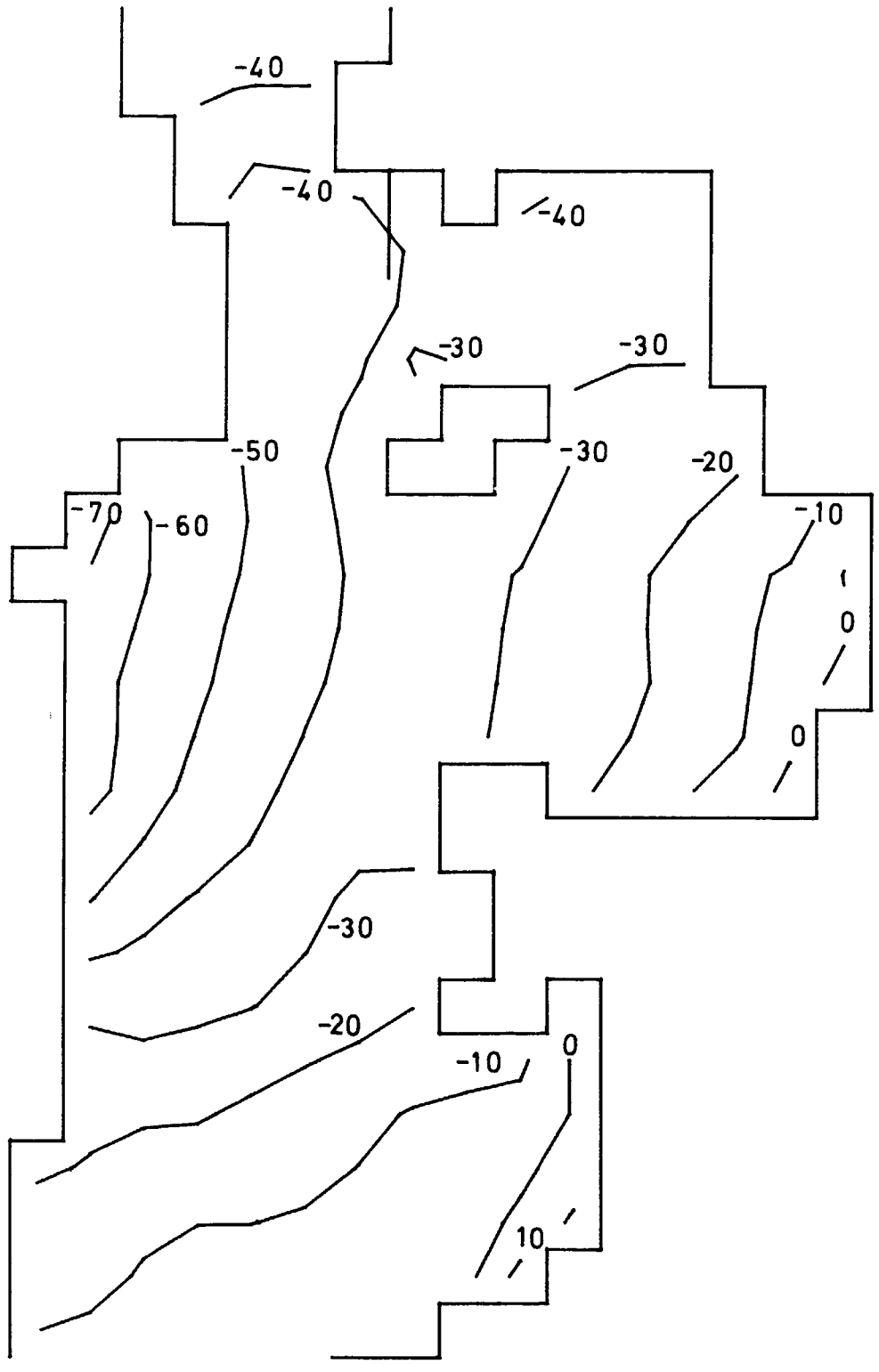

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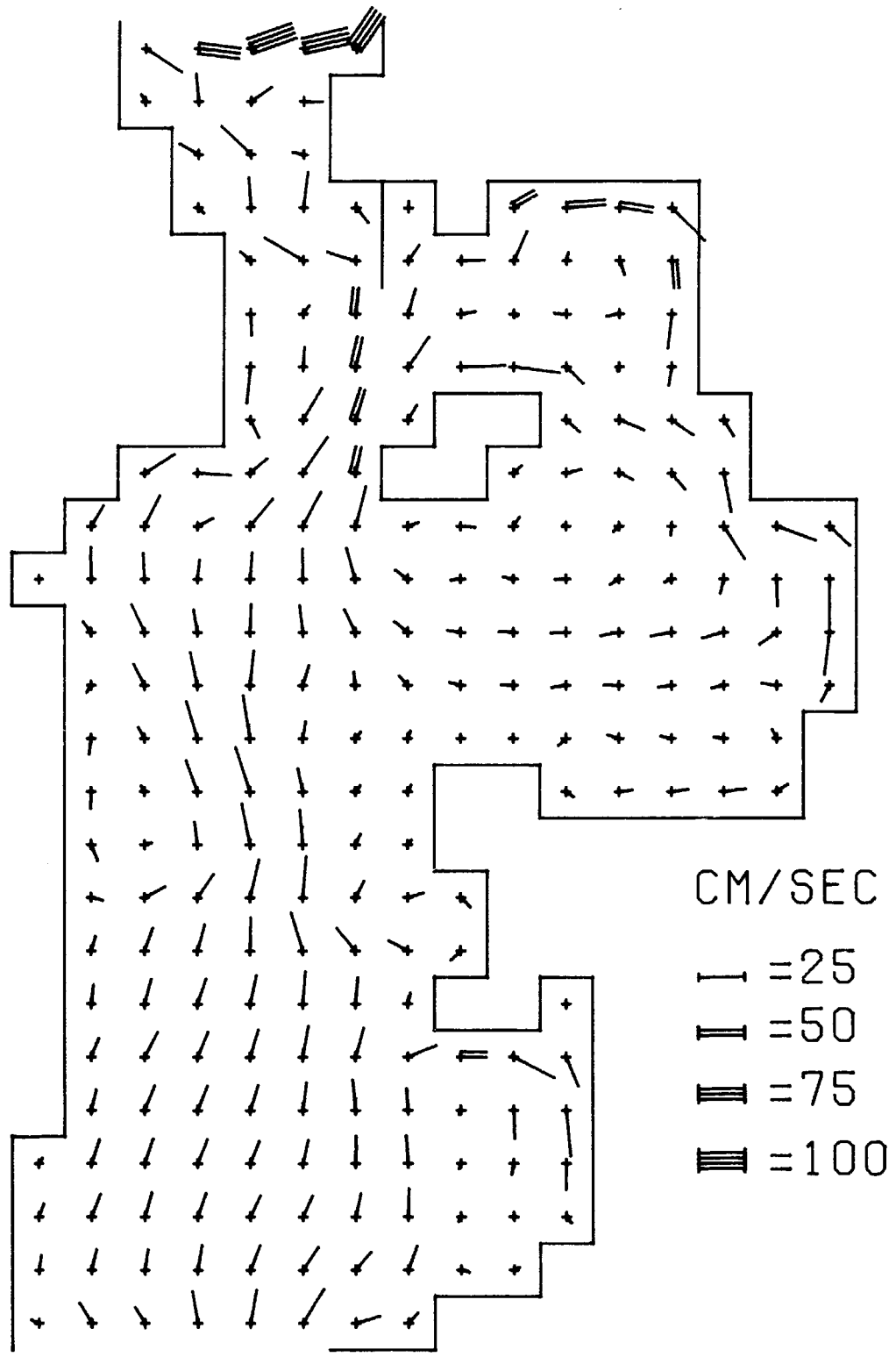

6 HRS 15TH

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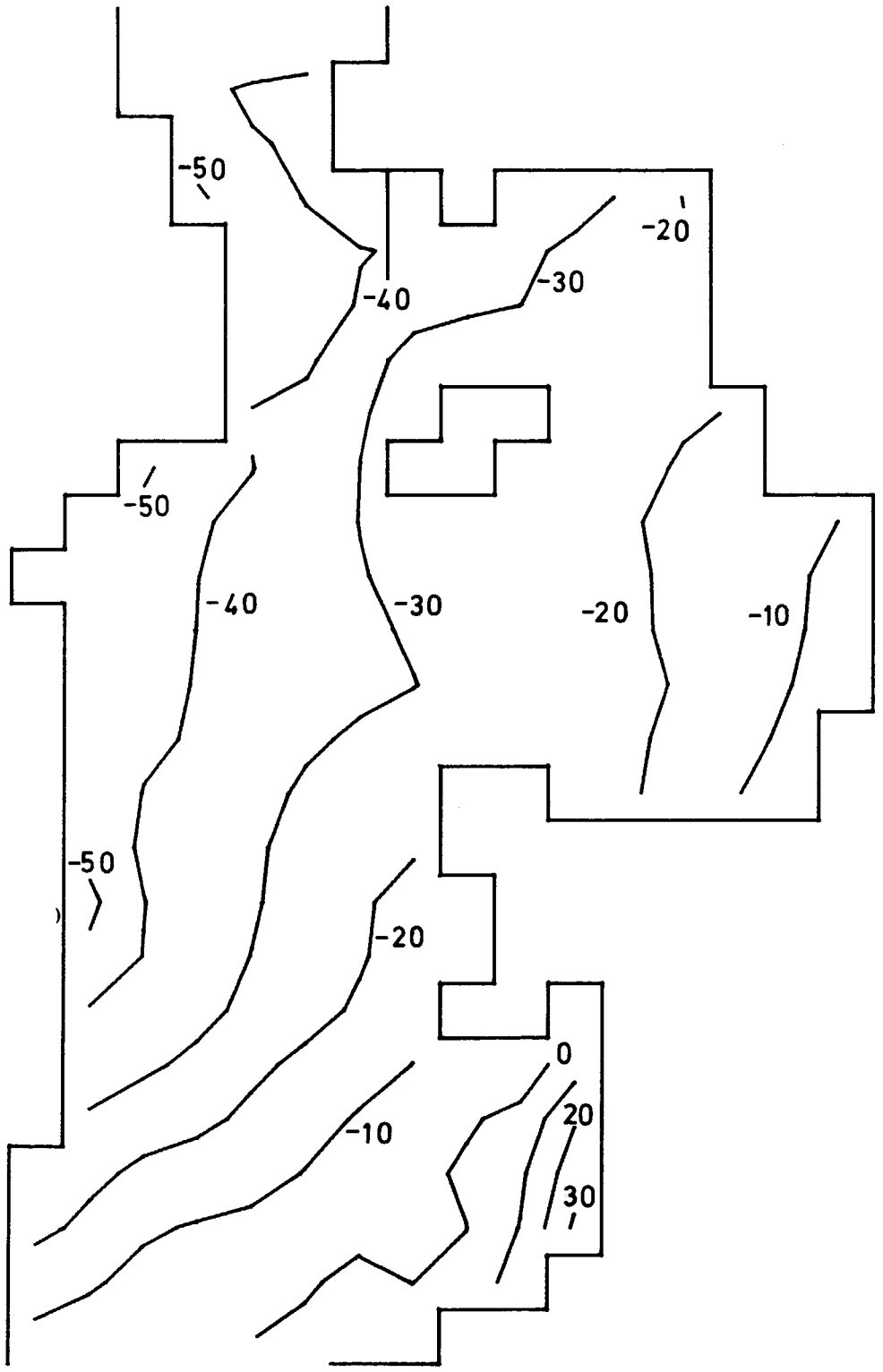

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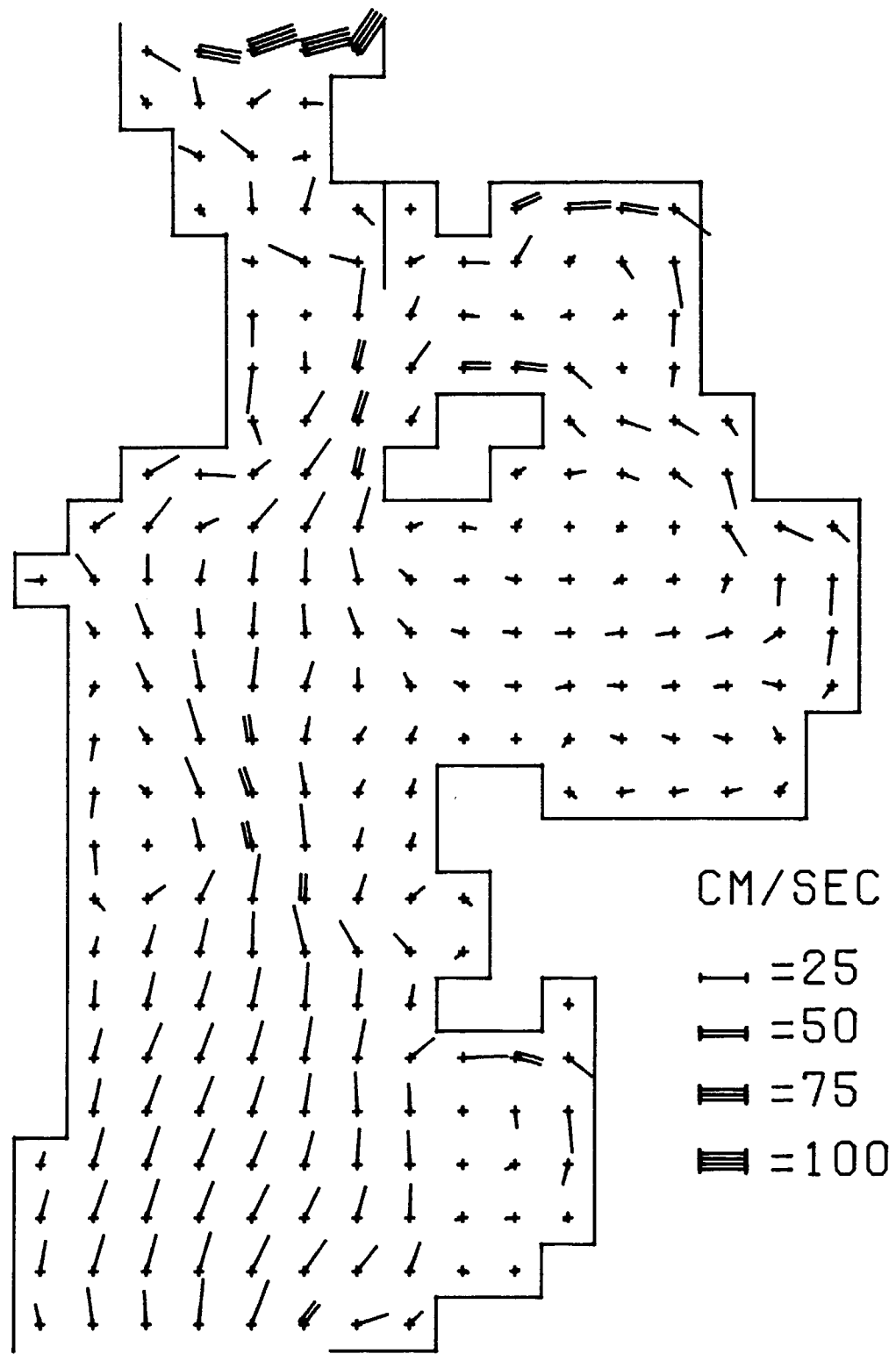

7 HRS 15TH

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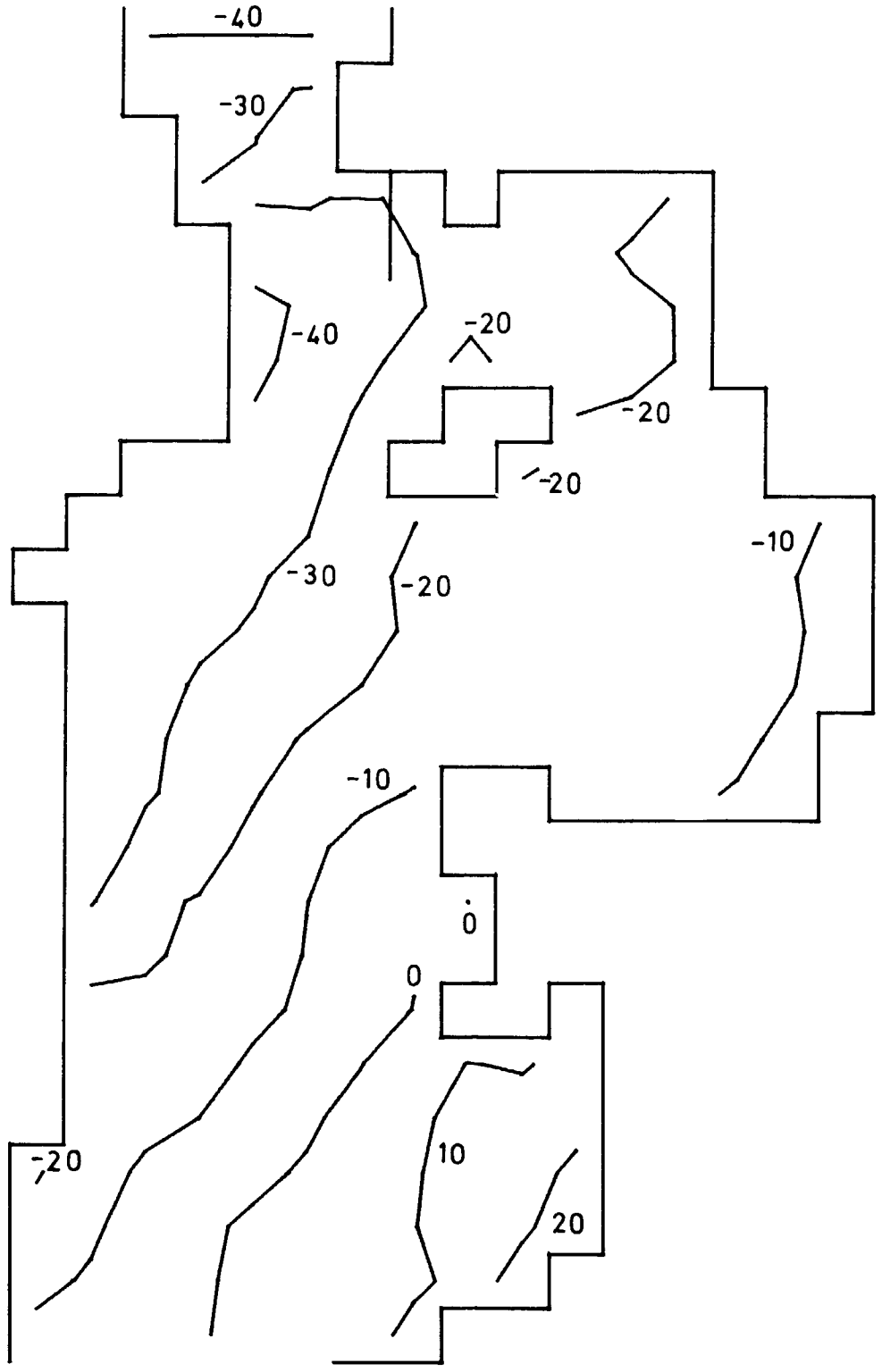

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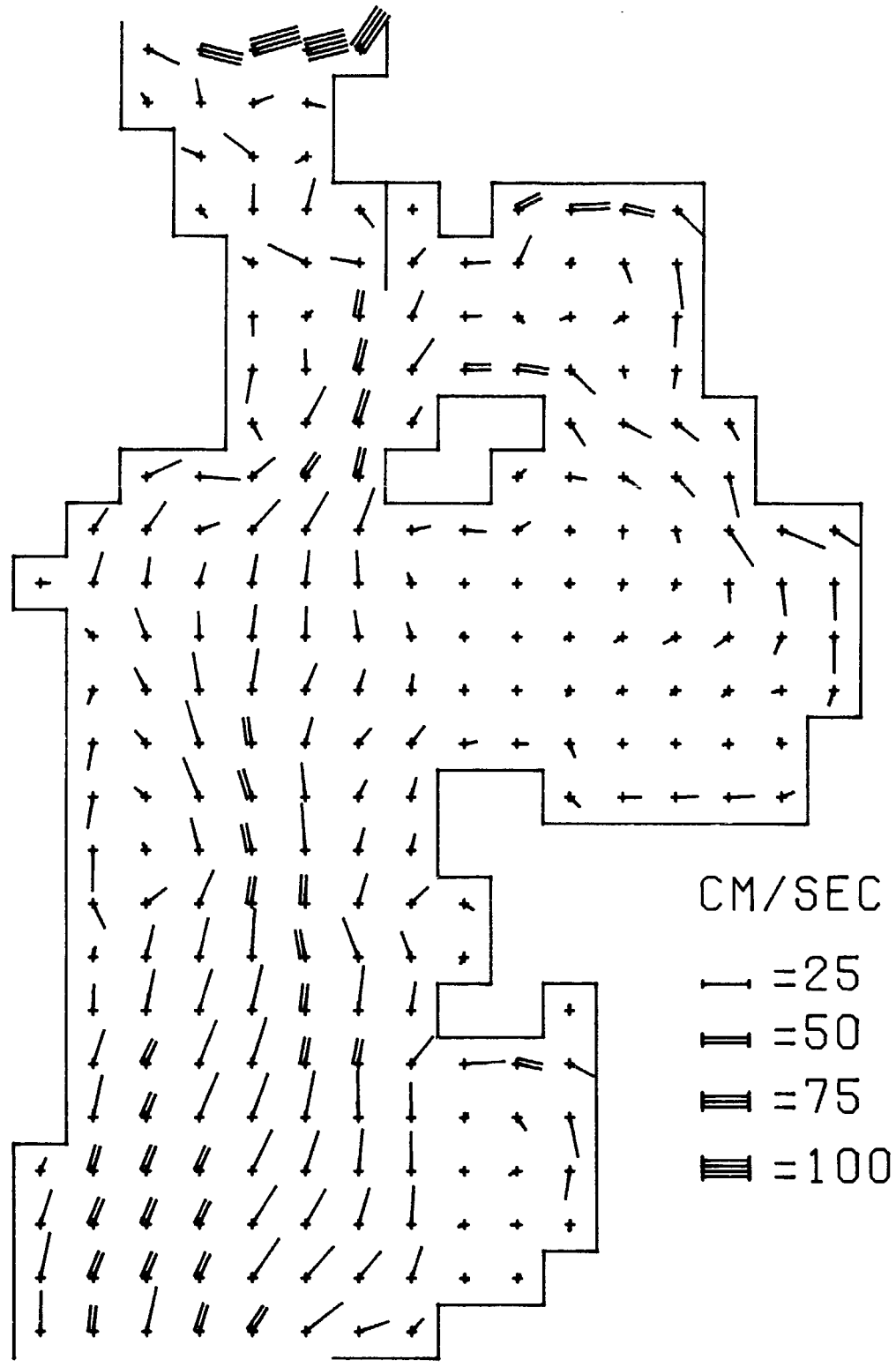

8 HRS 15TH

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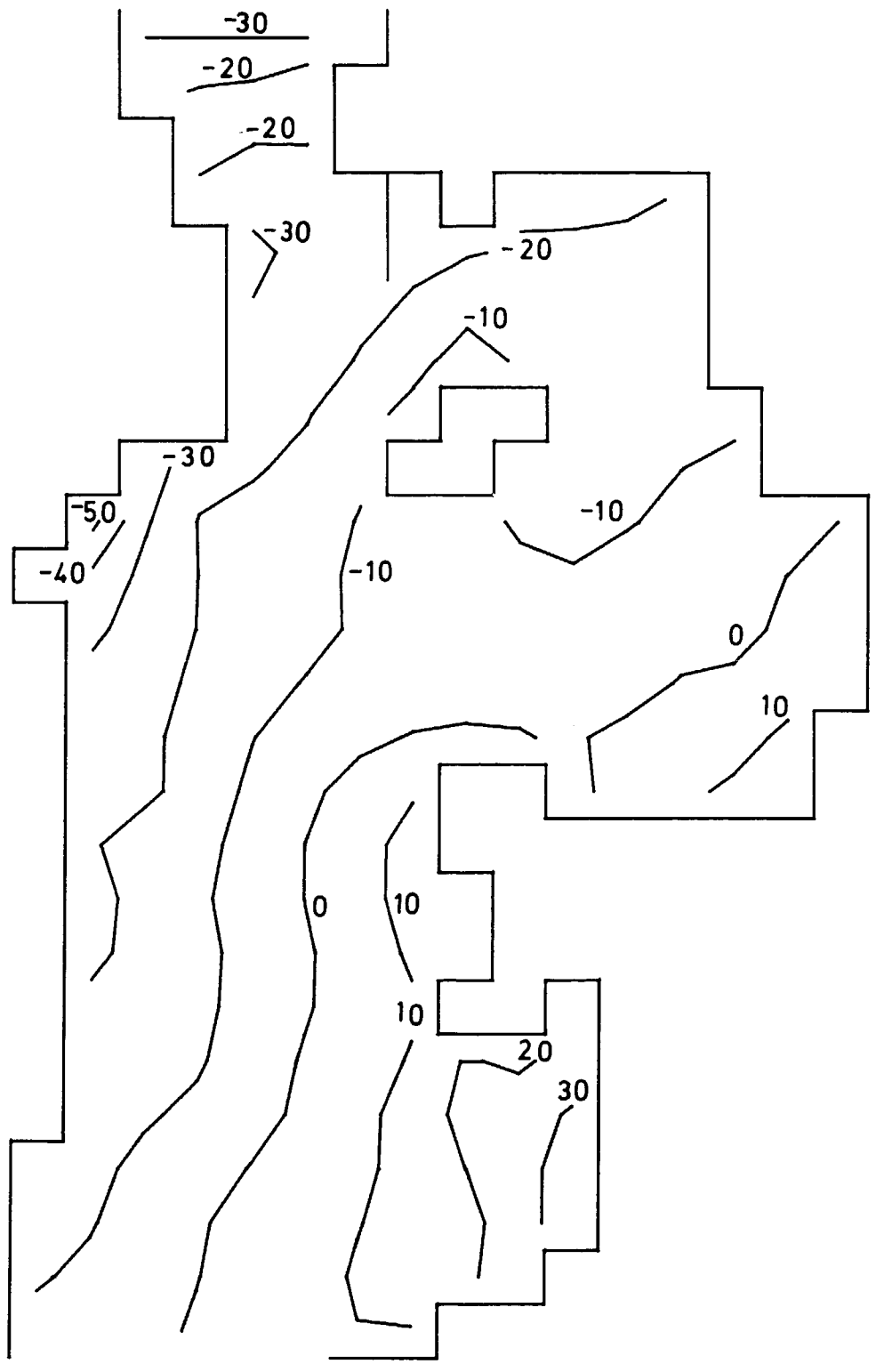

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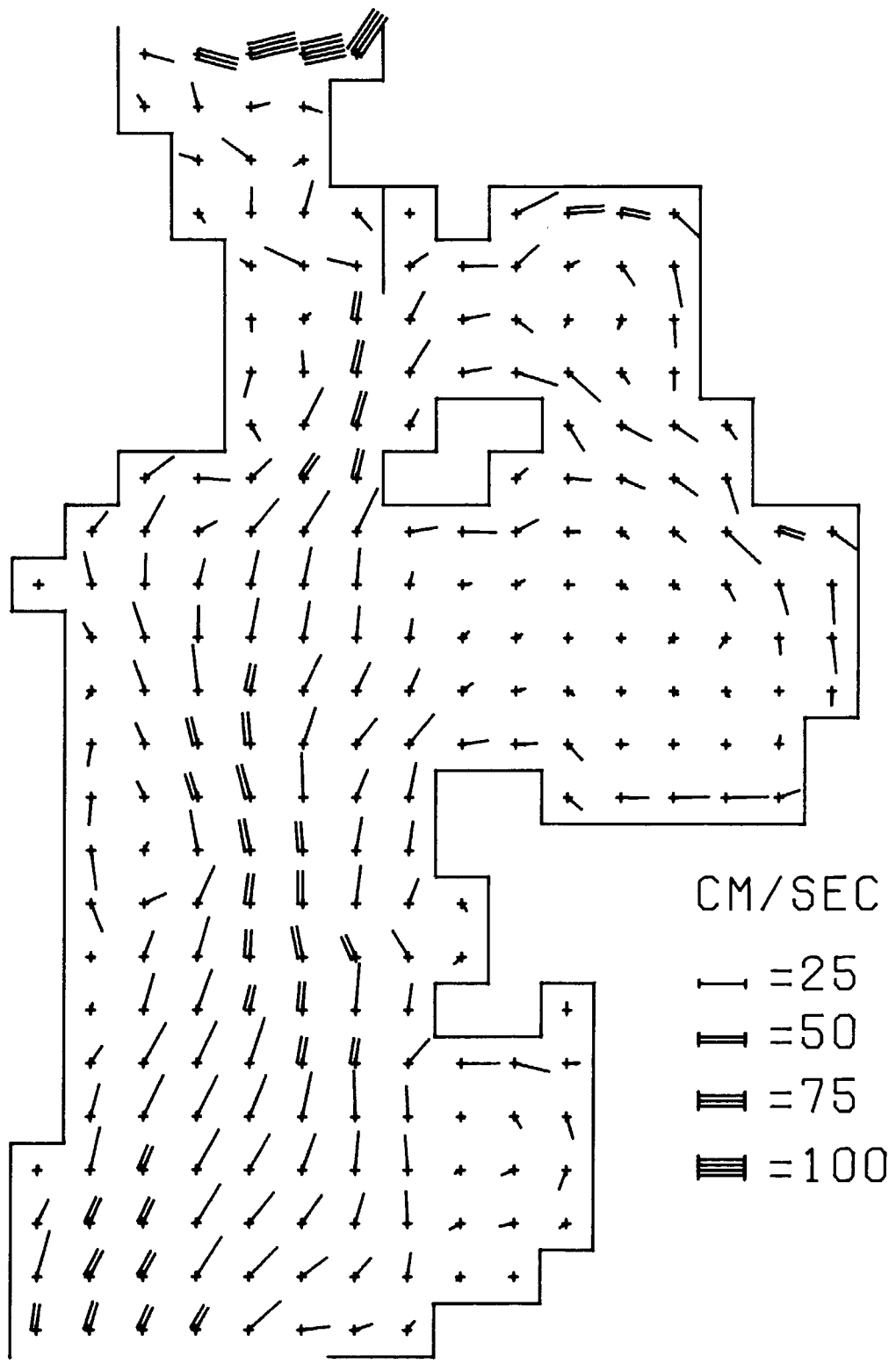

9 HRS 15TH

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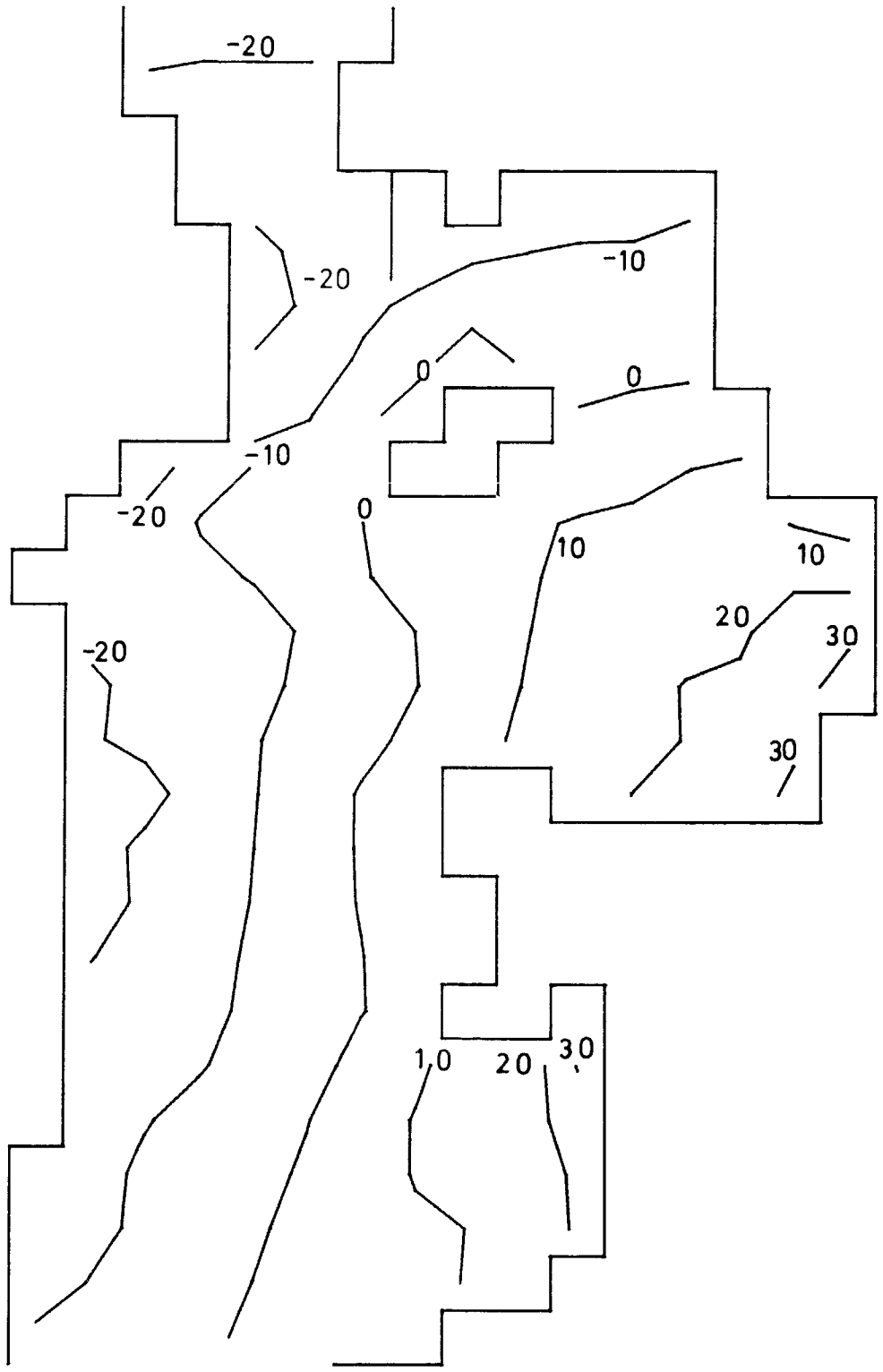

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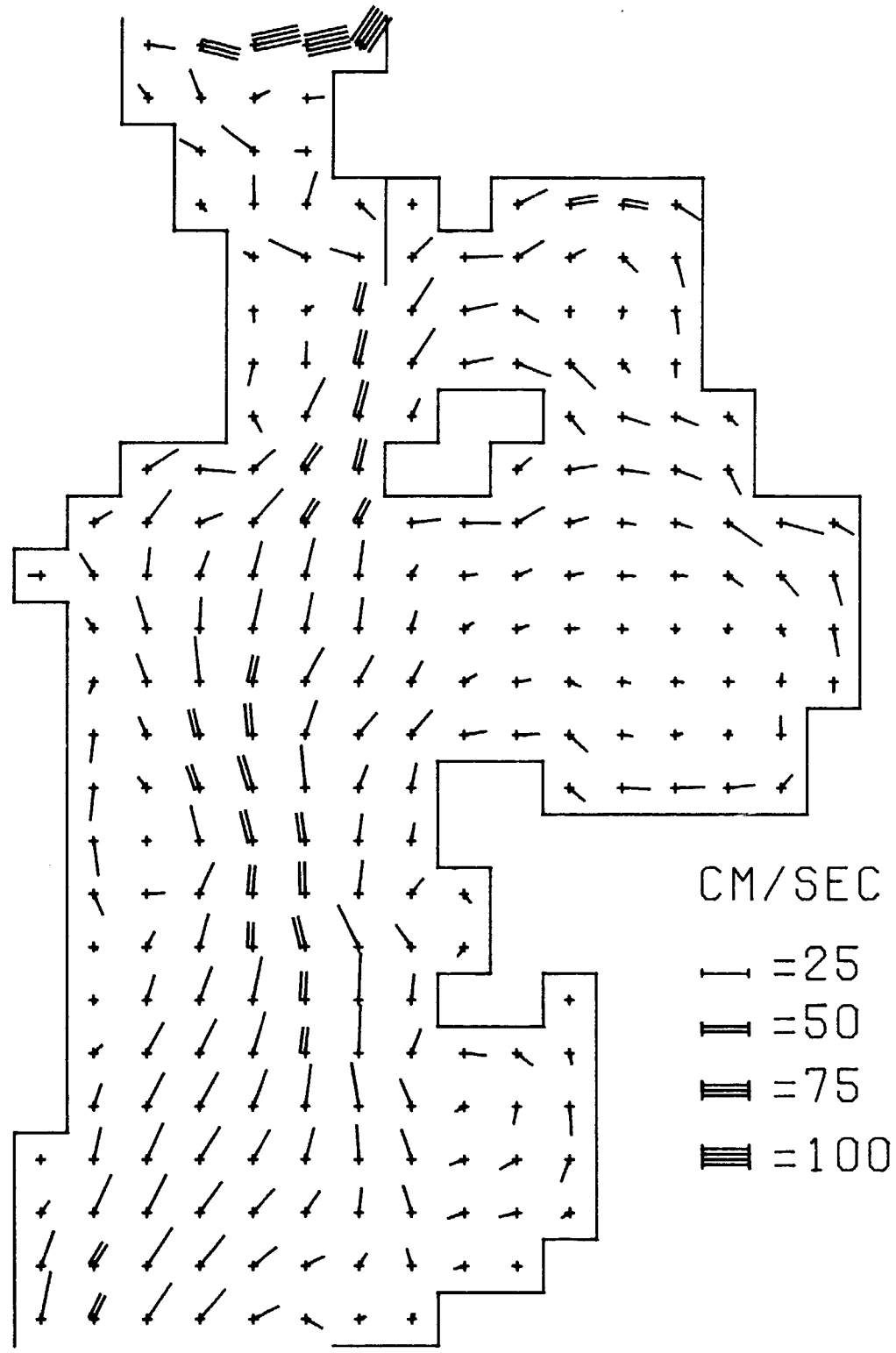

10 HRS 15TH

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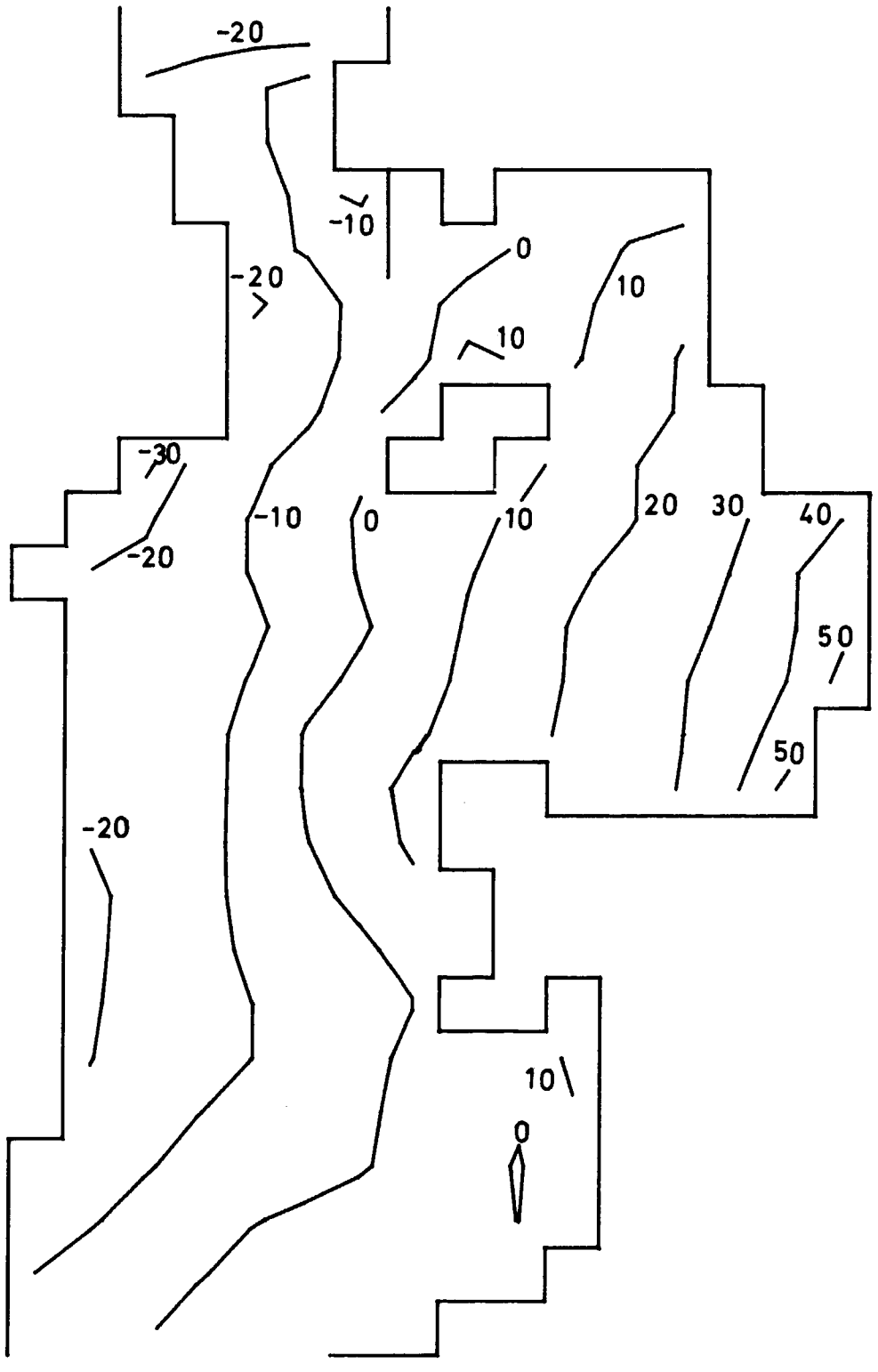

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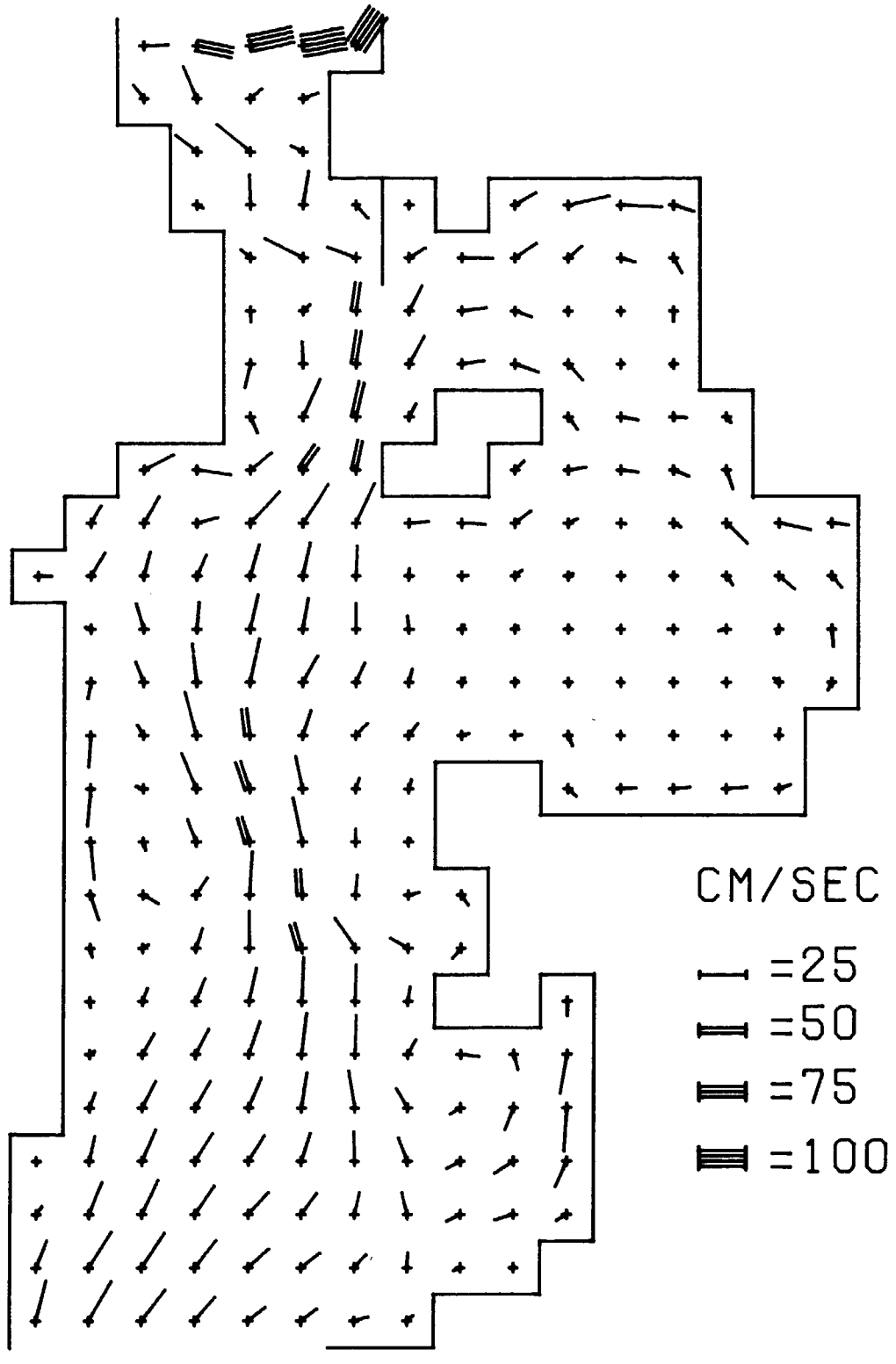

11 HRS 15TH

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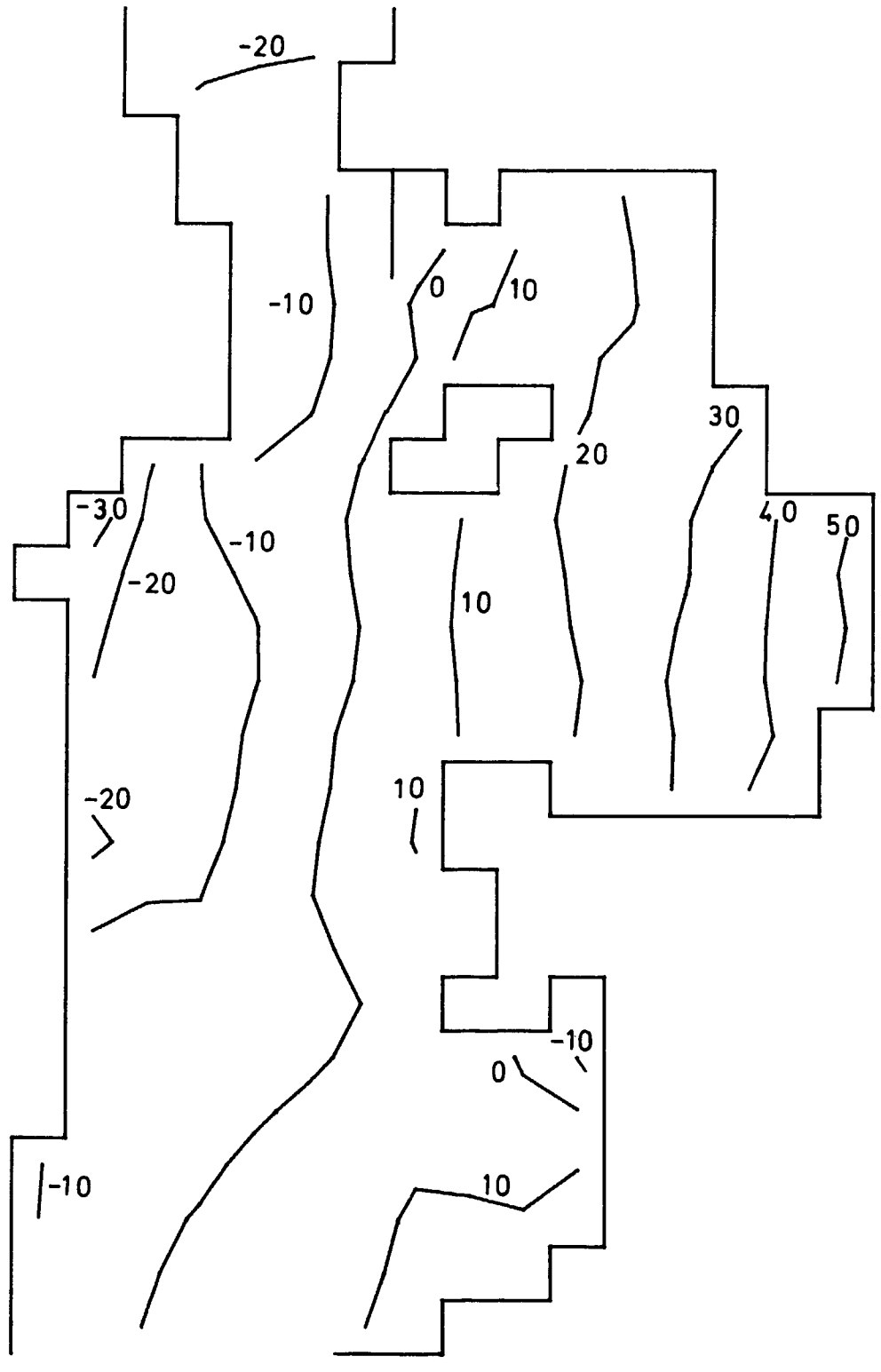

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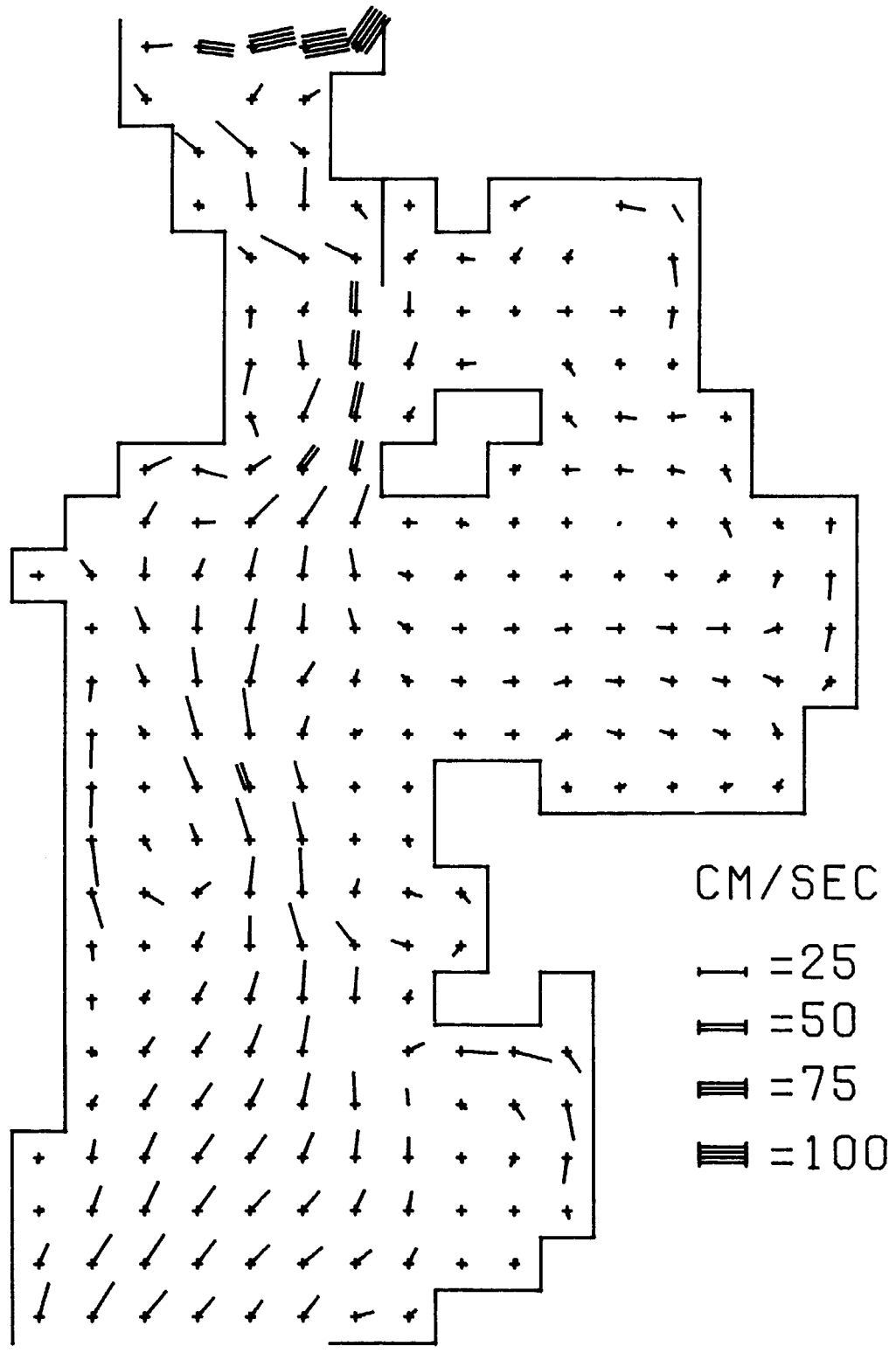

12 HRS 15TH

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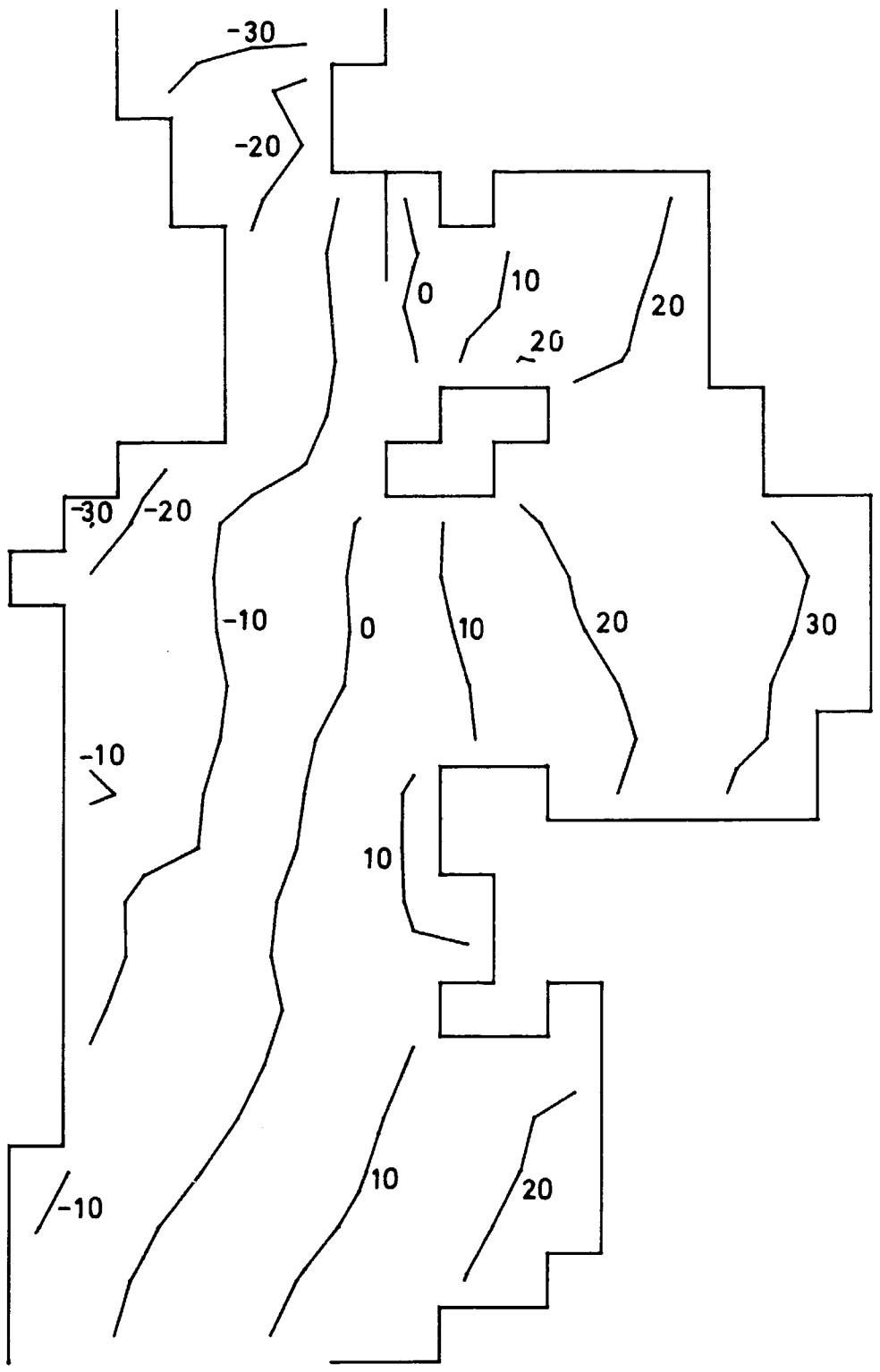

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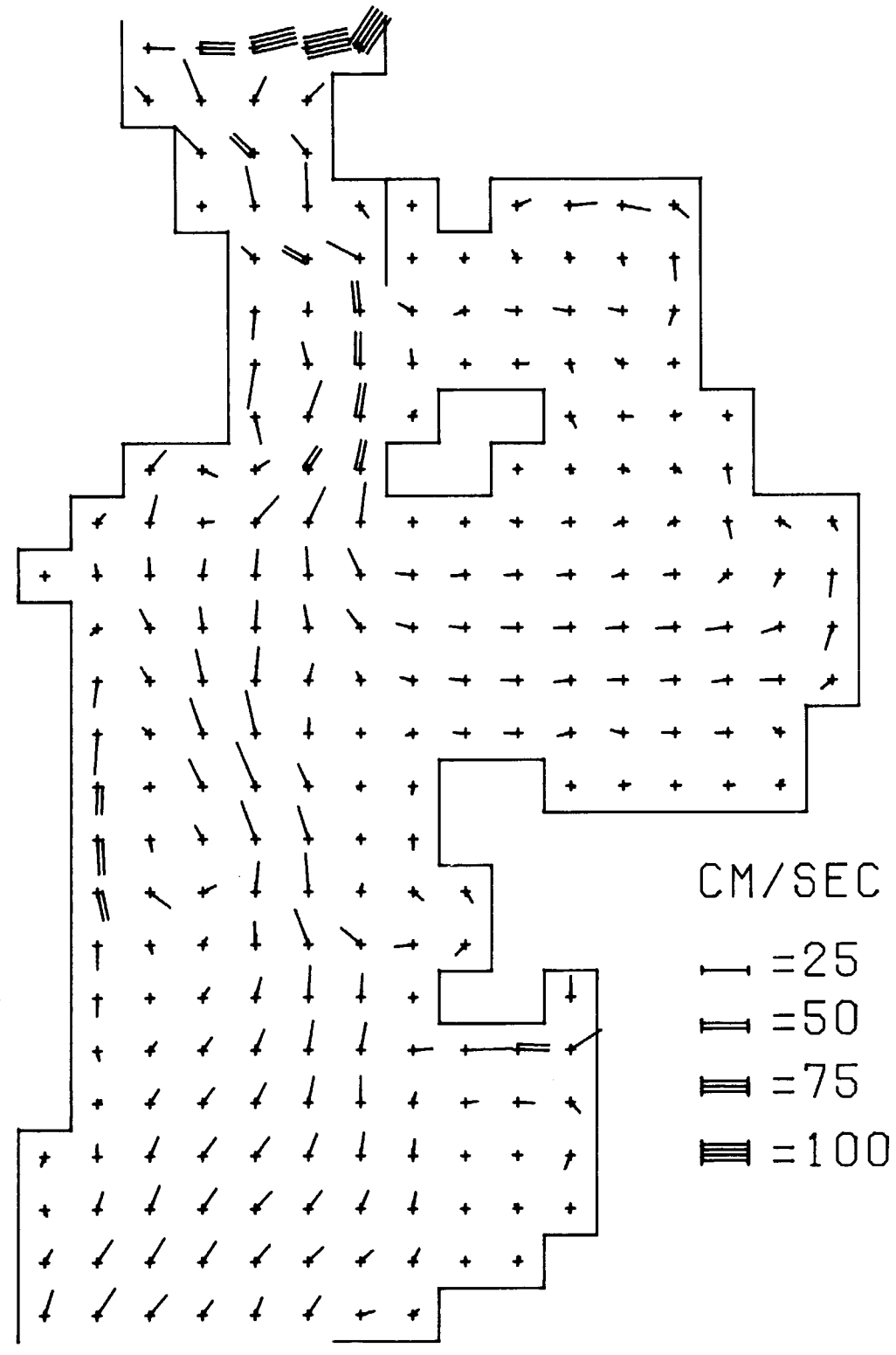

13 HRS 15TH

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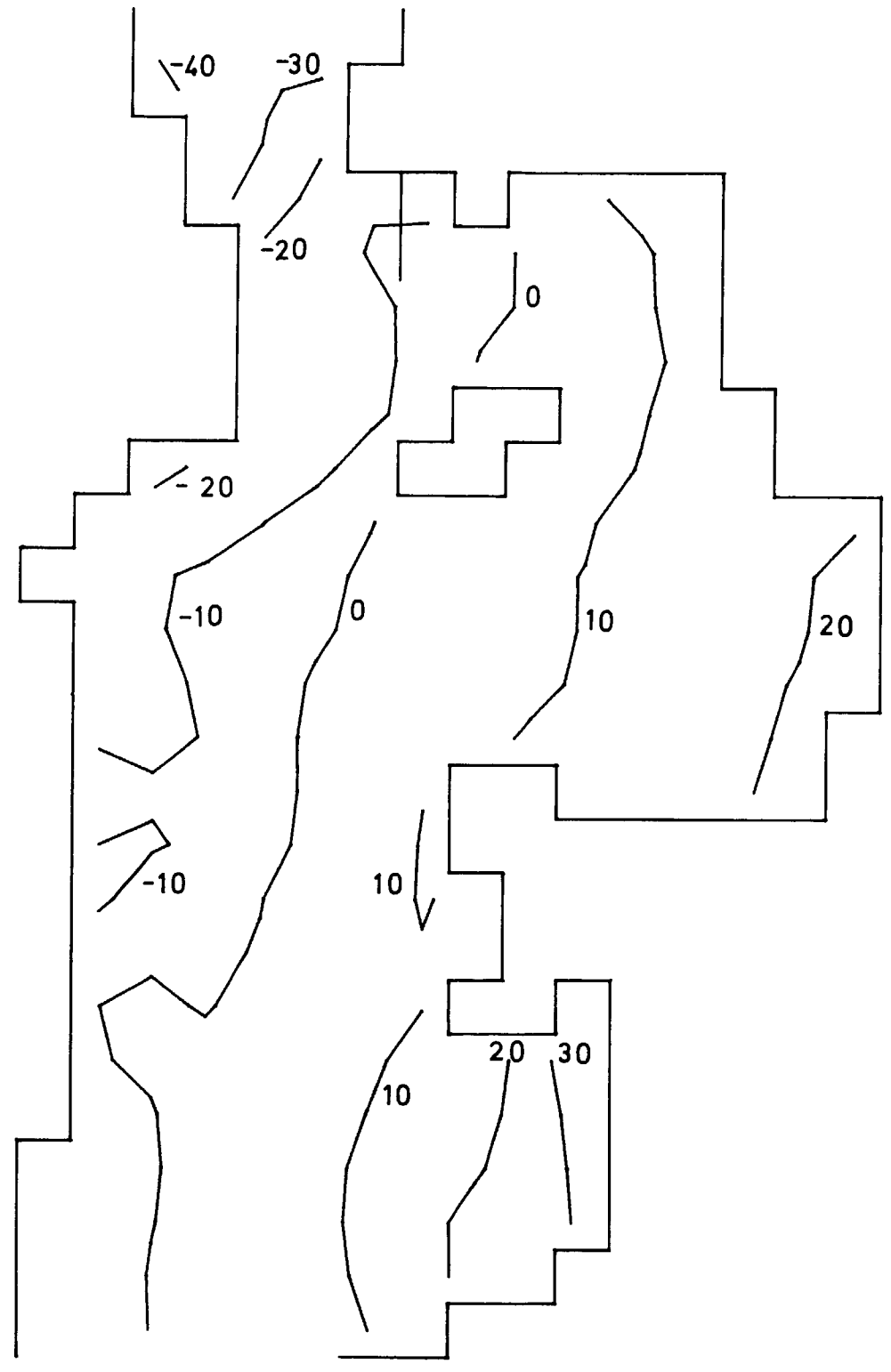

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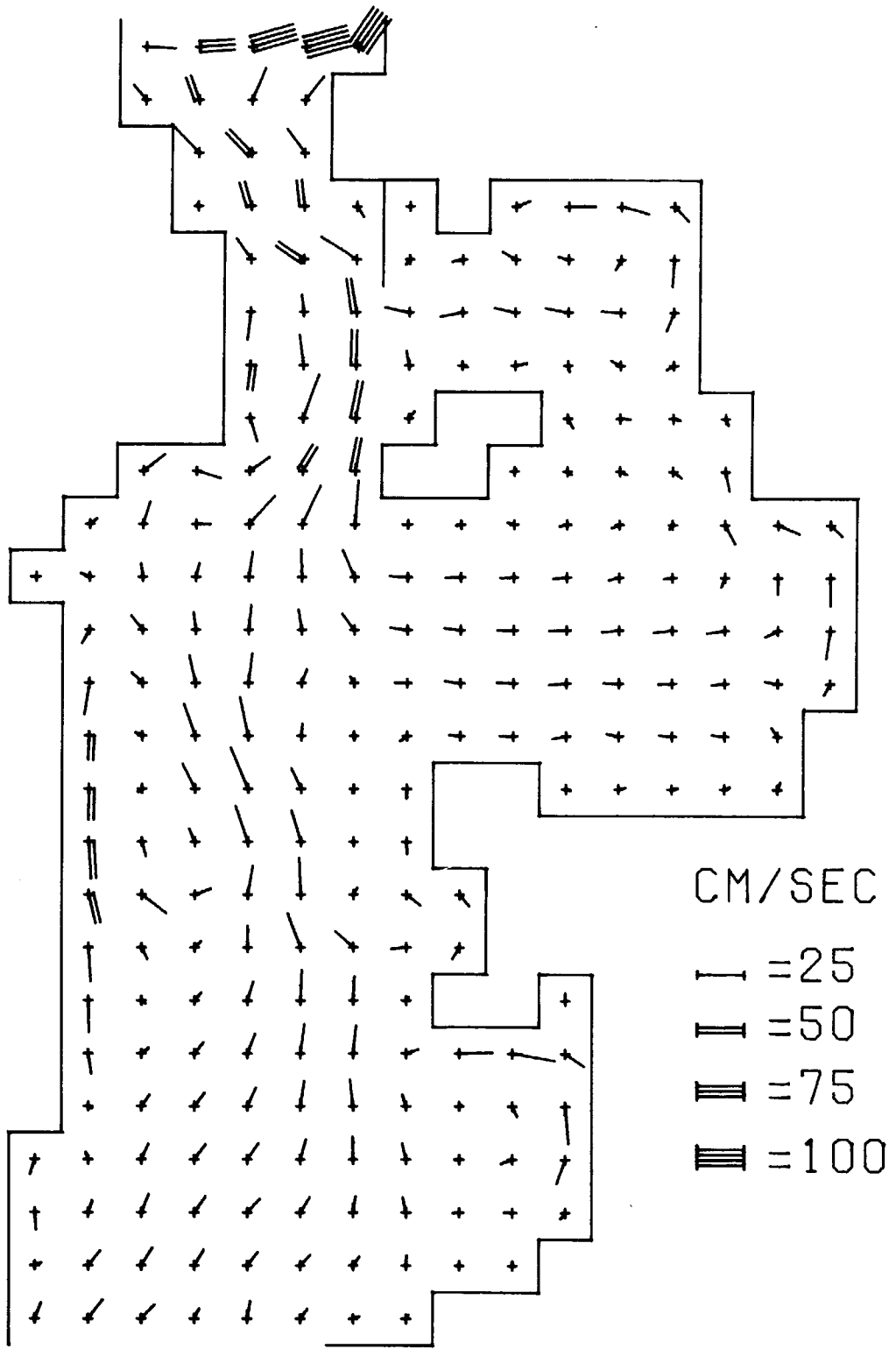

14 HRS 15TH

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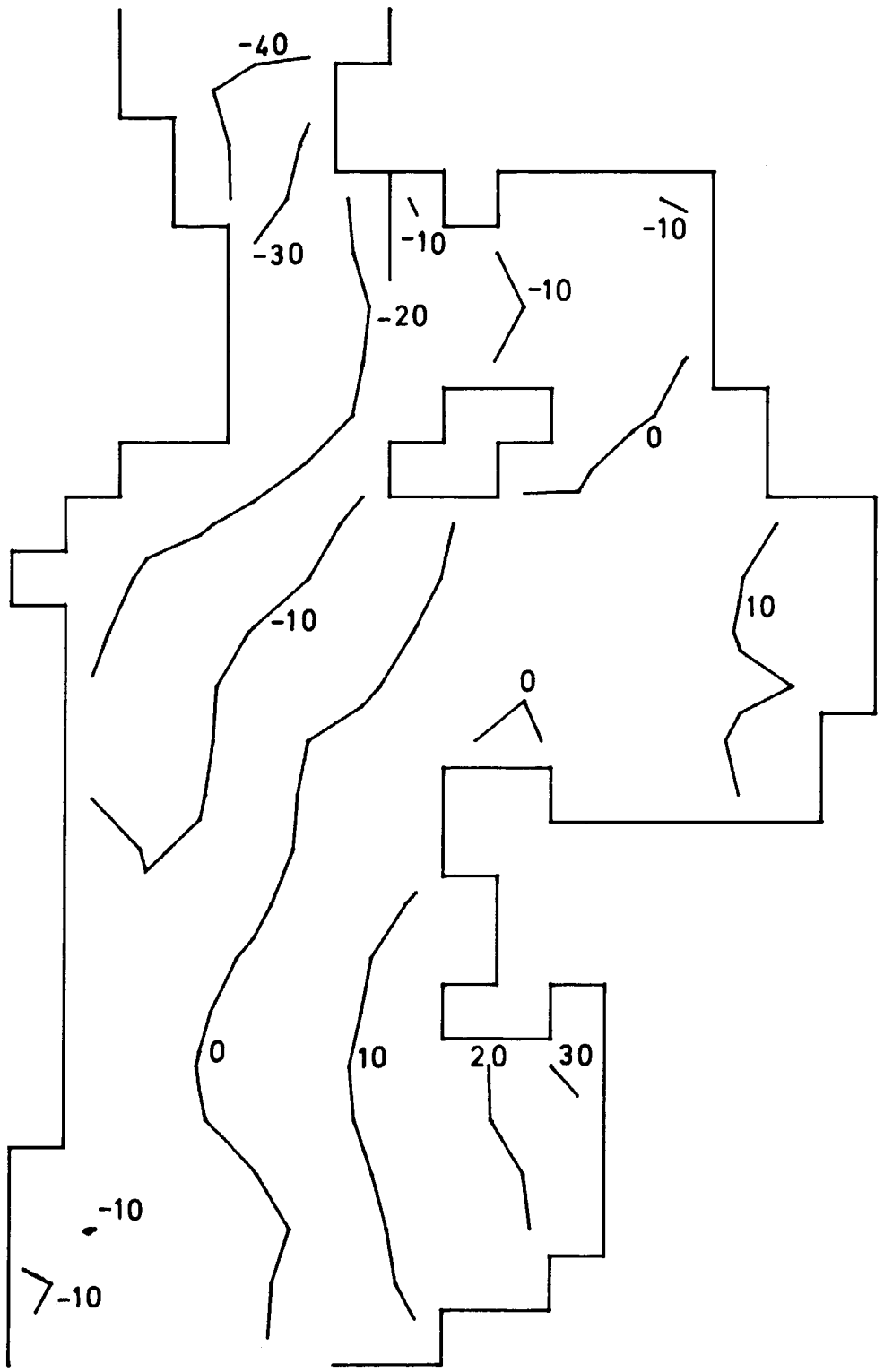

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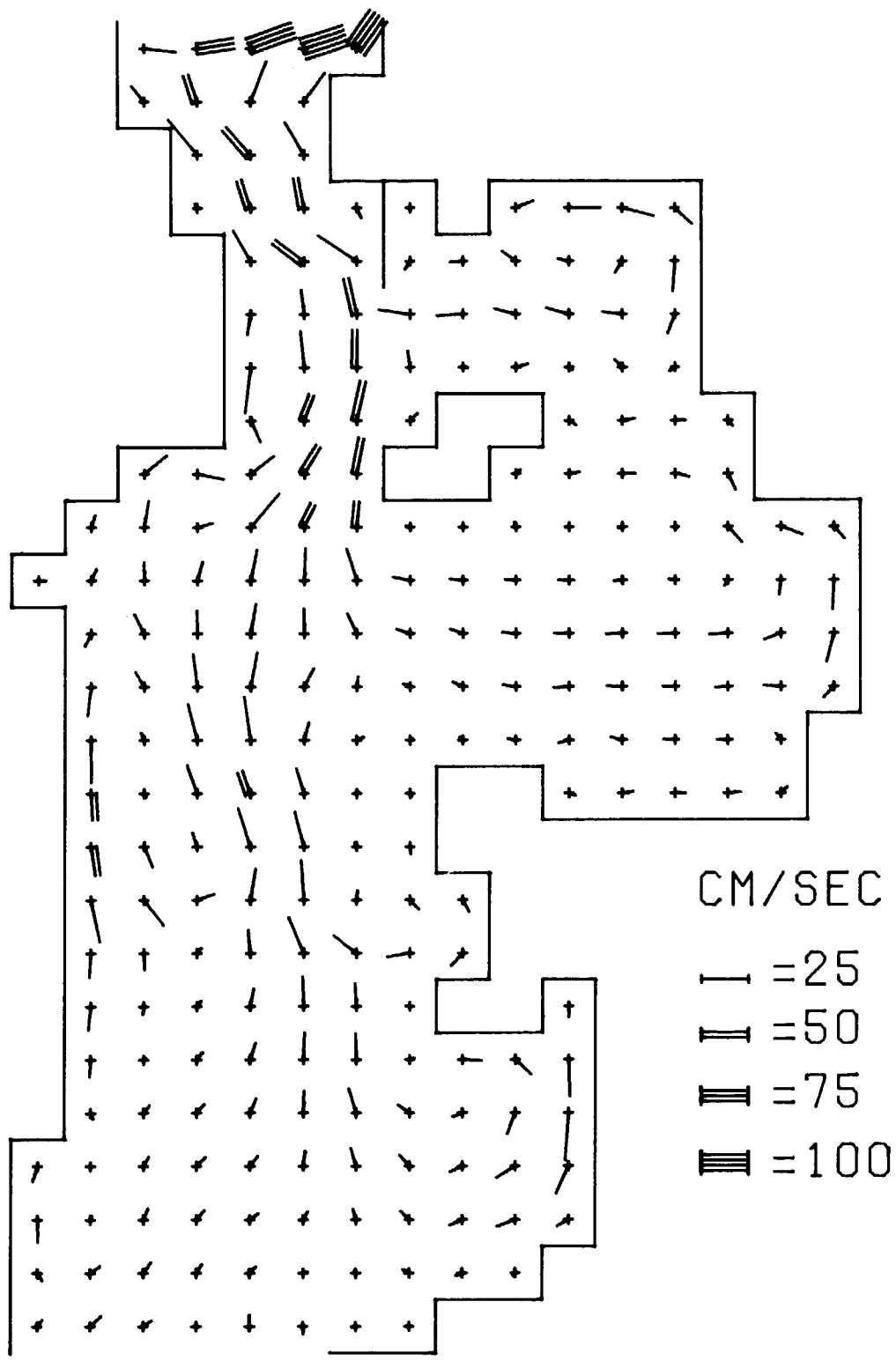

15 HRS 15TH

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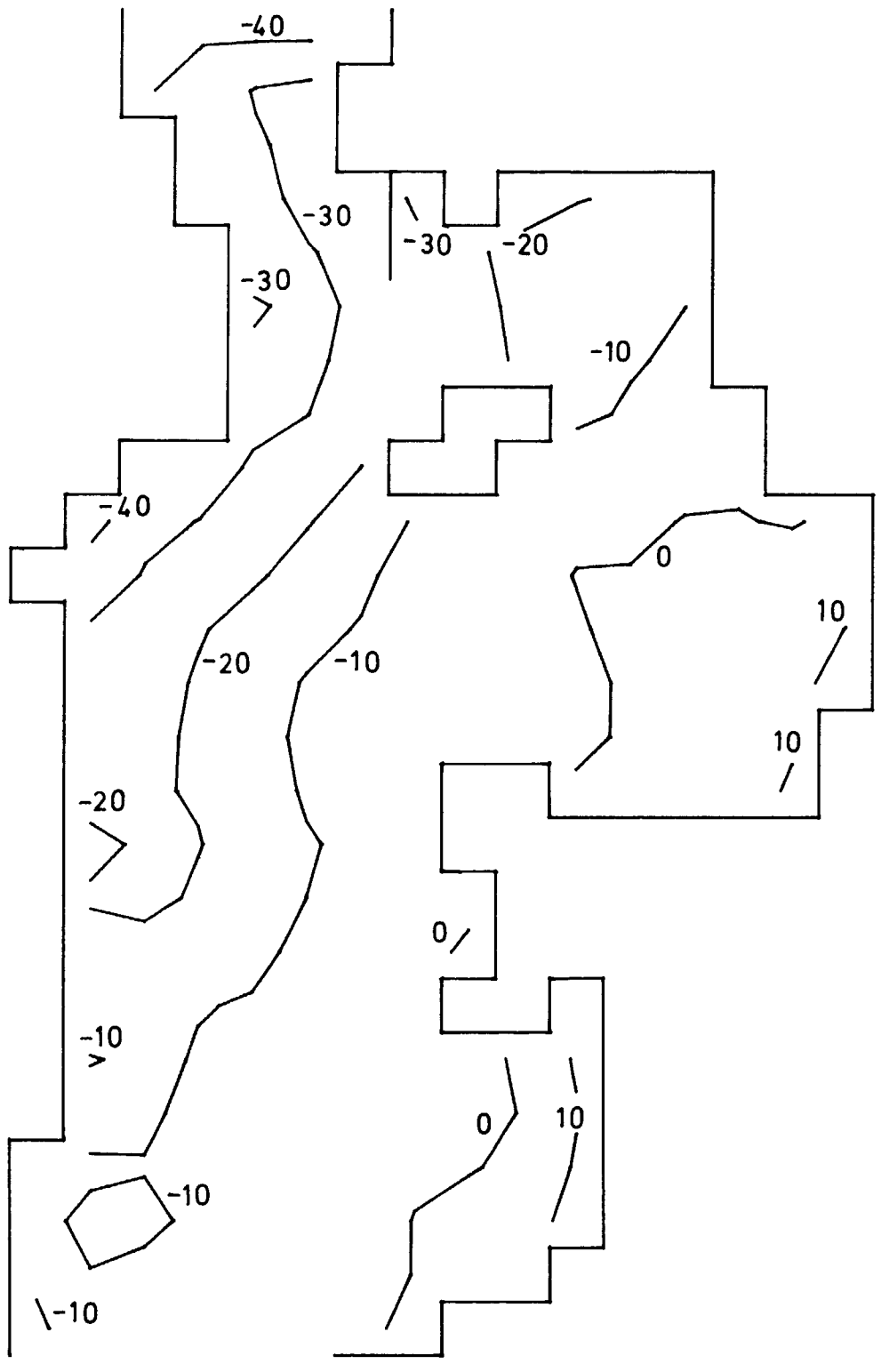

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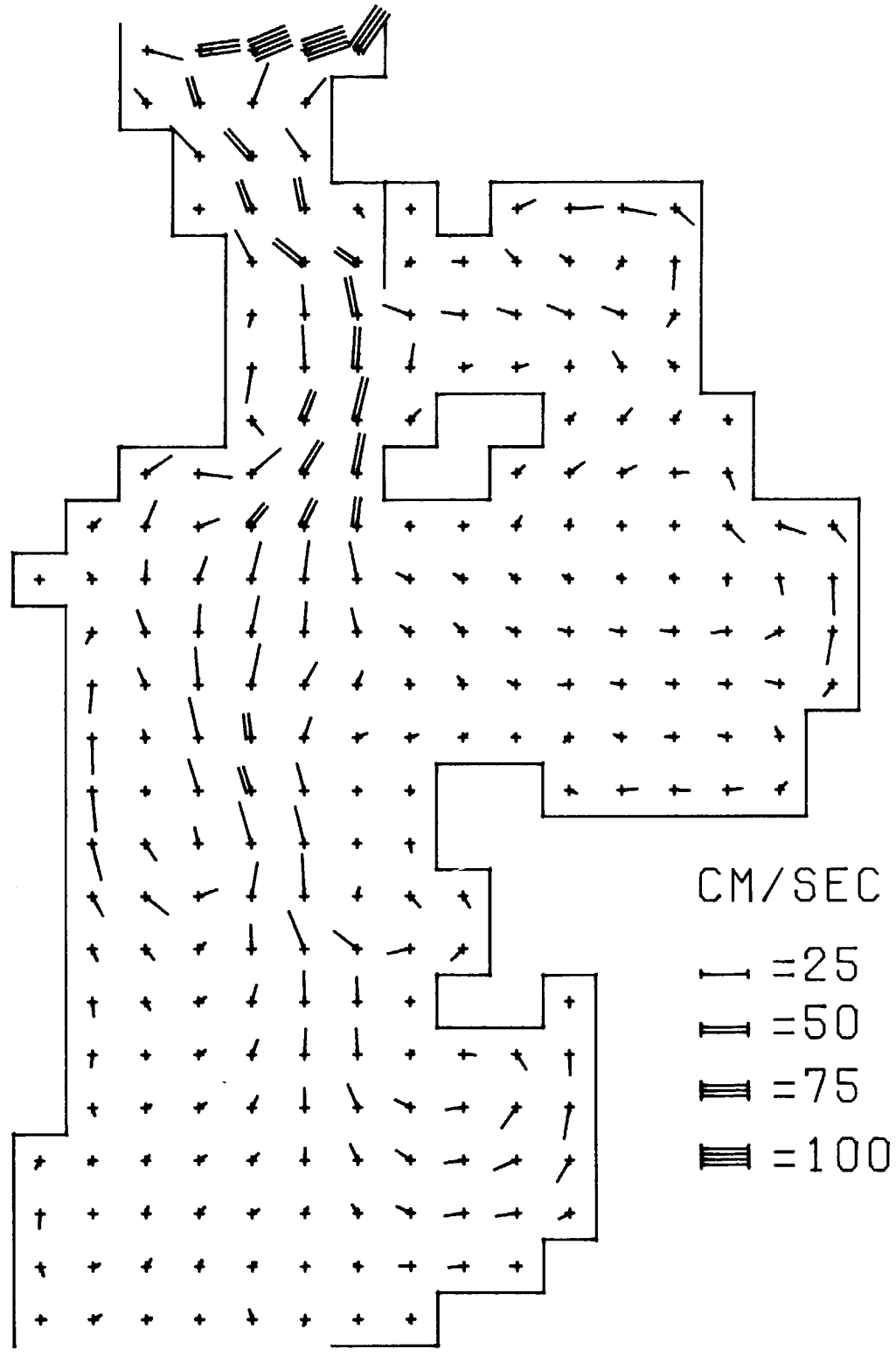

16 HRS 15TH

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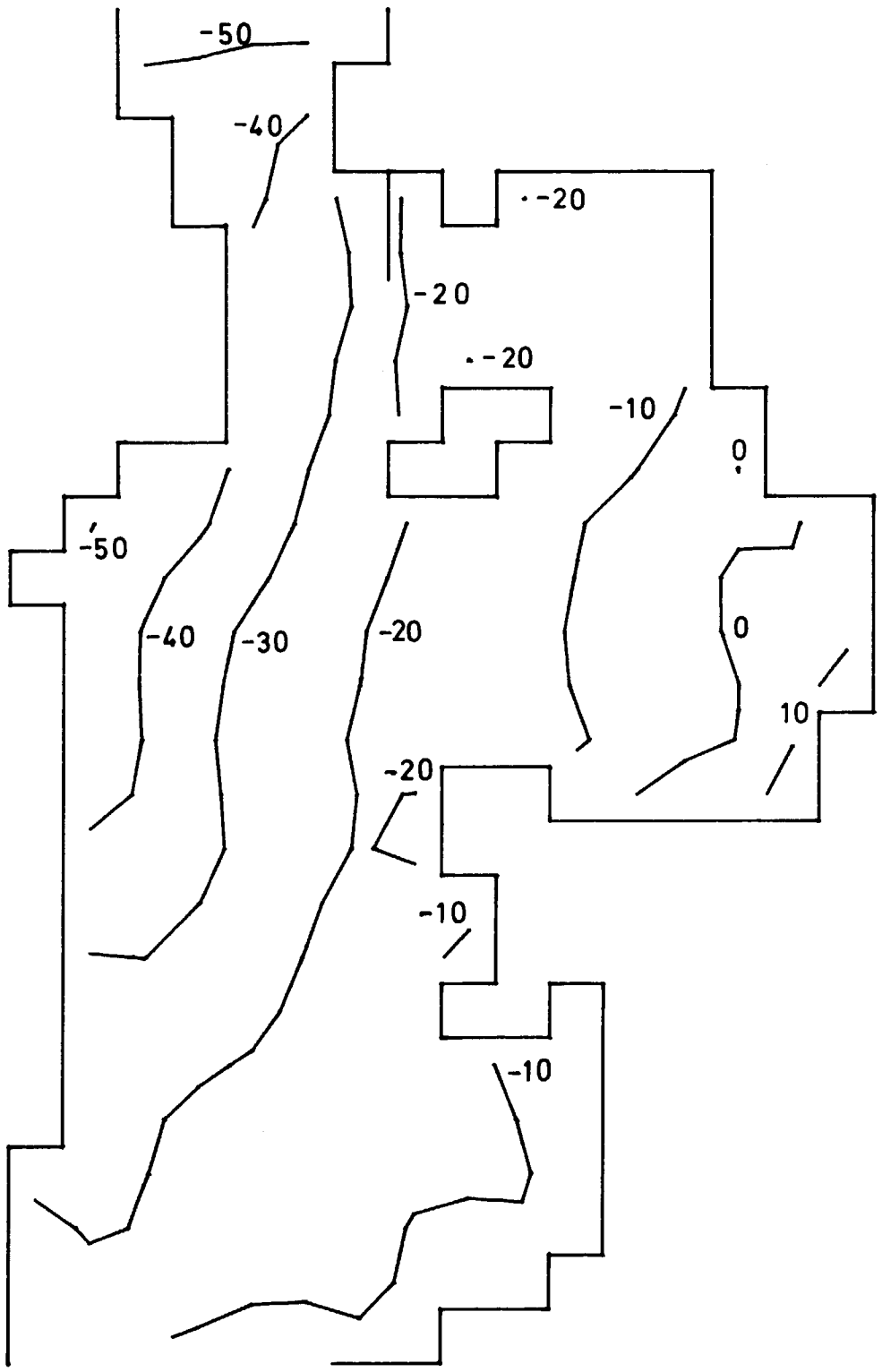

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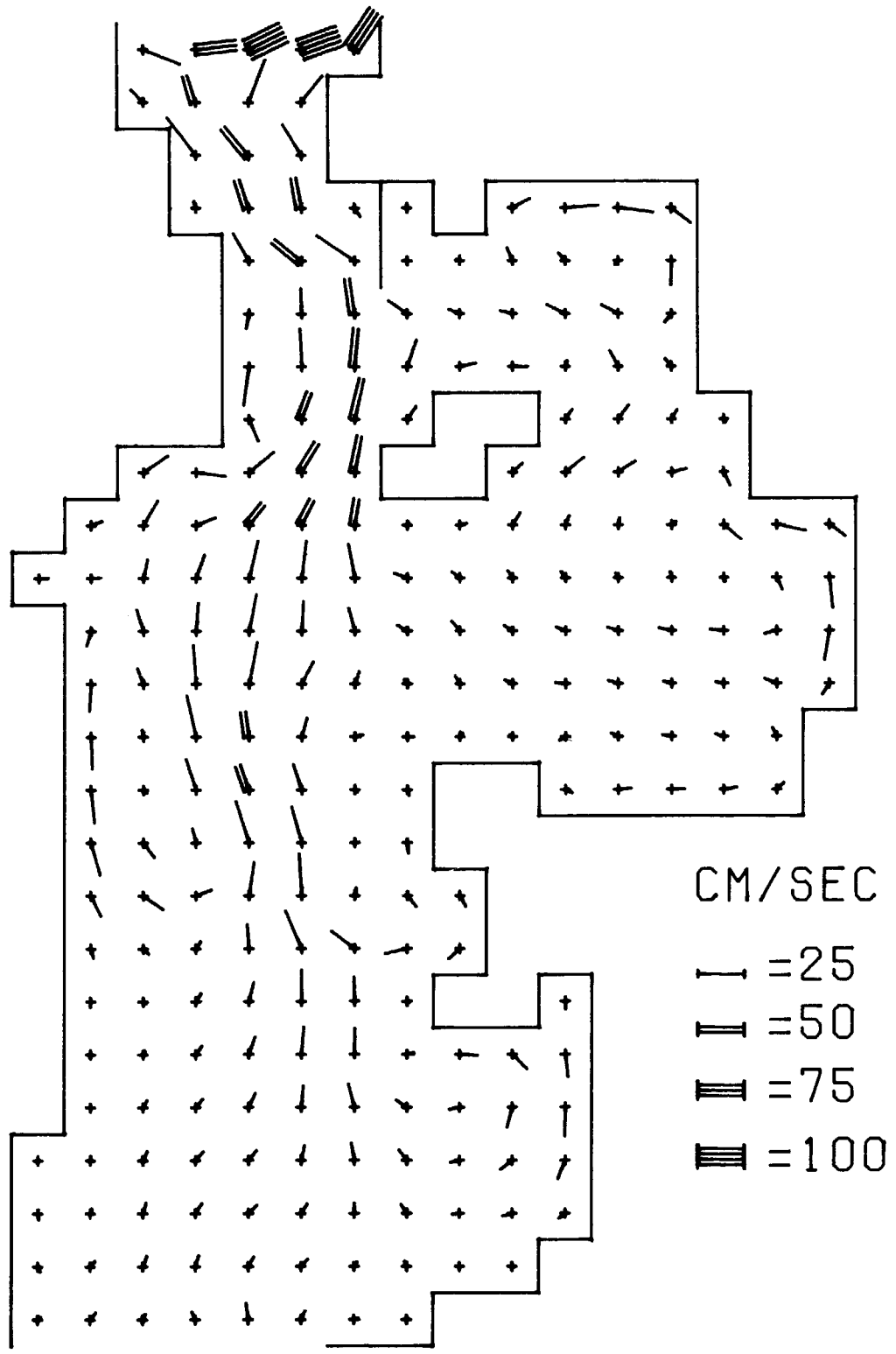

17 HRS 15TH

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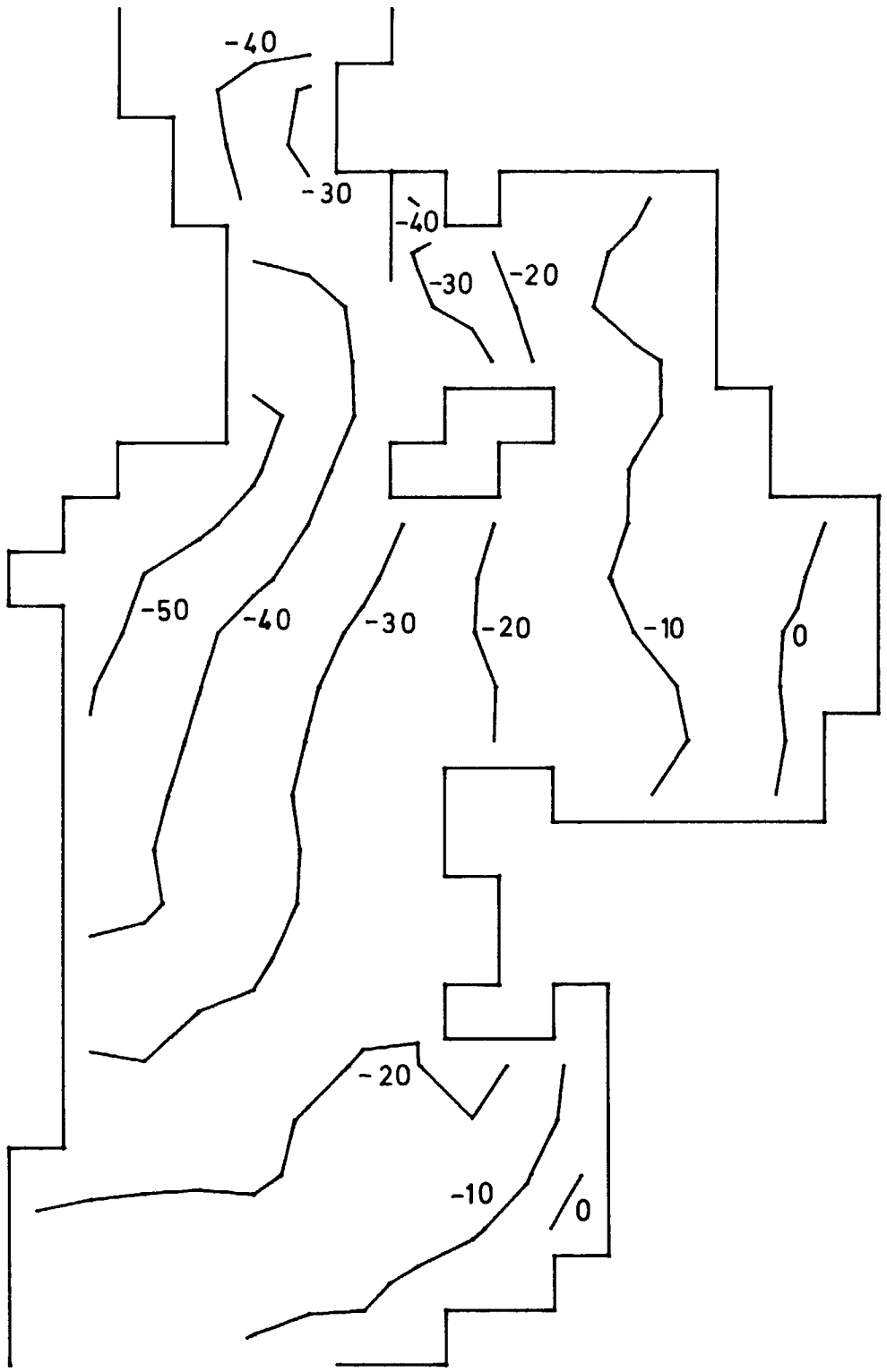

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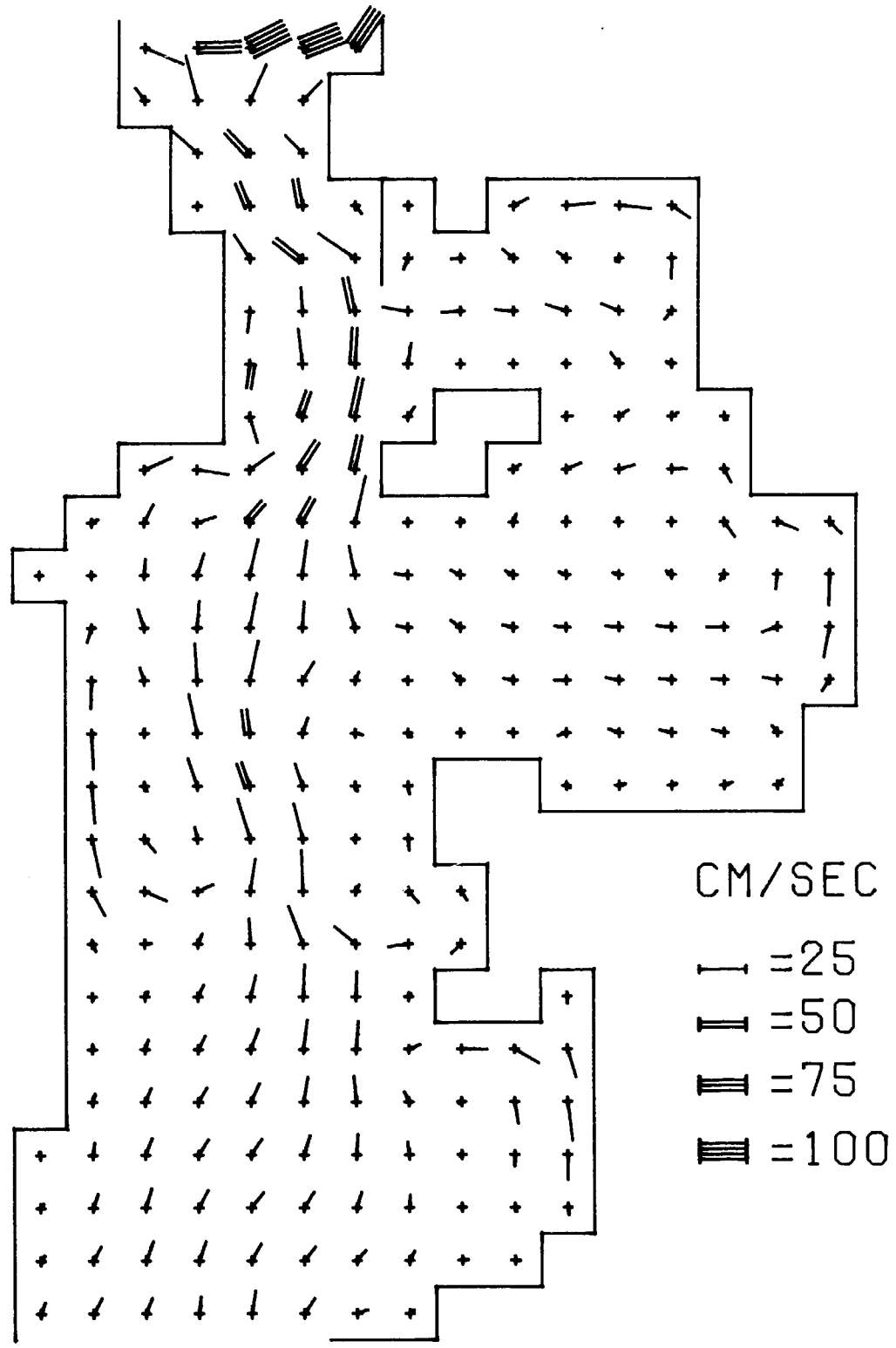

18 HRS 15TH

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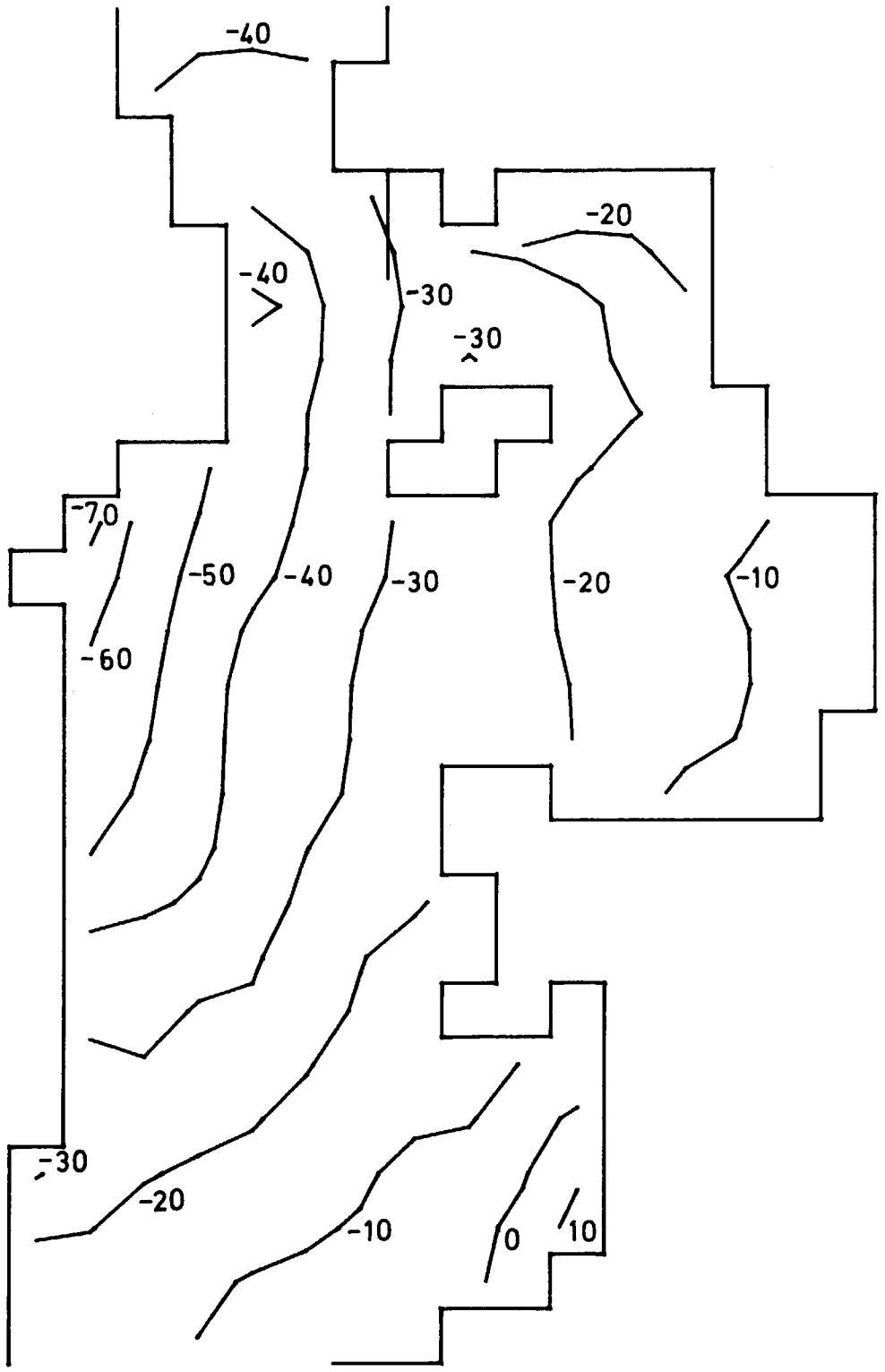

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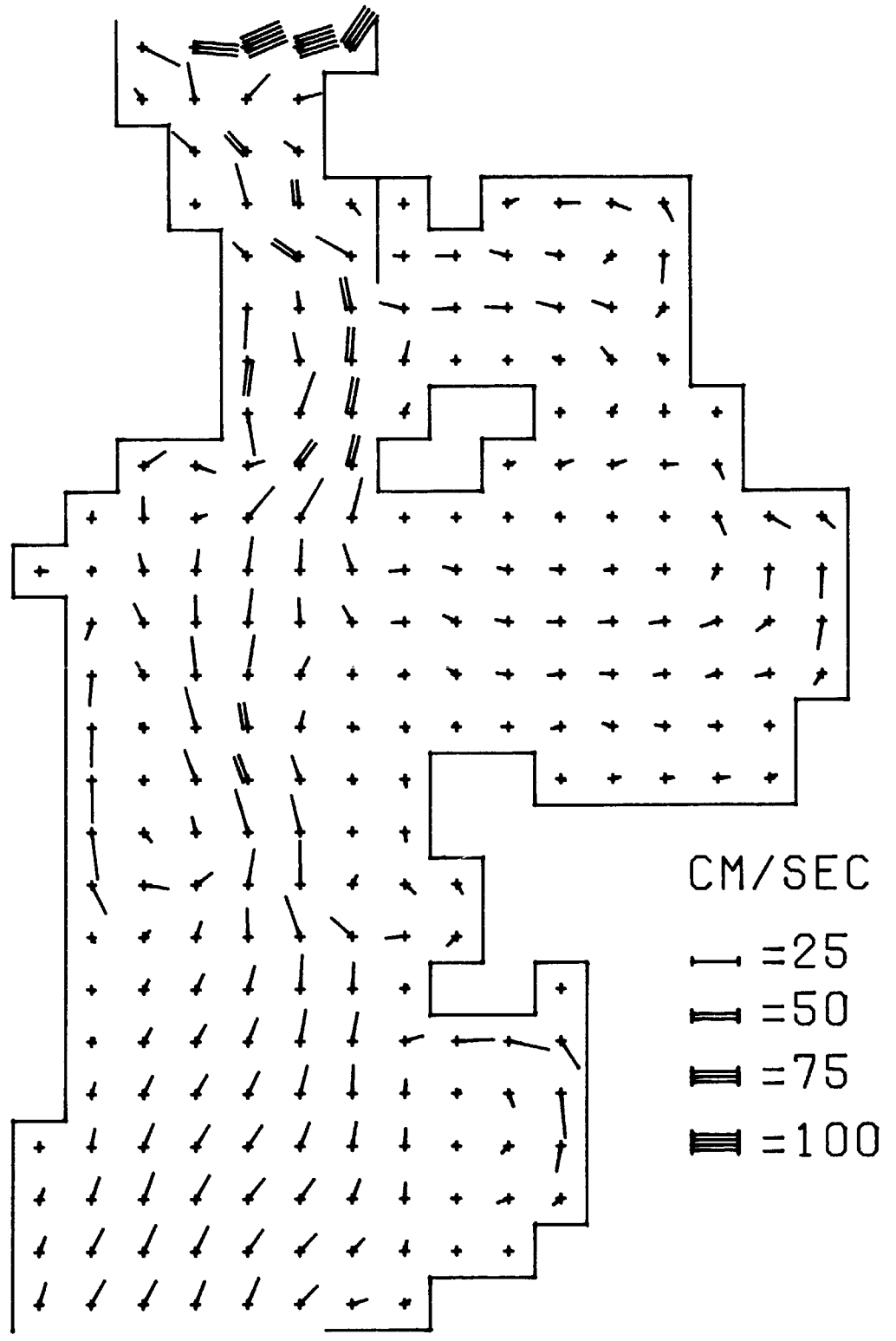

19 HRS 15TH

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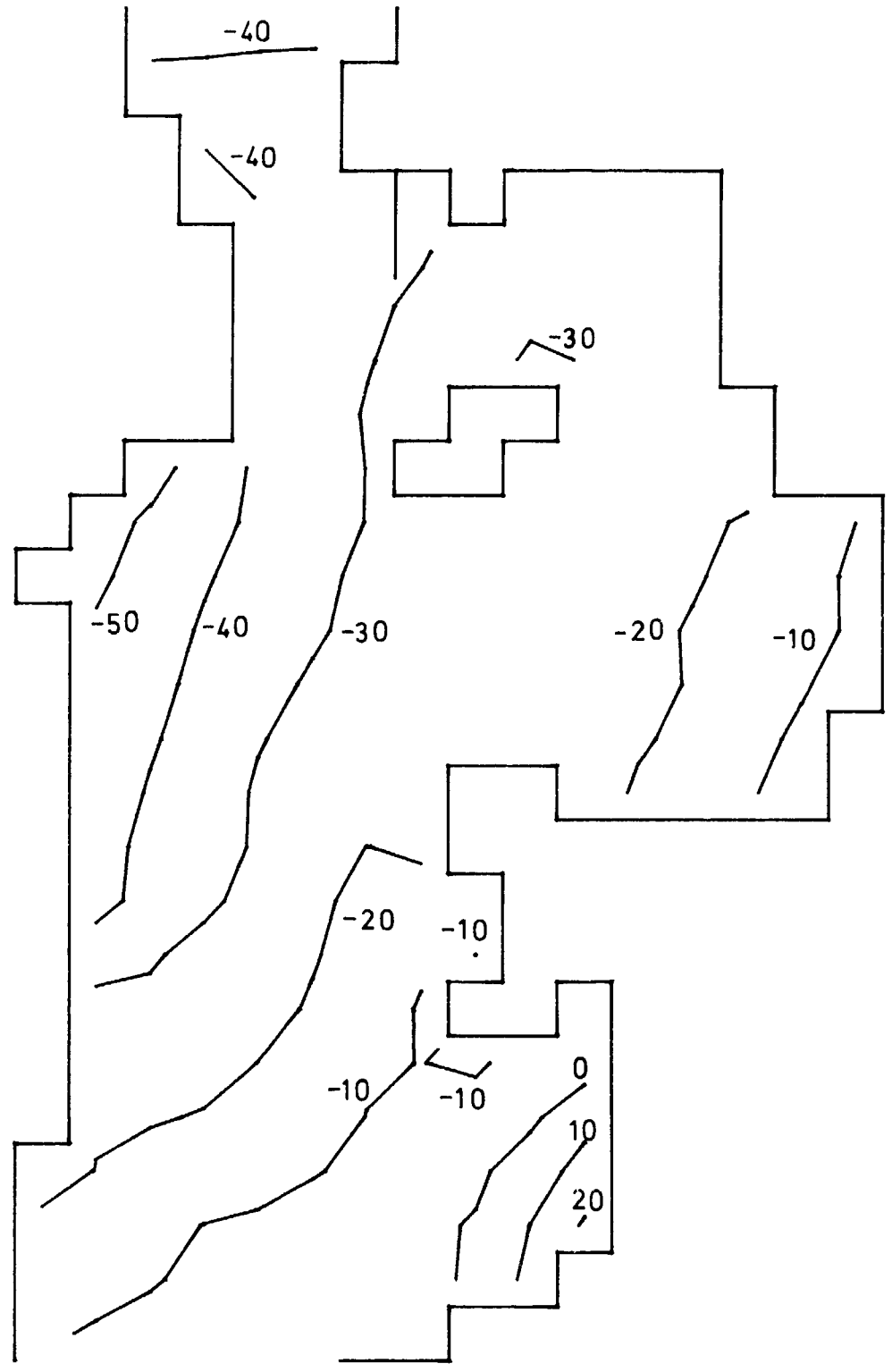

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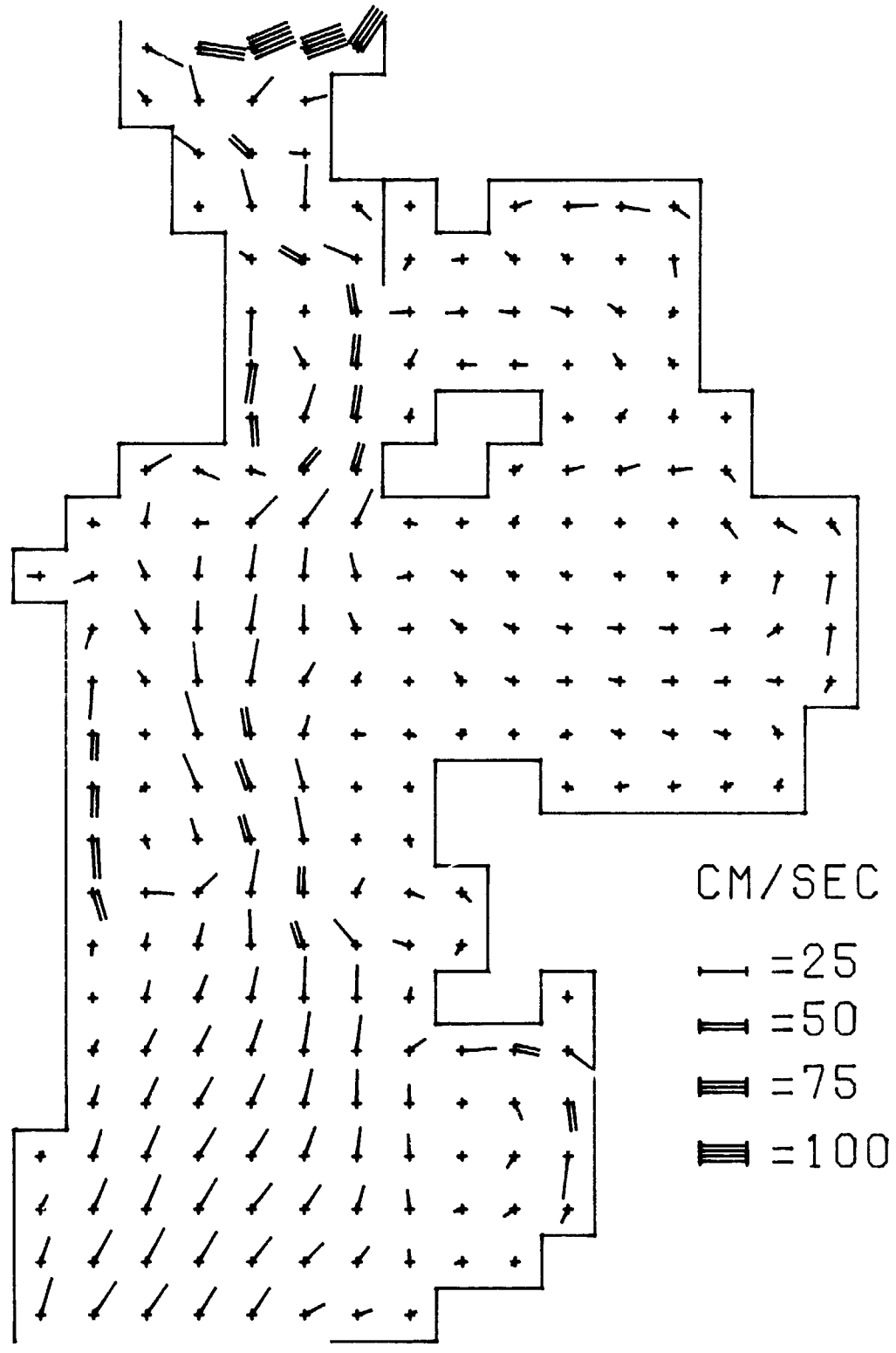

20 HRS 15TH

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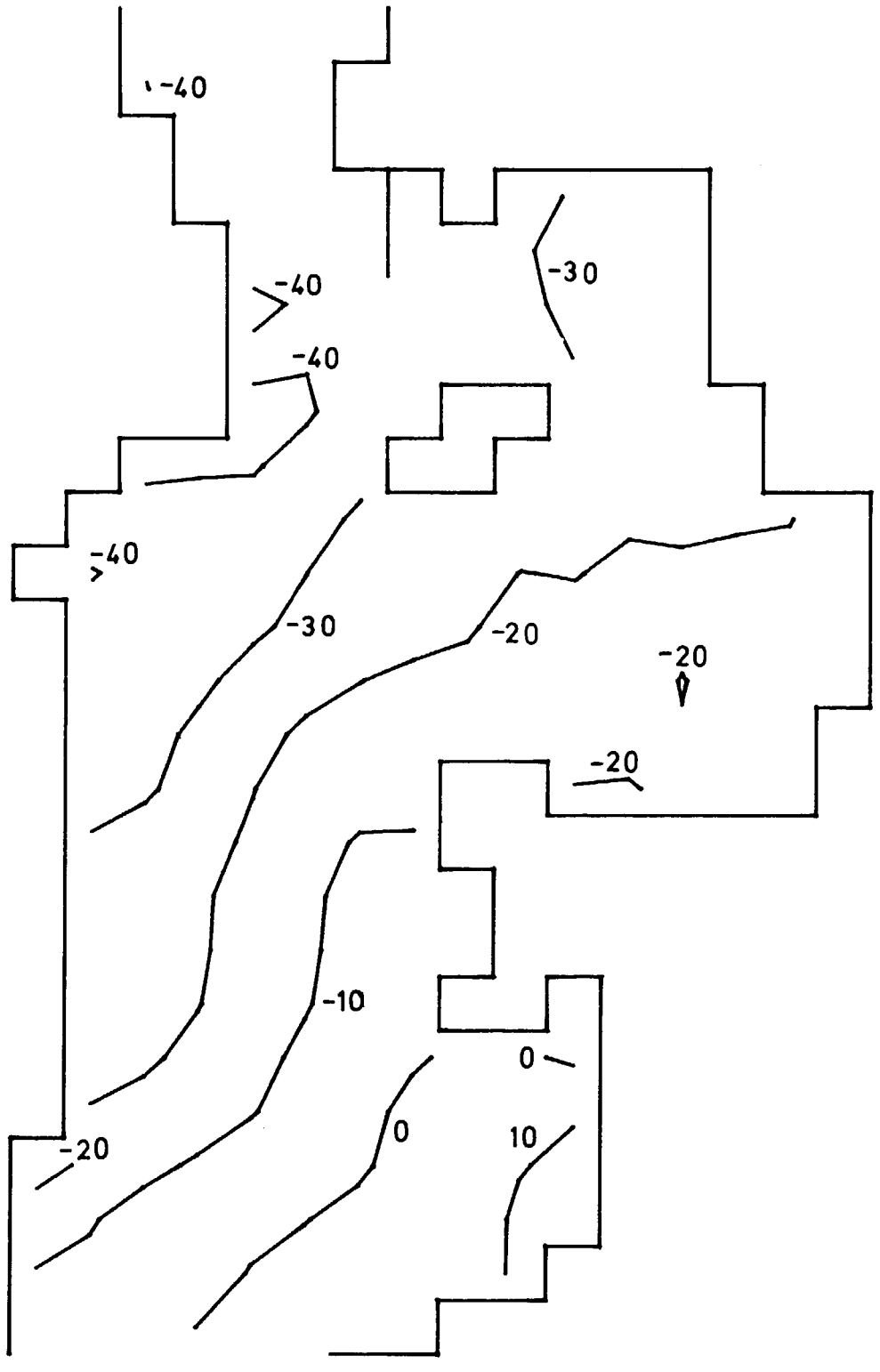

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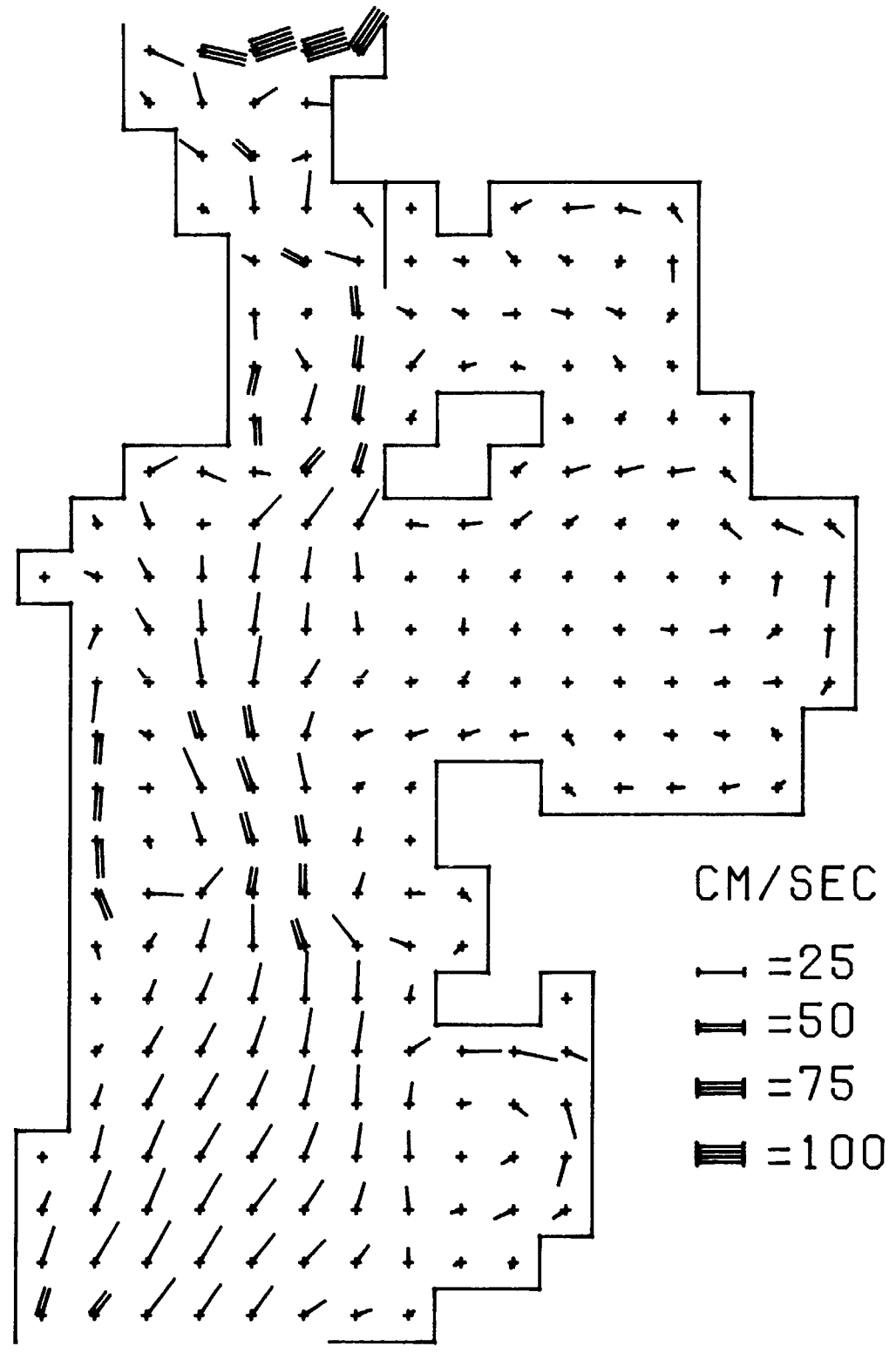

21 HRS 15TH

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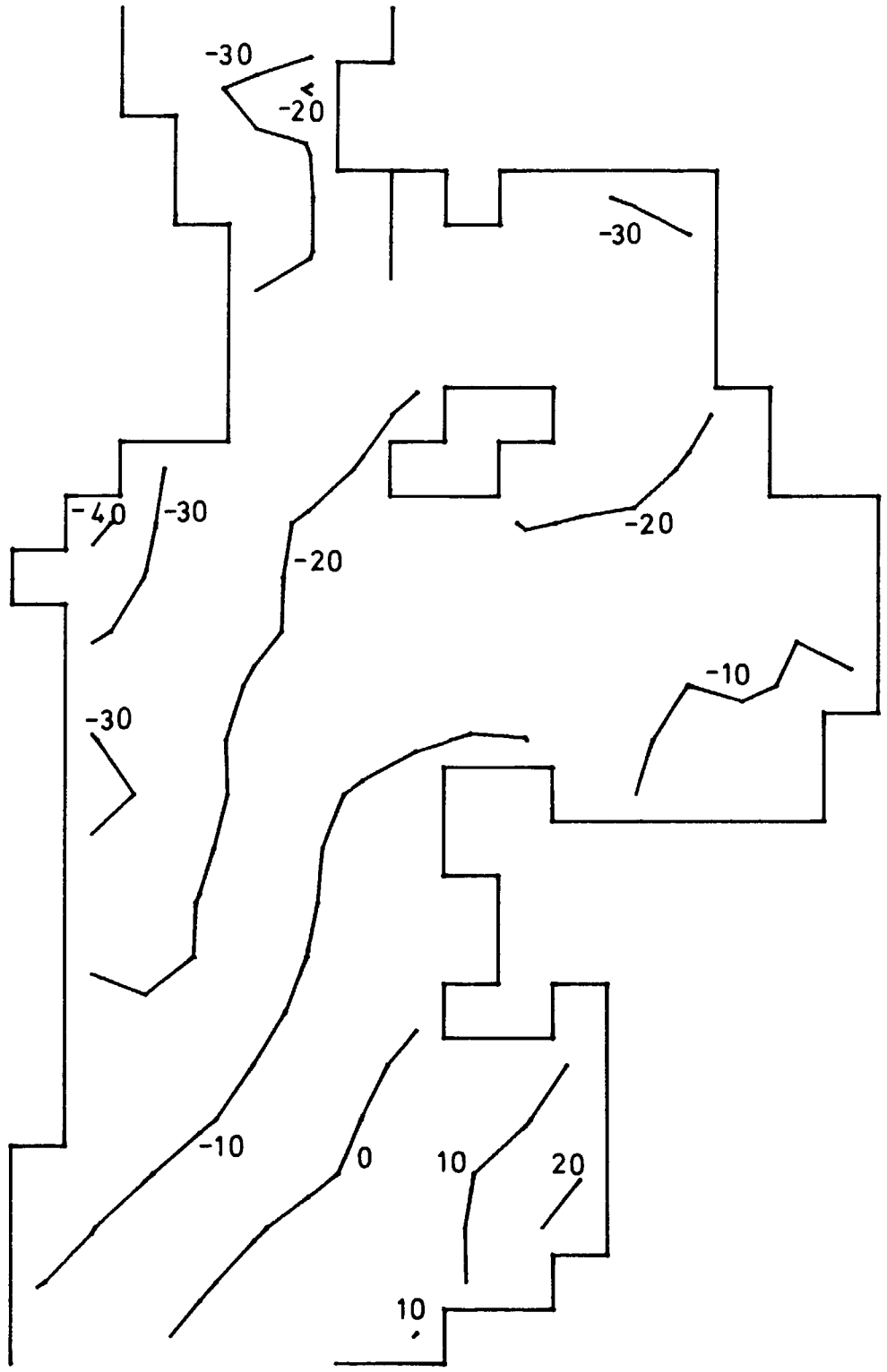

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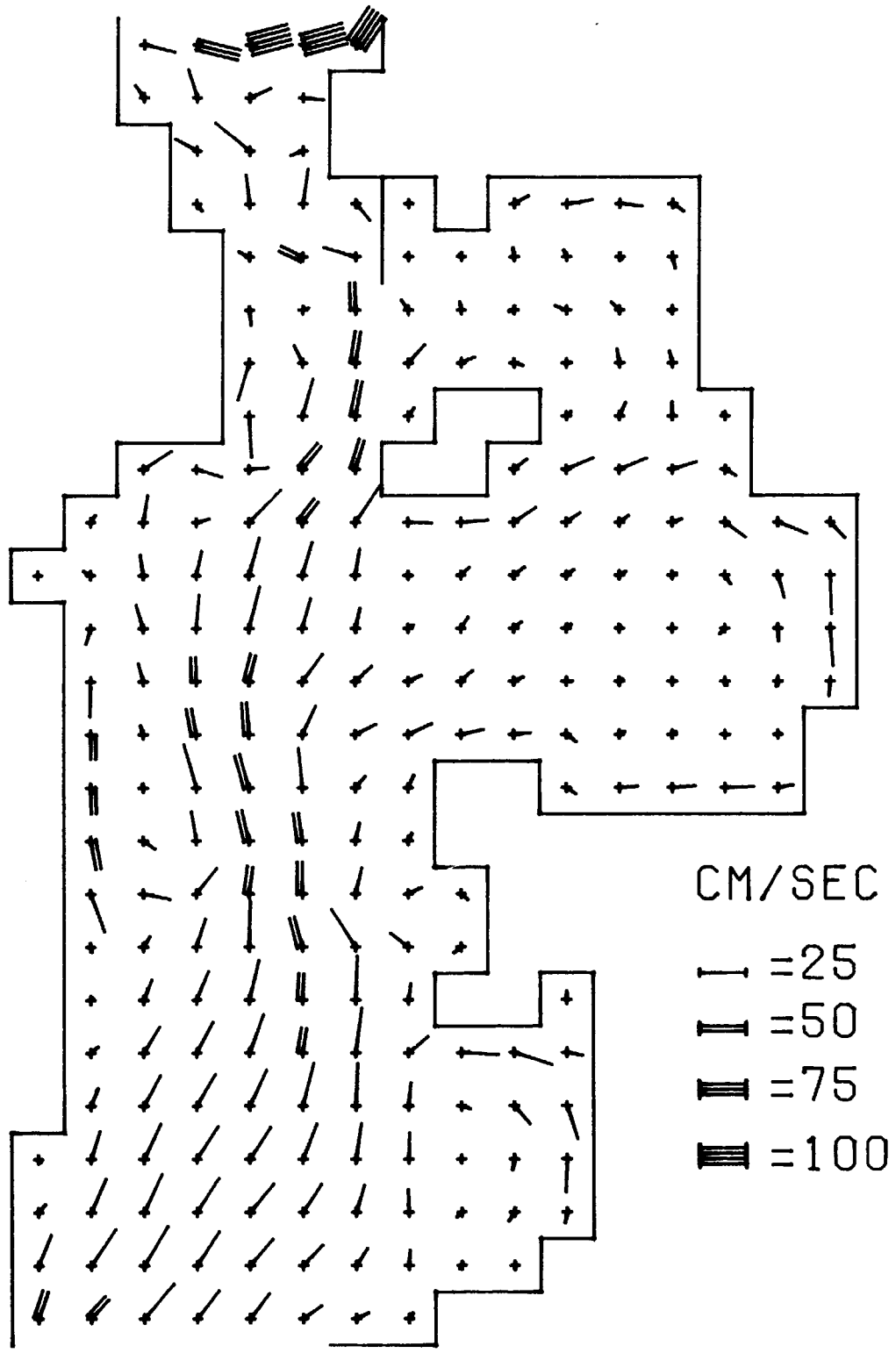
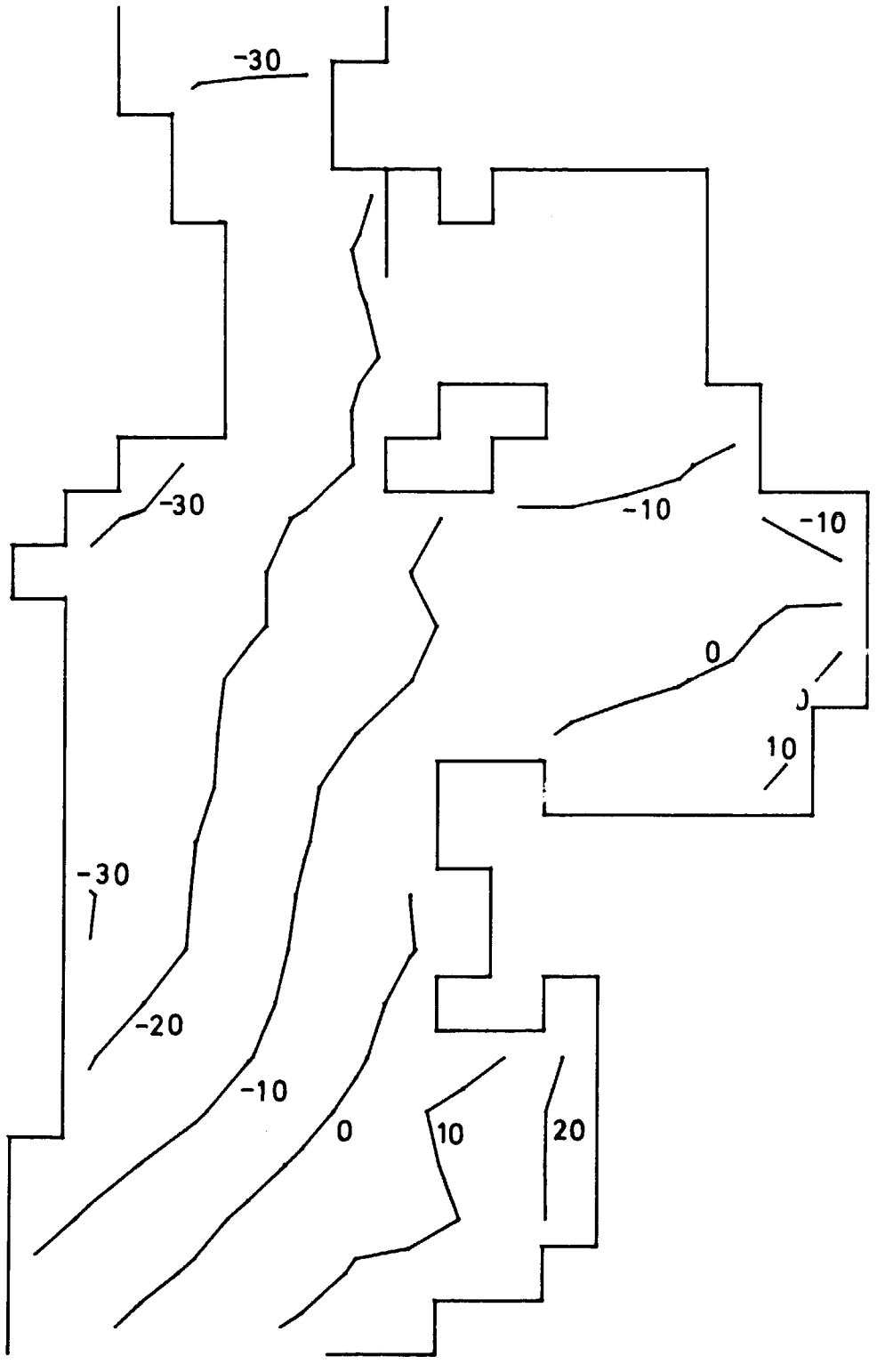


22 HRS 15TH

ELEVATIONS



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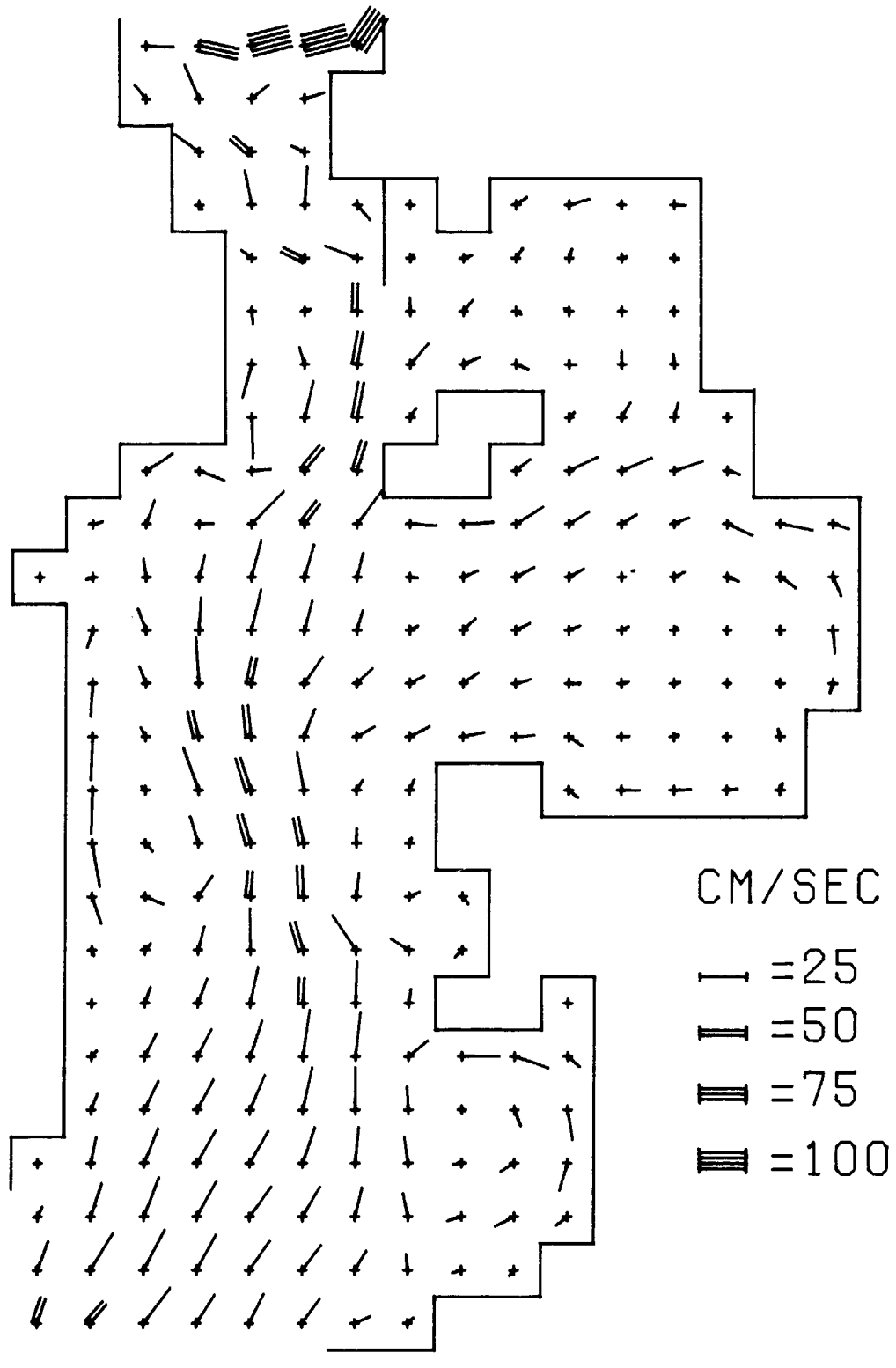

23 HRS 15TH

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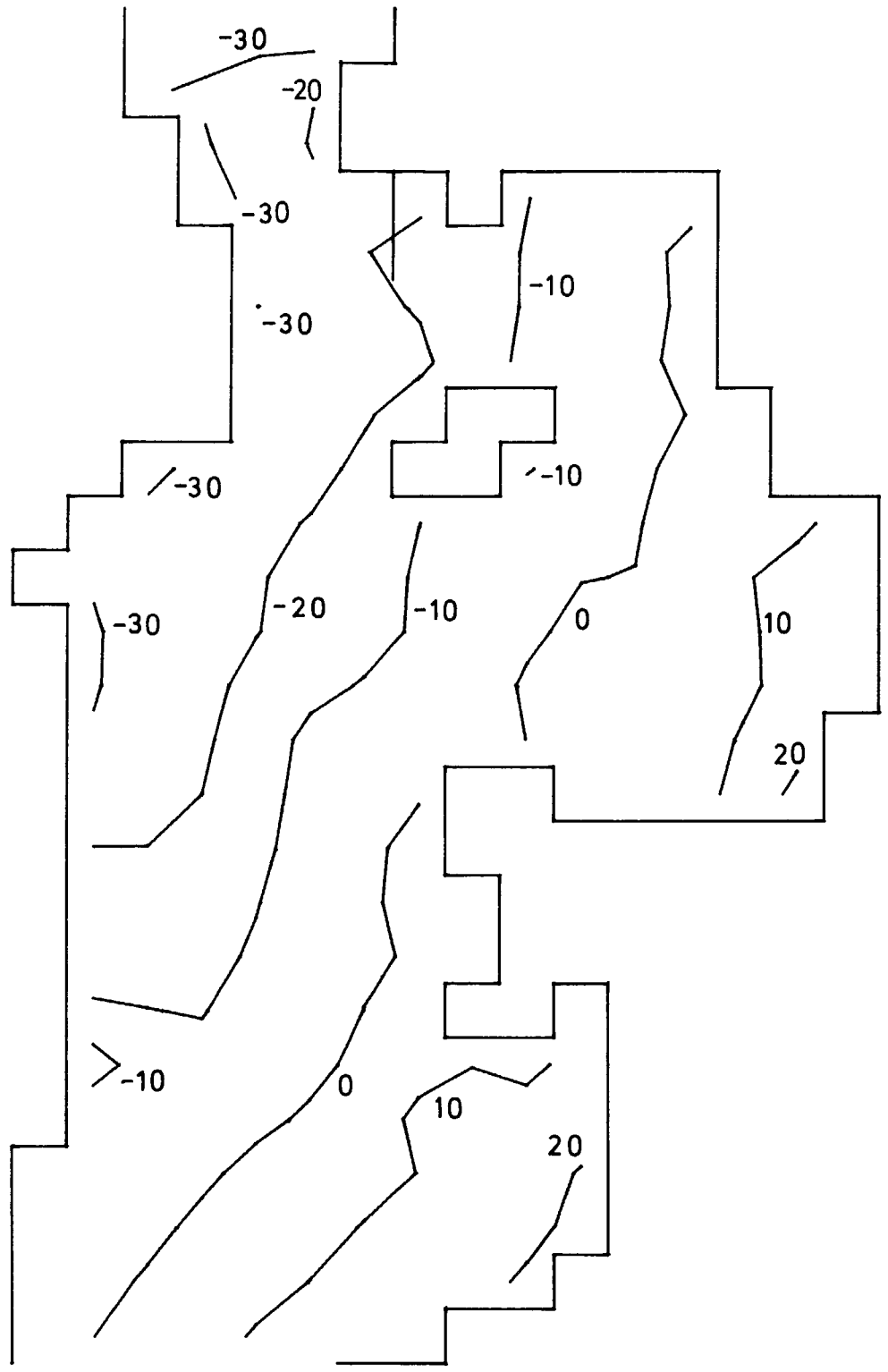

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