US00PP08991P

United States Patent [19]

Sanford et al.

[11] **Patent Number: Plant 8,991**

[45] **Date of Patent: Nov. 29, 1994**

[54] **STRAWBERRY SENECA**

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[21] Appl. No.: **22,948**

[22] Filed: **Feb. 26, 1993**

Related U.S. Application Data

[63] Continuation of Ser. No. 757,051, Sep. 9, 1991, abandoned.

[51] **Int. Cl.**[5] **A01H 5/00**

[52] **U.S. Cl.** **Plt./48**

[58] **Field of Search** ..... Plt. 48, 49

[56] **References Cited**

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Primary Examiner—James R. Feyrer

Assistant Examiner—Erich E. Veitenheimer

Attorney, Agent, or Firm—Jones, Tullar & Cooper

[57] **ABSTRACT**

A new and distinct variety of strawberry (Fragaria×Ananassa) which is exceptional in combining large yield, potential large fruit size, extreme fruit firmness and good fruit quality. The strawberry is named 'Seneca' and was tested as NY 1529.

9 Drawing Sheets

This application is a continuation of application Ser. No. 07/757,051, filed Sep. 9, 1991 now abandoned.

BACKGROUND OF THE INVENTION

This new cultivar was developed by the small fruits breeding program of the Department of Horticulture Sciences, Cornell University, Geneva, N.Y., 14456. It was selected in 1976 from 243 progeny of a cross between NY 1261×'Holiday'. (NY 1261 being a cross of 'Redcoat' and NY 844; with 'Redcoat' in turn being a cross of 'Redglow' and NY 254; NY 254 in turn being a cross of Tenn, Shipper and Fairfax. The NY 1261 ×Holiday cross was made in 1974. As a selection the new cultivar was tested as NY 1529. It was tested for many years in second test plots, and was evaluated in replicated yield trials in 1981 and 1982. It was further evaluated at numerous sites throughout the Great Lakes States by cooperative testers. In the fall of 1991, NY 1529 will be publicly released as 'Seneca'.

DESCRIPTION OF RELATED ART

NY 1529 has moderate vigor and runnering growth habit, its leaves are medium green in color, corresponding to Green 137B of the R.H.S. Colour Chart, and foliage is opened and not cupped. NY 1529 leaf serrations are less deeply serrated in comparison with 'Earliglow'. Glandular hairs on the flower pedicel epidermis of NY 1529 run almost parallel with the pedicel, similar to 'Earliglow'. In contrast, glandular hairs on 'Honeoye' are perpendicular to the pedicel and may point slightly downward. The glandular hairs on NY 1529 are much less dense then 'Allstar'.

Table 1 sets forth mean maturity dates based on a 1982 field trial. Mean date of harvest was calculated on a weighted basis. Means followed by the same letter are not significantly different, based on Waller and Duncan's BSD test, K=100.

Table 2 sets forth mean subjective fruit skin toughness scores. Skin toughness was subjectively determined by rubbing the skin of several berries in the hand from each replicate of each genotype. Each plot at each harvest (replicate) was scored independently. Each genotype was rated 1 to 9 with '9' being most resistant to skin abrasion.

Table 3 sets forth mean Instron measurements from 1982 (firmest fruit listed first). Each genotype mean score reflects the force required for the Instron probe to penetrate the flesh of undamaged berries. Twelve berries were tested of each genotype on the same day of harvest for each harvest date. Means followed by the same letter are not significantly different, based on Waller and Duncan's BSD test, K=100.

Table 4 sets forth mean berry weight of 29 strawberry genotypes based upon 1982 field trials. Mean berry weight was determined by dividing total yield per plot by total number of berries per plot. Means followed by the same letter are not significantly different based on Waller and Duncan's BSD test, K=100.

Table 5 sets forth mean subjective fruit appearance scores. Berries were rated 1 to 9 with '9' being the most attractive. Each plot at each harvest (replicate) was scored independently. Means followed by the same letter are not significantly different, based on Waller and Duncan's BSD test, K=100.

Table 6 sets forth mean subjective flavor scores. Berries were rated 1 to 9 with '9' being best flavor. Each plot at each harvest (replicate) was scored independently. Means followed by the same letter was not significantly different, based on Waller and Duncan's BSD test, K=100.

Table 7 shows fruit yields in 1981 and 1982. Means followed by the same letter are not significantly different, based on Waller and Duncan's BSD test, K=100.

Table 8 sets forth the findings of two years of taste panel evaluations.

Table 9 sets forth the mean ranking of 29 cultivars and selections, averaged over 8 characteristics.

Table 10 sets forth the relative performance of NY 1529 at numerous test sites throughout the Great Lakes Region.

TABLE 1

Mean maturity date of NY 1529 vs. other cultivars

Genotype	Mean Weighted Date of Harvest	
'Earlidawn'	June 23	A
'Midland'	June 24	AB
NY 1402	June 25	ABC
MDUS 4380	June 26	BCD
'Lester'	June 26	BCD
MDUS 4355	June 26	BCD
NY 1524	June 26	BCD
MDUS 4774	June 26	BCD
'Catskill'	June 27	CDE
NY 1560	June 27	CDE
'Honeoye'	June 28	DEFG
'Holiday'	June 28	DEFG
NY 1530	June 28	DEFG
MDUS 4579	June 28	DEFGH
'Raritan'	June 28	DEFGHI
NY 1570	June 29	EFGHIJ
NY 1333	June 29	FGHIJK
MDUS 4426	June 29	FGHIJK
'Jewel'	June 30	GHIJKL
NY 1529	July 1	HIJKLM
NY 1368	July 1	HIJKLMN
NY 1431	July 1	IJKLMN
NY 1406	July 1	IJKLMN
NY 1580	July 1	JKLMN
'Allstar'	July 1	JKLMN
'Canoga'	July 2	KLMN
'Scott'	July 2	LMN
'Sparkle'	July 3	MN
NY 1482	July 4	N

TABLE 2

Mean subjective fruit skin toughness scores for NY 1529 and other cultivars.

Treatment	Replicates	Mean Score	
NY 1524	6	7.7	A
NY 1529	5	7.6	AB
'Jewel'	5	7.4	AB
NY 1530	6	7.2	ABC
MDUS 4426	5	7.0	ASCD
NY 1368	5	6.8	ABCDE
MDUS 4579	5	6.8	ABCDE
'Holiday'	8	6.8	ABCDE
NY 1580	3	6.7	ABCDEF
'Canoga'	4	6.5	ABCDEF
'Scott'	8	6.5	BCDEF
'Lester'	7	6.3	BCDEF
'Allstar'	4	6.2	BCDEFG
NY 1333	5	6.0	CDEFG
NY 1406	9	5.9	DEFG
MDUS 4335	6	5.8	DEFG
MDUS 4774	5	5.6	EFGH
NY 1482	4	5.5	EFGHI
NY 1560	4	5.3	EFGHI
NY 1402	5	5.2	FGHI
NY 1431	5	5.2	FGHI
'Raritan'	7	5.0	GHI
'Honeoye'	7	4.5	HIJ
MDUS 4380	6	4.3	IJK
'Sparkle'	5	3.8	JK
'Earlidawn'	8	3.7	JK
Midland	7	3.0	K
NY 1570	1	2.0	KL
'Catskill'	7	1.1	L

TABLE 3

Mean firmness measurement for NY 1529 and other cultivars

Genotype	Mean puncture force (daltons)	
NY 1570	65.8	A
'NY 1529'	62.7	A
MDUS 4579	57.6	A
MDUS 4774	56.4	A
NY 1524	53.9	AB
NY 1530	46.9	BC
NY 1580	46.7	BC
NY 1560	46.1	BC
'Holiday'	45.7	CD
'Canoga'	44.7	CDE
MDUS 4426	44.2	CDE
Allstar'	39.3	CDEF
NY 1431	38.3	DEFG
'Scott'	37.6	EFGH
NY 1406	35.9	FGHI
'Jewel'	33.5	FGHIJ
NY 1402	32.5	FGHIJ
NY 1333	30.8	GHIJ
NY 1482	30.1	GHIJK
MDUS 4380	30.0	HIJK
'Honeoye'	28.8	IJK
MDUS 4355	28.7	IJK
'Lester'	28.6	IJK
'Midland'	27.1	JKL
NY 1368	27.1	JKL
'Raritan'	25.9	JKL
'Earlidawn	25.6	JKL
'Sparkle'	22.0	KL
'Catskill'	19.9	L

TABLE 4

Mean berry weight for NY 1529 and other cultivars

Genotype	Grams/berry	
NY 1524	14.4	A
'Canoga'	13.7	AB
'Allstar'	13.6	AB
NY 1333	13.5	ABC
MDUS 4426	13.4	ABC
NY 1431	12.6	ABCD
NY 1482	12.5	ABCD
NY 1529	11.8	BCDE
NY 1570	11.5	CDEF
'Jewel'	11.3	DEFG
'Lester'	11.2	DEFG
NY 1580	11.2	DEFG
NY 1406	10.9	DEFGH
NY 1368	10.8	DEFGHI
'Holiday'	10.7	DEFGHIJ
NY 1560	10.5	EFGHIJK
MDUS 4579	10.2	EFGHIJKL
'Honeoye'	10.0	EFGHIJKL
MDUS 4380	10.0	EFGHIJKL
NY 1402	10.0	EFGHIJKL
MDUS 4774	9.7	FGHIJKL
'Raritan'	9.3	GHIJKL
'Scott'	9.1	HIJKL
MDUS 4355	9.0	HIJKL
'Catskill'	8.9	HIJKL
NY 1530	8.8	IJKL
'Midland'	8.7	JKL
'Sparkle'	8.6	KL
'Earlidawn'	8.3	L

TABLE 5

Mean fruit appearance scores for NY 1529 and other cultivars

Genotype	Replicates	Mean Score	
NY 1333	5	7.6	A
'Lester'	7	7.3	AB
'Jewel'	5	6.8	ABC
NY 1524	6	6.5	ABCD
NY 1530	6	6.3	ABCD
MDUS 4355	6	6.3	ABCDE
'Honeoye'	7	6.3	ABCDE

TABLE 5-continued

Mean fruit appearance scores for NY 1529 and other cultivars

Genotype	Replicates	Mean Score	
NY 1529	5	6.2	ABCDEF
MDUS 4380	6	6.2	BCDEF
'Scott'	8	6.1	BCDEF
NY 1368	5	6.0	BCDEF
NY 1560	4	5.8	CDEF
'Raritan'	7	5.7	CDEFG
'Allstar'	4	5.5	CDEFG
'Canoga'	4	5.5	CDEFG
'Holiday'	8	5.5	CDEFG
NY 1431	5	5.4	CDEFG
NY 1530	3	5.3	CDEFG
NY 1482	4	5.3	DEFG
NY 1402	5	5.0	EFG
NY 1406	9	4.9	FG
MDUS 4774	5	4.8	FG
'Earlidawn'	8	4.6	G
MDUS 4426	5	4.2	G
MDUS 4579	5	4.0	G
'Midland'	7	4.0	G
'Sparkle'	5	3.4	G
NY 1570	2	3.0	GH
'Catskill'	7	1.9	H

TABLE 6

Mean flavor scores for NY 1529 and other cultivars

Treatment	Replicates	Mean Score	
'Lester'	7	6.3	A
NY 1570	2	6.0	AB
NY 1529	5	6.0	AB
'Jewel'	5	5.8	AB
'Holiday'	8	5.8	AB
NY 1368	5	5.6	AB
NY 1560	4	5.5	AB
'Sparkle'	5	5.4	AB
NY 1524	6	5.3	AB
'Raritan'	7	5.3	AB
'Honeoye'	7	5.1	AB
'Allstar'	4	5.0	AB
'Canoga'	4	5.0	AB
MDUS 4380	6	5.0	AB
'Scott'	8	4.9	AB
NY 1530	6	4.8	AB
MDUS 4355	6	4.8	AB
MDUS 4426	5	4.8	AB
NY 1333	5	4.8	AB
NY 1431	5	4.8	AB
NY 1580	3	4.7	AB
MDUS 4774	5	4.6	B
NY 1402	5	4.6	B
'Midland'	7	4.4	B
NY 1406	9	4.2	B
NY 1482	4	4.0	B
'Catskill'	7	4.0	B
MDUS 4579	5	3.8	B
'Earlidawn'	8	3.8	B

TABLE 7

Mean fruit yield of 29 strawberry genotypes in 1981 (established under adverse growing conditions) and in 1982 (Established under favorable conditions)

Genotype	Yield 1981 (g/4.5 m)[1]		Yield 1982 (g/4.5 m)	
Allstar	3197	abc	6592	efghi
Canoga	4321	ab	10876	a
Catskill	5268	a	9830	abcd
Earlidawn	3322	abc	7133	cdefghi
Holiday	3394	abc	9750	abcd
Honeoye	2760	abc	10396	ab
Lester	2762	abc	6481	efghi
MDUS 4355	2594	abc	5131	hij
MDUS 4380	2272	abc	5038	ij
MDUS 4426	2883	abc	5422	ghij
MDUS 4579	3150	abc	8177	abcdefg
MDUS 4774	2069	bc	4599	ij
Midland	3479	abc	5149	hij

TABLE 7-continued

Mean fruit yield of 29 strawberry genotypes in 1981 (established under adverse growing conditions) and in 1982 (Established under favorable conditions)

Genotype	Yield 1981 (g/4.5 m)[1]		Yield 1982 (g/4.5 m)	
Jewel	5166	ab	6407	efghi
NY 1333	2113	abc	6064	fghi
NY 1368	3148	abc	6841	efghi
NY 1402	2450	abc	7089	defghi
NY 1406	4616	ab	10748	a
NY 1431	2744	abc	8359	abcdef
NY 1482	5171	ab	7874	bcdefgh
NY 1524	2622	abc	7234	cdefghi
NY 1529	3542	abc	10824	a
NY 1530	5010	ab	9674	abcd
NY 1560	2458	abc	6418	efghi
NY 1570	1125	c	2749	j
NY 1580	2309	abc	9834	abcd
Raritan	3383	abc	9933	abc
Scott	4270	abc	8347	abcdef
Sparkle	3942	abc	8943	abcde

[1]To convert to lb/A multiply by 1.6

TABLE 8

Summary of results from 1981 and 1982 taste panel evaluations of frozen fruit.

1. Consistently rated 'very good'
   MDUS 4744
   Holiday
   Honeoye
   MDUS 4355
   NY 1406
2. Consistently rate 'good'
   Scott
   NY 1529
   Jewel
3. Marginally 'acceptable'
   NY 1580
   Sparkle
   Lester
   NY 1570
   NY 1482
   NY 1524
   NY 1402
   Midland
4. 'Unacceptable'
   Canoga
   Allstar
   Raritan
   NY 1333
   NY 1560
   MDUS 4579
   NY 1530
   NY 1368
   MDUS 4426
   NY 1431
   MDUS 4380
   Earlidawn
   Catskill

TABLE 9

Overall genotype mean rankings (yield, size, attractiveness, skin, flesh, fresh flavor, frozen quality) listed in order of total mean ranking of overall traits.

Overall ranking	cultivar/ selection	Yield[1] rank	Yield[2] rank	Size[3] rank	Attractiveness[4] rank
1	NY 1529	9	2	2	8
2	Holiday	11	8	13	16
3	Jewel	3	22	18	3
4	NY 1524	21	15	8	4
5	Canoga	6	1	1	15
6	NY 1530	4	9	19	5
7	Scott	7	12	16	10
8	NY 1406	5	3	17	21
9	MDUS 4359	18	20	11	2
10	Honeoye	19	4	20	7

TABLE 9-continued

Overall genotype mean rankings (yield, size, attractiveness, skin, flesh, fresh flavor, frozen quality) listed in order of total mean ranking of overall traits.

11	NY 1580	25	6	10	18
12	Allstar	14	19	7	14
13	NY 1482	2	14	6	19
14	NY 1368	16	18	15	11
15	MDUS 4579	15	13	12	25
16	MDUS 4426	17	24	5	24
17	NY 1333	27	23	3	1
18	MDUS 4355	22	26	24	6
19	MDUS 4774	28	28	14	22
20	Raritan	12	5	22	13
21	NY 1560	23	21	21	12
22	NY 1570	29	29	4	28
23	NY 1431	20	11	9	17
24	Sparkle	8	10	28	27
25	NY 1402	24	17	25	20
26	MDUS 4380	26	27	23	9
27	Catskill	1	7	27	29
28	Midland	10	25	26	25
29	Earlidawn	13	16	29	23

Overall ranking	cultivar/ selection	Skin[5] rank	Texture[6] rank	Flavor[7] rank	Quality[8] rank
1	NY 1529	2	2	3	9
2	Holiday	8	9	5	1
3	Jewel	3	16	4	9
4	NY 1524	1	5	9	19
5	Canoga	10	10	13	29
6	NY 1530	4	6	16	29
7	Scott	11	14	15	9
8	NY 1406	15	15	25	1
9	MDUS 4359	12	23	1	19
10	Honeoye	23	21	11	1
11	NY 1580	9	7	21	19
12	Allstar	13	12	12	29
13	NY 1482	18	19	26	19
14	NY 1368	6	25	6	29
15	MDUS 4579	7	3	28	29
16	MDUS 4426	5	11	18	29
17	NY 1333	14	18	19	29
18	MDUS 4355	16	22	17	1
19	MDUS 4774	17	4	22	1
20	Raritan	22	26	10	29
21	NY 1560	19	8	7	29
22	NY 1570	28	1	2	19
23	NY 1431	21	13	20	29
24	Sparkle	25	28	8	19
25	NY 1402	20	17	23	19
26	MDUS 4380	24	20	14	29
27	Catskill	29	29	27	29
28	Midland	27	24	24	19
29	Earlidawn	26	27	29	29

[1]Yield based on 3 replicates, 15-ft. plots. 8 harvest dates, 1981.
[2]Yield based on 3 replicates, 15-ft. plots, 8 harvest dates, 1982.
[3]Size = total yield divided by total number of fruit.
[4]Attractiveness evaluated subjectively, scored 1–9, 4–8 reps.
[5]Skin toughness evaluated subjectively, scored 1–9, 4–8 reps.
[6]Texture evaluated using Instron Instrument, 12 fruit per mean, 4–8 reps.
[7]Flavor evaluated subjectively, score 1–9, 4–8 reps.
[8]Frozen quality evaluated by replicated blind taste panels, 1 = very good, 9 = good, 19 = acceptable, 29 = unacceptable.

TABLE 10

NY 1529 as scored at various sites in the Great lakes region of North America.

Test site	Yield	Flavor	Size	Appearance	Firmness
Montreal, Quebec	3	3	3	3	5
MN	4	2	3	3	5
WS	3	4	3	4	—
MA	5	3	4	4	4
NY	4	4	5	5	4
OH	5	4	4	4	4
PA	5	3	4	4	3
Average Score:	4.1	3.3	3.7	4.4	4.2

1 = poor, 3 = average, 5 = best

DESCRIPTION OF FIGURES

FIG. 1. One quart basket of NY 1529 shown with scale in inches and millimeters. Note large size, glossy color, and attractive appearance and shape.

FIG. 2. Fruit shown ripening in a field planting. Note fruit size in comparison to the quarter, and fruit ripen over a long period.

FIG. 3. Foliage shown in a field planting. Note open canopy, leaves not cupped.

FIG. 4. Plot of NY 1529 with moderate vigor and runnering, very acceptable habit for production in the Northeast.

FIG. 5. NY 1529 leaf serrations in comparison with 'Earliglow'. 'Earliglow' (on the right) is more deeply serrated along the leaf edge.

FIG. 6. Glandular hairs on the flower pedicel and peduncle of NY 1529 run almost parallel with the pedicel, similar to 'Earliglow'.

FIG. 7. Note the way the glandular hairs on 'Earliglow' run parallel to the pedicel.

FIG. 8. The amount of grandular hairs on NY 1529 (photo 6), is much less dense than 'Allstar', shown here.

FIG. 9. In contrast to FIGS. 6 and 7, glandular hairs on 'Honeyoye' are perpendicular to the pedicel and may be pointed slightly downward or more than 90 degrees. This is similar to NY 1593, except NY 1593 glandular hairs are pointed slightly upward and less than 90 degrees from the pedicel.

FIG. 10. Microphotograph of the upper leaf surface of 'Seneca'.

FIG. 11. Microphotograph of the upper leaf surface of 'Allstar'.

FIG. 12. Microphotograph of the lower leaf surface of 'Seneca'.

FIG. 13. Microphotograph of the lower leaf surface of 'Allstar'.

FIG. 14. Microphotograph of the lower leaf surface of 'Honeyoye'.

FIG. 15. Microphotograph of the lower leaf surface of 'Earliglow'.

FIG. 16. Microphotograph of the lower leaf surface of 'Jewel'.

DESCRIPTION OF THE INVENTION

This invention is a new and distinct variety of strawberry (Fragaria×Ananassa) which is exceptional in combining large yield, potential large fruit size, extreme fruit firmness, and good fruit quality. The strawberry is named 'Seneca' and was tested as NY 1529. Asexual propagation has been achieved by runner plants and also by means of tissue culture at the Department of Horticultural Sciences, Cornell University, Geneva, N.Y.

The primary berries of NY 1529 are blunt conic in shape with very broad-shoulders, the smaller fruit are near globose in shape. Seeds are mostly dull-yellow and may be dark red on the dark side of the fruit, are slighly sunken to even with the skin, and are more often even toward the fruit tip. The calyx is even to sunken, not reflexed. Sepals rest on top of fruit and tend to lay flatter as fruit mature. Sepal tips may turn upward until fruit mature. Skin has moderate toughness, flesh is very firm, exterior color is medium red and glossy, corresponding to Red 45A and 46B of the Royal Horticultural Society (London) Colour Chart. Internal flesh is a very light red transparent color. Fruit flavor is good,

slightly acid with a mild 'Holiday' aromatic quality. NY 1529 matures in late midseason.

NY 1529 has a moderate vigor and runnering growth habit, its leaves are medium green in color, corresponding to Green 137B of the R.H.S. Colour Chart and foliage is open not cupped. NY 1529 leaf serrations are less deeply serrated in comparison with 'Earliglow'. Glandular hairs on the flower pedicil epidermis of NY 1529 run almost parallel with the pedicel. The glandular hairs of NY 1529 are less dense than 'Allstar'.

Further examination of 'Seneca' leaves revealed a few more distinguishing characteristics. FIG. **10** shows the upper surface of a 'Seneca' strawberry leaf with moderate pubescence, compared to FIG. **11** showing the upper surface of an 'Allstar' strawberry leaf with no pubescence present. Upon microscopic examination of the upper leaf surfaces, 'Seneca' always shows a moderate amount of pubescence and 'Allstar' is absent of any pubescence on the upper leaf surface.

FIG. **12** shows the lower leaf surface of 'Seneca' with no interveinal pubescence and few veinal hairs running parallel and on the lower leaf venation, compared to 'Allstar' in FIG. **13** which has many interveinal hairs and more dense and coarse venal pubescence. FIG. **14** shows the undersurface of a 'Honeoye' leaf and has similar veinal and interveinal pubescence as 'Allstar'. 'Earliglow' (FIG. **15**), and 'Jewel' (FIG. **16**), (as well as 'Chambly', 'Cavendish', and 'Lateglow') all have less interveinal pubescence than 'Allstar' and 'Honeoye', but more than 'Seneca'.

Mature 'Seneca' upper leaf surfaces correspond to green 137 B of the R.H.S. Colour Chart and lower surfaces correspond to Greyed-Green 191 A. Younger and newly unfurled leaves correspond to Green 137 D

for the upper leaf surface and Greyed-Green 191 B for the lower leaf surface.

'Seneca' leaflet size ranges in length from 8.1–9.5 cm (average length 8.54 cm) and ranges in width from 5.9–9.5 cm (average width 7.06 cm) with an average of 28.88 serrations per leaflet. Average serration width is 0.93 cm.

'Seneca' has no brown resistance to any root diseases including Red Steele and verticillium wilt and seems particularly susceptible to Black Root Rot disease. Therefore, it should not be planted into solid known to be infested up such root disease organisms.

Usefulness

This new cultivar is particularly well-suited for use by commercial fruit growers in the Great Lakes Region of the United States, because of its high potential (Table 7), its tough skin (Table 2) and firm flesh (Table 3) which are needed for shipping, its large fruit size (Table 4) which is needed for efficient hand harvest, and its attractive (Table 5) and pleasant flavored (Table 6) fruit which should market well. Cooperative testers in many Great Lakes States report superior performance (Table 10), indicating good hardiness. In addition, taste panels have found this cultivar to be superior to most other cultivars tested in terms of frozen fruit quality (Table 8). When 29 cultivars and selections adapted to the Great Lakes climate were ranked for 8 characteristics, this cultivar was found to make the highest mean ranking for all characters (Table 9).

We claim:

1. The new and distinct variety of strawberry herein described and illustrated and identified by the characters enumerated above.

* * * * *

FIG. 1

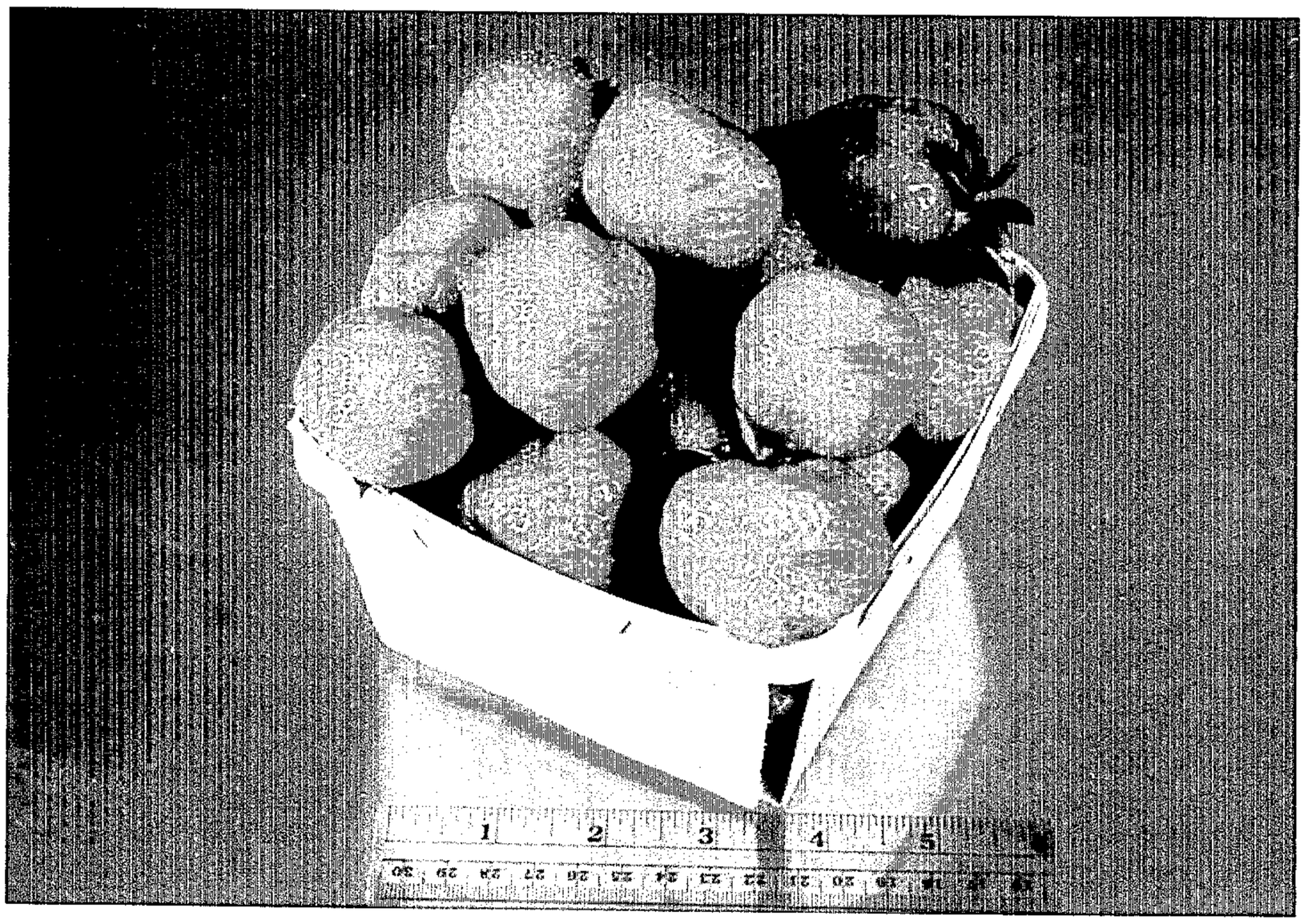

FIG. 2

FIG. 3

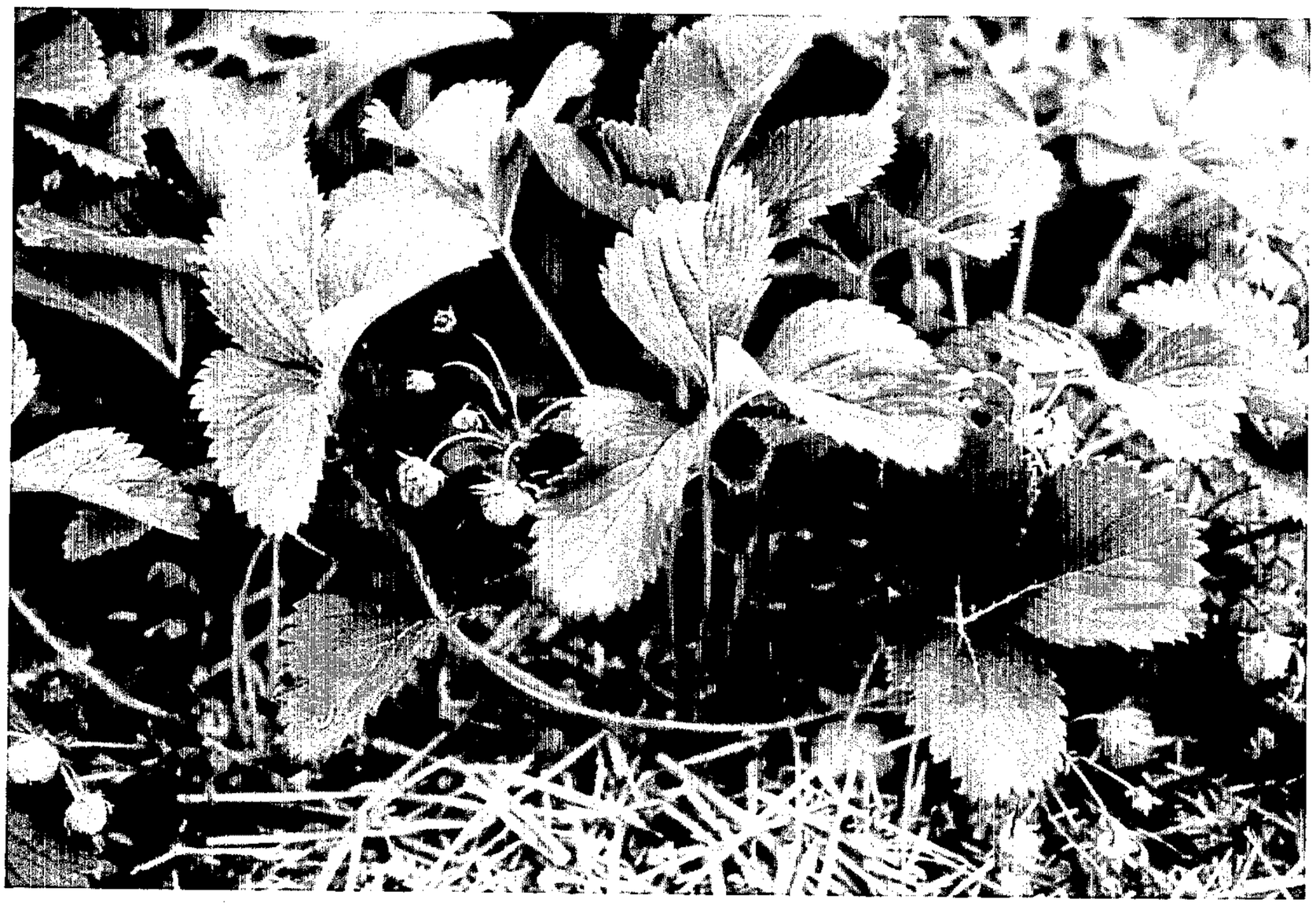

FIG. 5

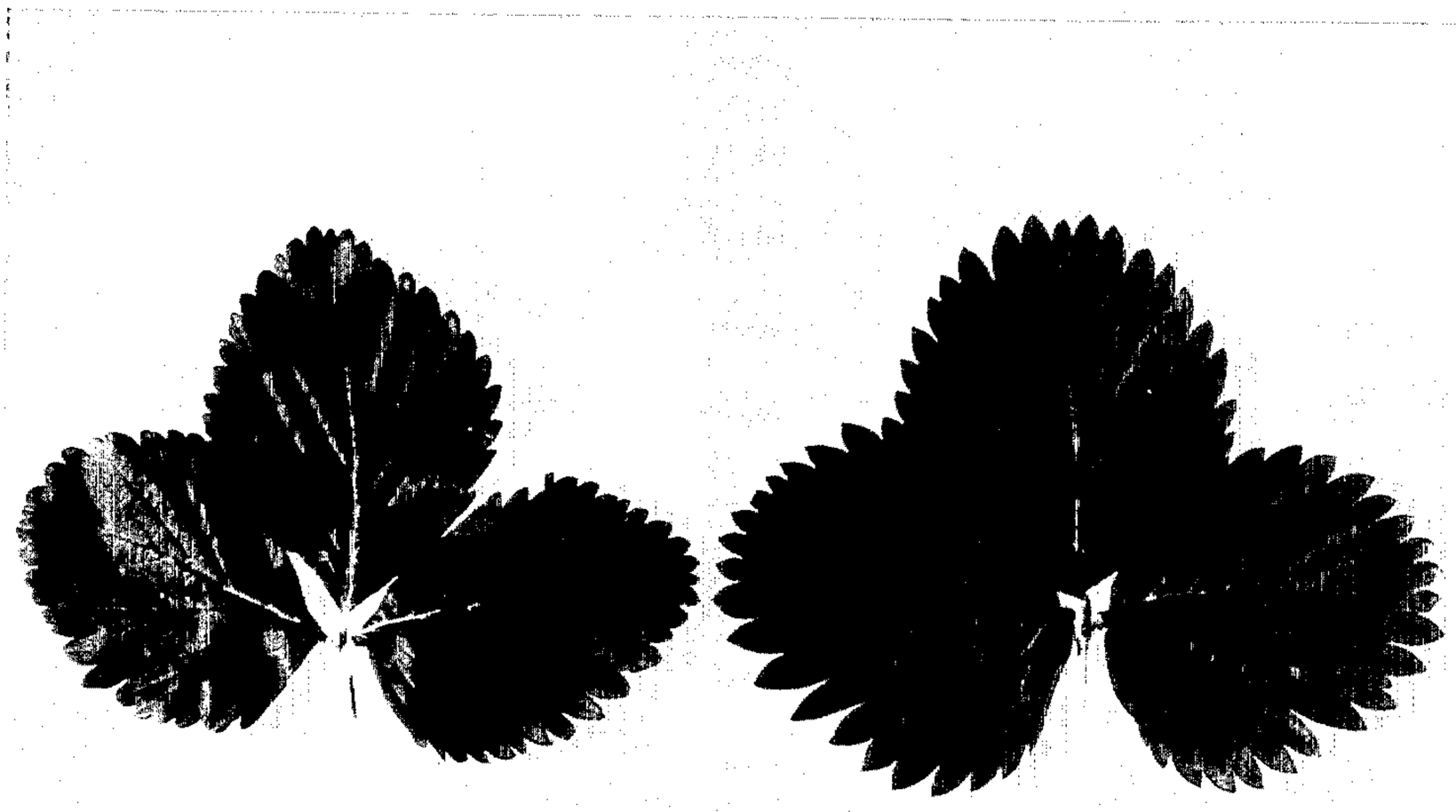

FIG. 4

FIG. 6

FIG. 7 (PRIOR ART)

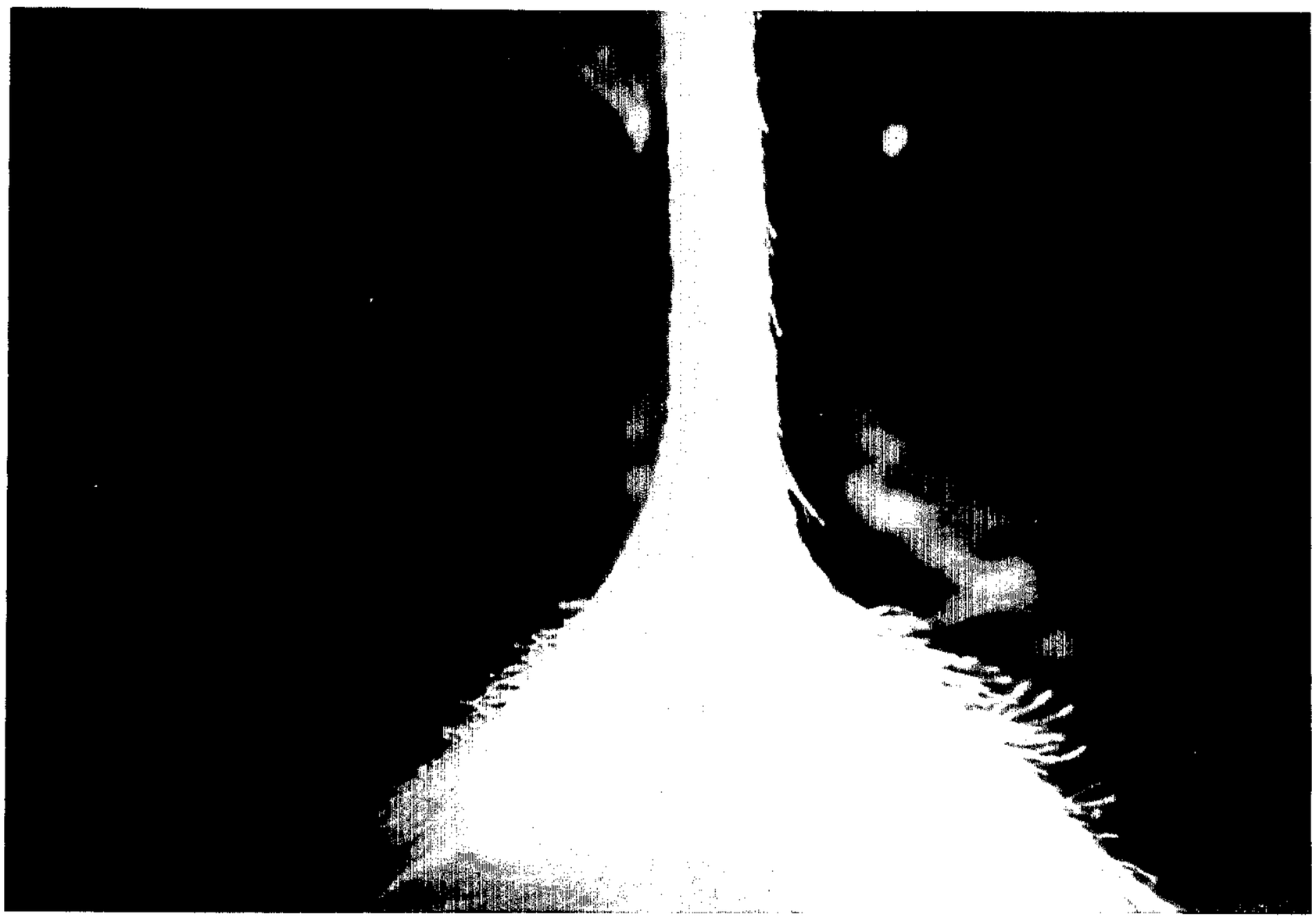

FIG. 8 (PRIOR ART)

FIG. 9 (PRIOR ART)

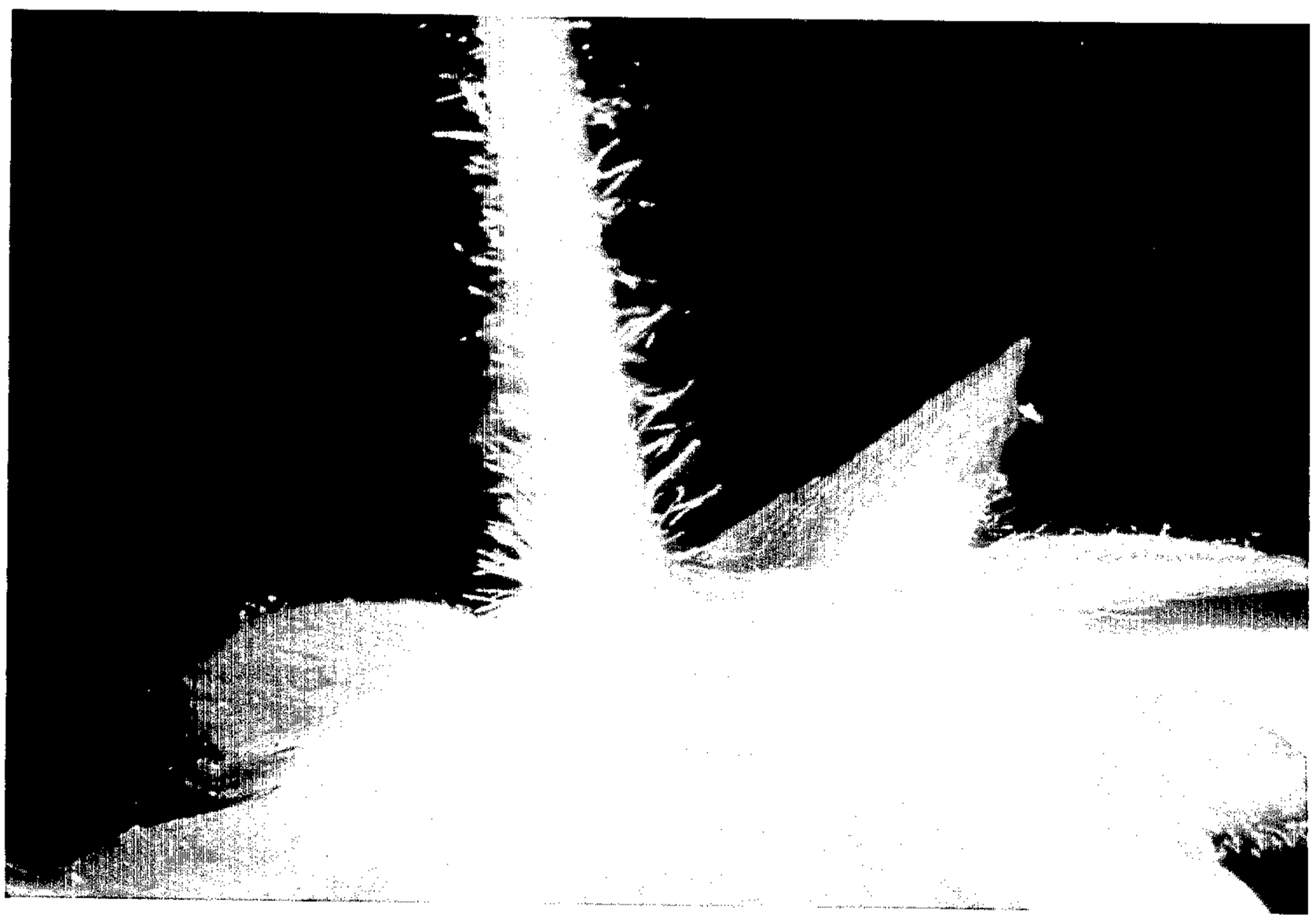

FIGURE 10

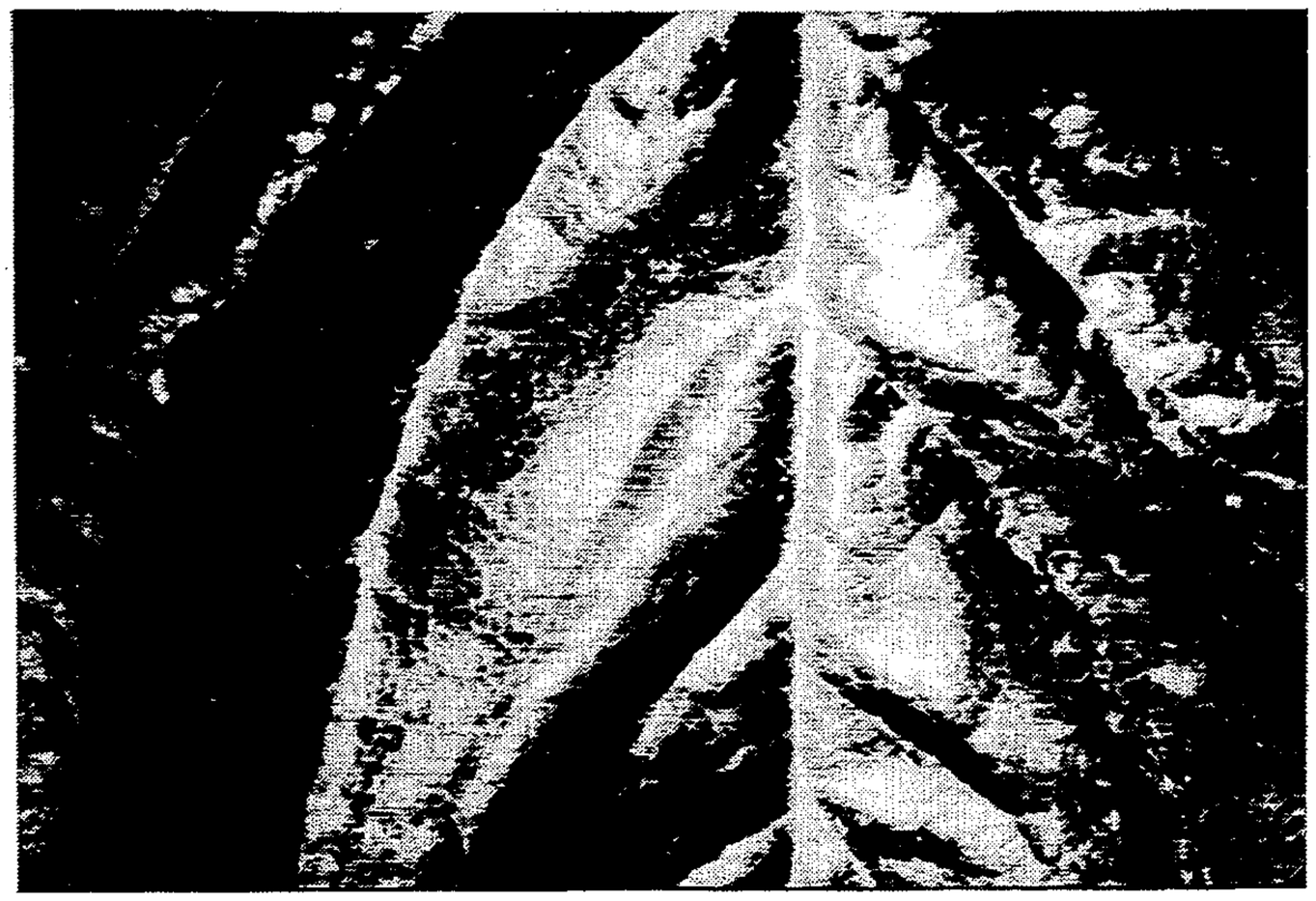

FIGURE 11

(PRIOR ART)

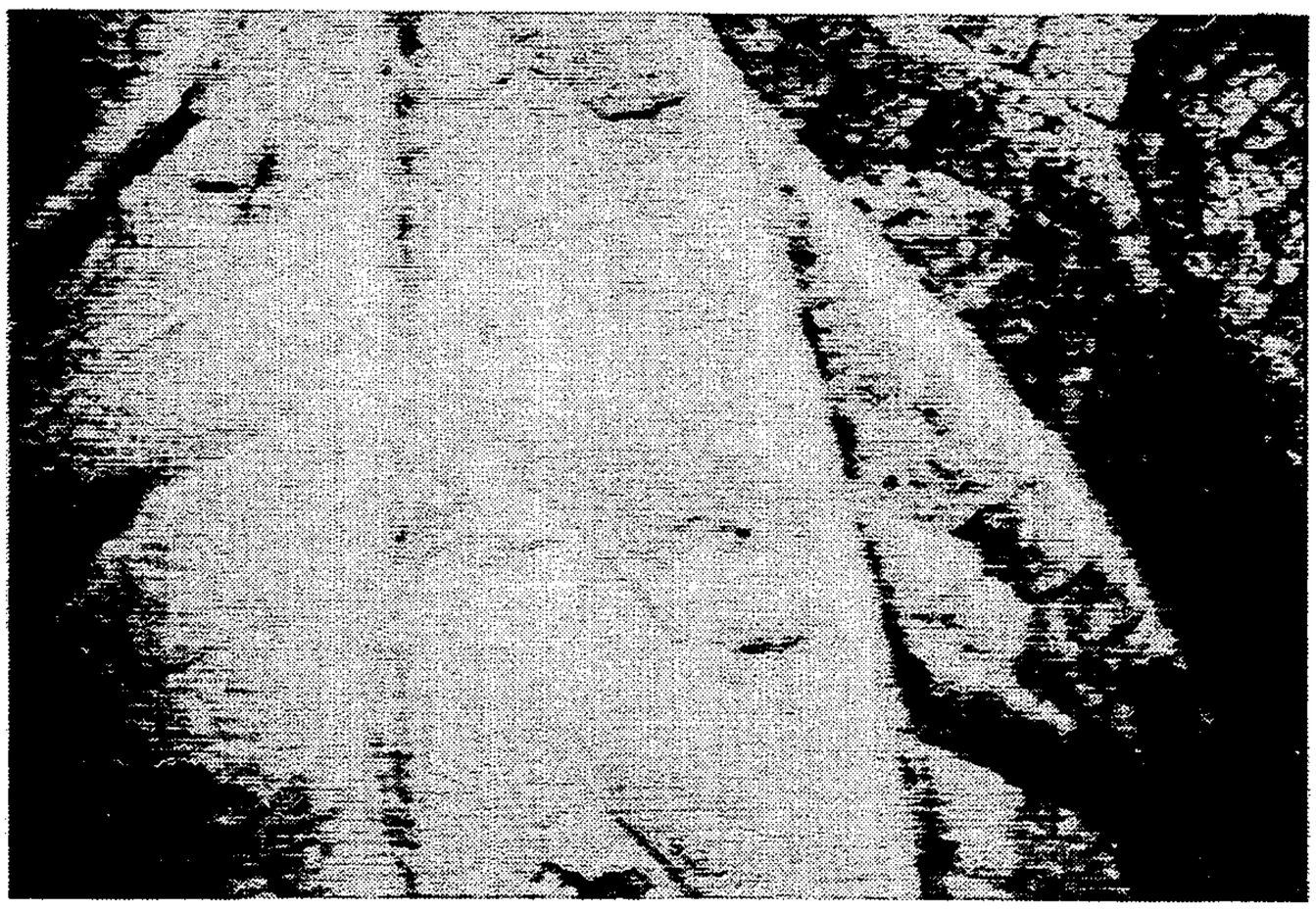

FIGURE 12

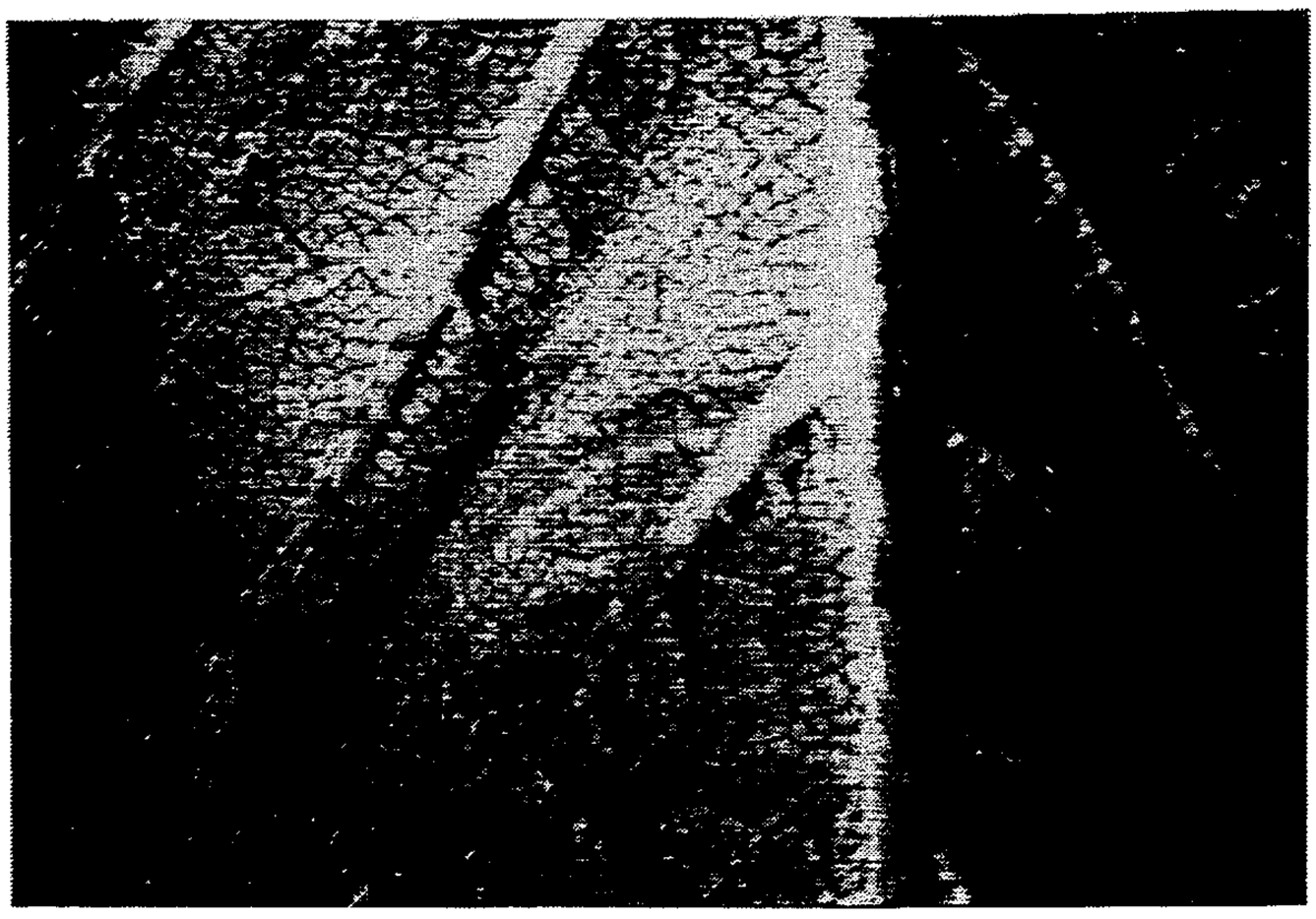

FIGURE 13

(PRIOR ART)

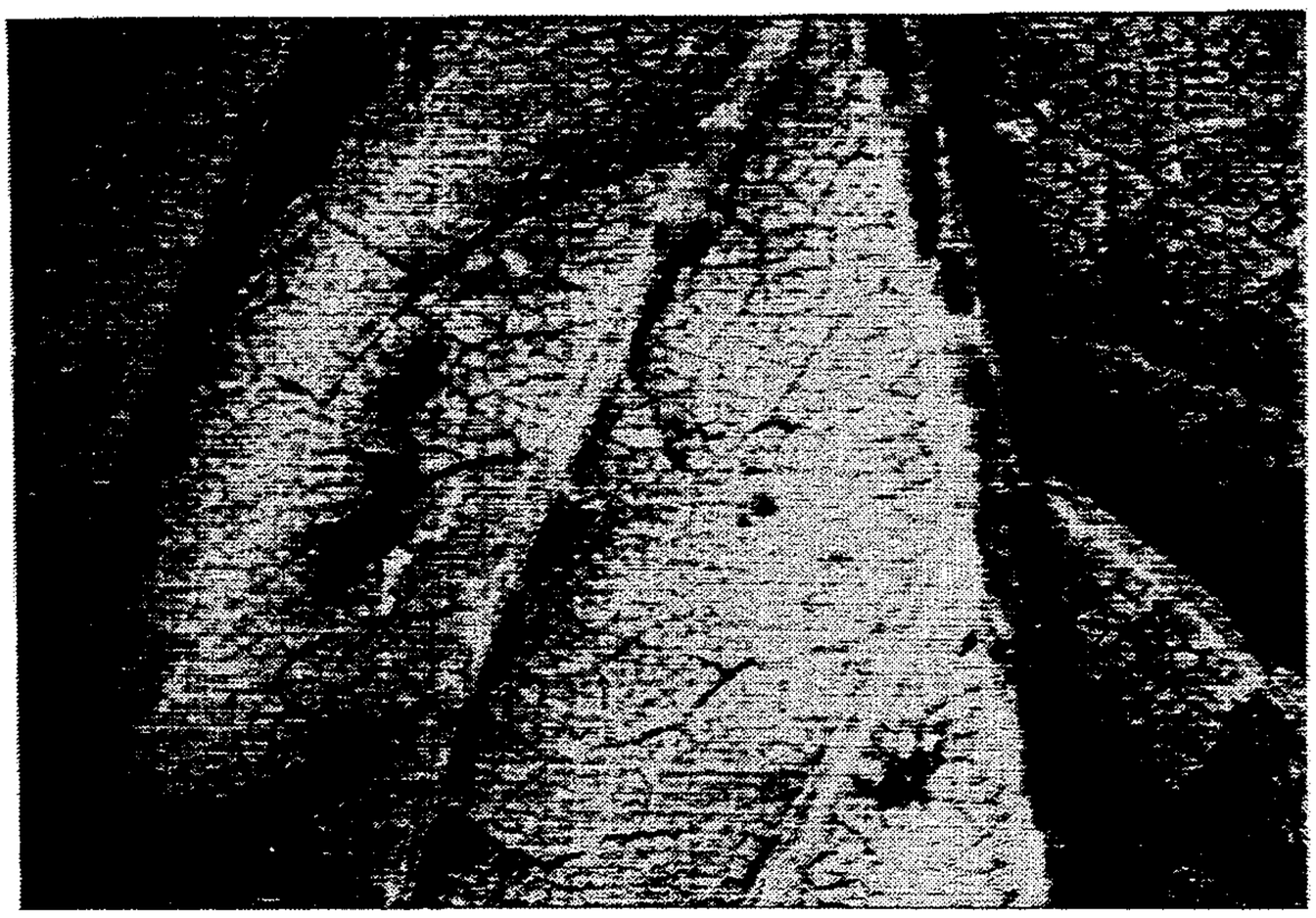

FIGURE 14
(PRIOR ART)

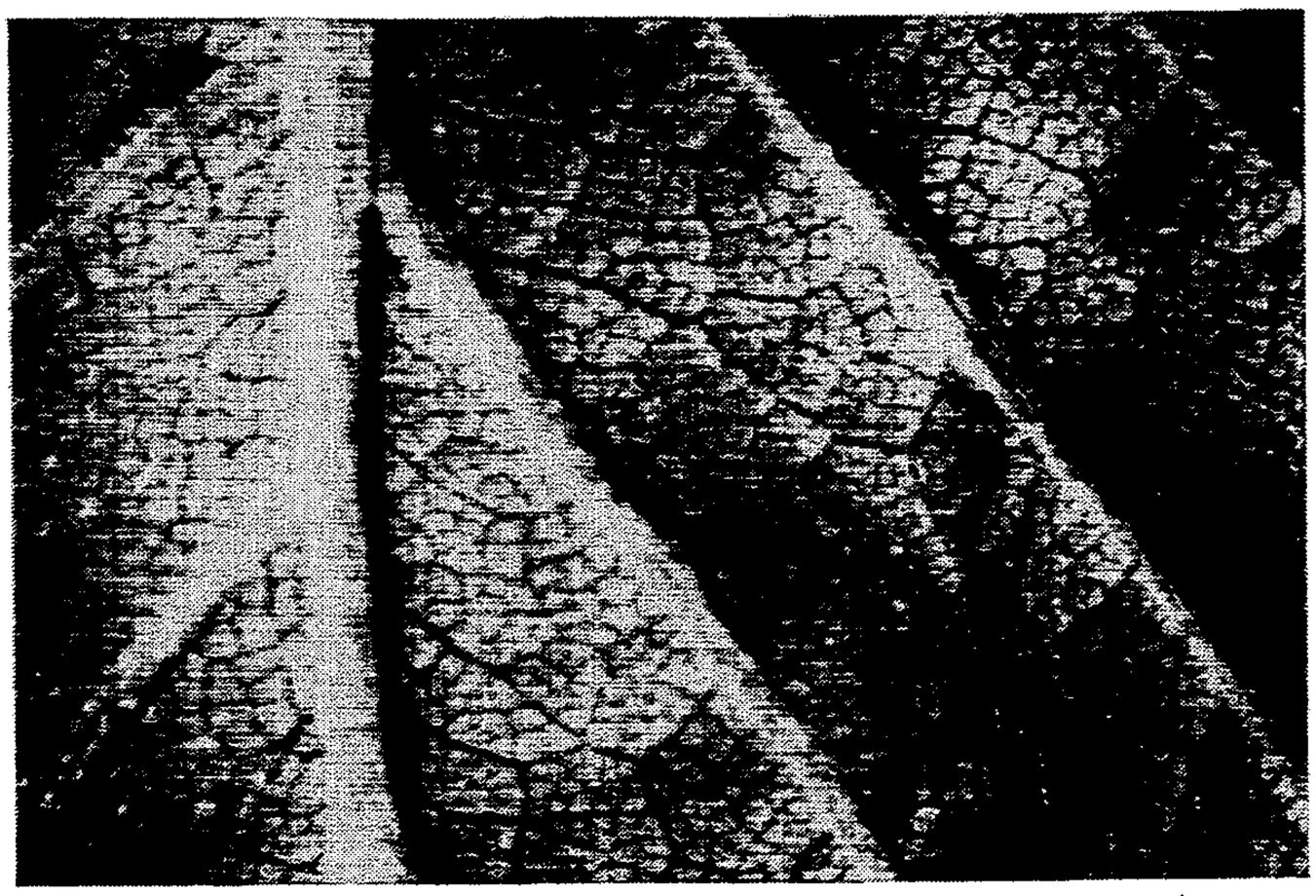

FIGURE 15
(PRIOR ART)

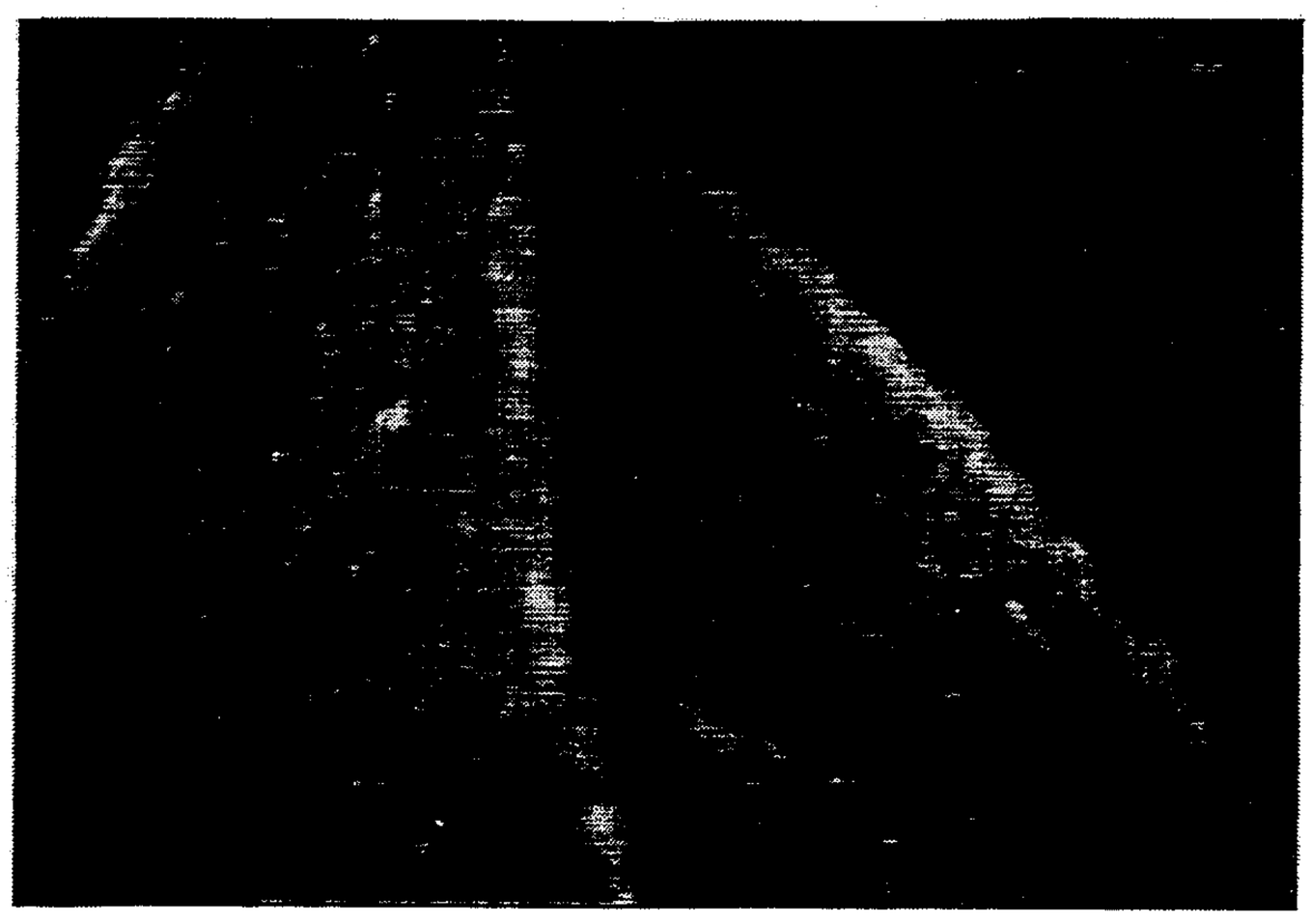

FIGURE 16

(PRIOR ART)