United States Patent

Cook

[15] **3,648,022**

[45] **Mar. 7, 1972**

[54] METHOD FOR TABULATING ELECTION RETURNS

[72] Inventor: **Arnold G. Cook**, River Forest, Ill.

[73] Assignee: **Automatic Voting Machine Corporation**, Jamestown, N.Y.

[22] Filed: **Oct. 20, 1969**

[21] Appl. No.: **867,963**

Related U.S. Application Data

[63] Continuation of Ser. No. 509,911, Nov. 26, 1965, abandoned.

[52] **U.S. Cl.** .....**235/61.9 R**, 101/93 C, 235/56, 235/61.1

[51] **Int. Cl.** **B41j 5/36**, G06k 1/12, G06k 3/00, G07c 13/00

[58] **Field of Search**.....235/61.9, 56; 101/93 C

[56] **References Cited**

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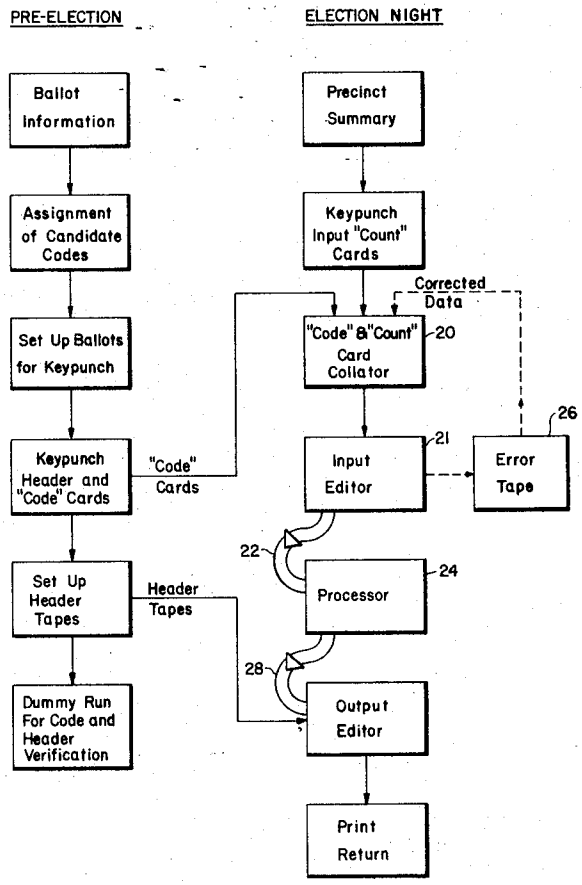
Primary Examiner—Maynard R. Wilbur
Assistant Examiner—Robert M. Kilgore
Attorney—Strauch, Nolan, Neale, Nies & Kurz

[57] **ABSTRACT**

A novel election ballot counting method and system utilizing data processing equipment and capable of providing an itemized total of the votes cast for each vote choice in an election accommodating ballot format variation including candidate rotation.

12 Claims, 62 Drawing Figures



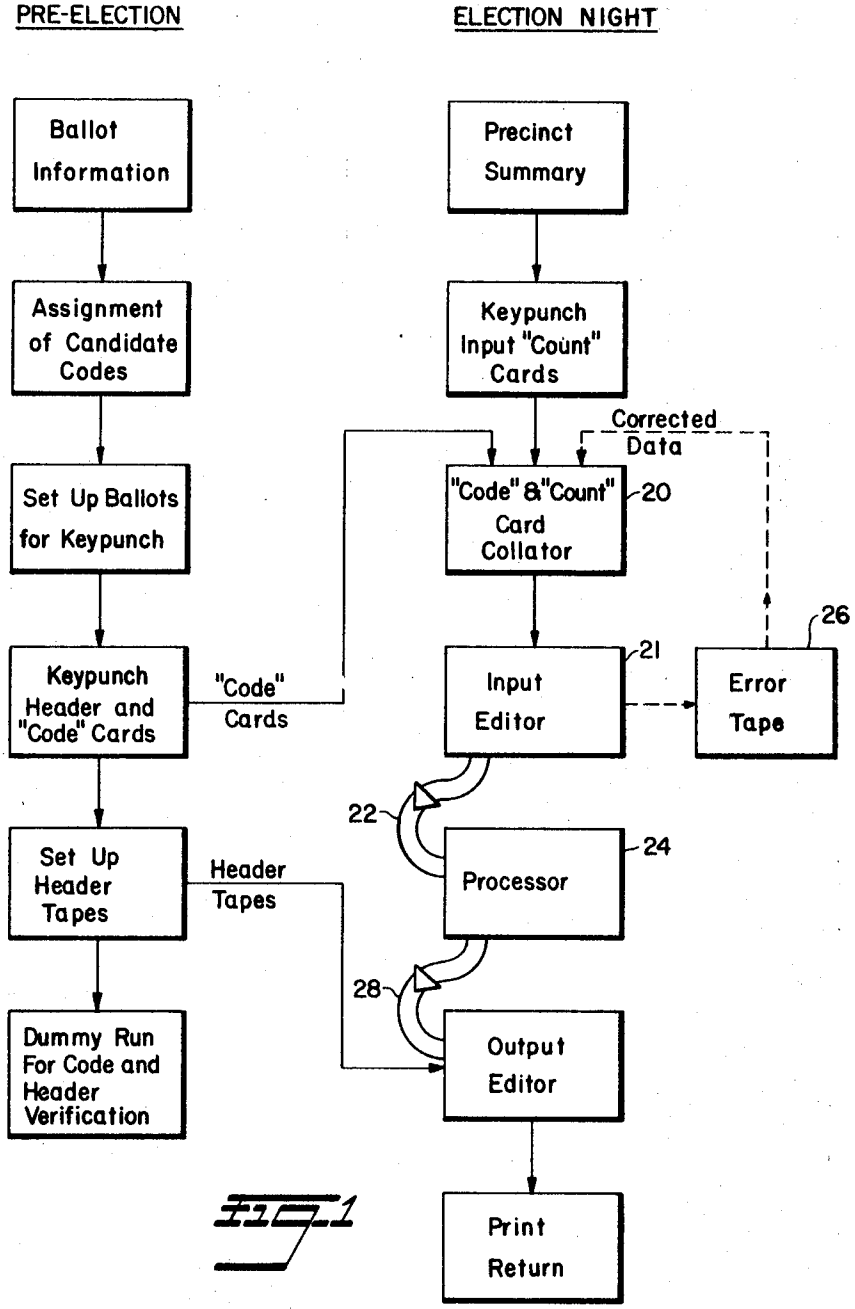


FIG. 1

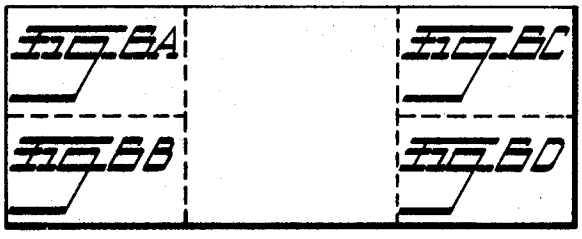


FIG. 6

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ATTORNEYS

Patented March 7, 1972 **3,648,022**

55 Sheets-Sheet 2

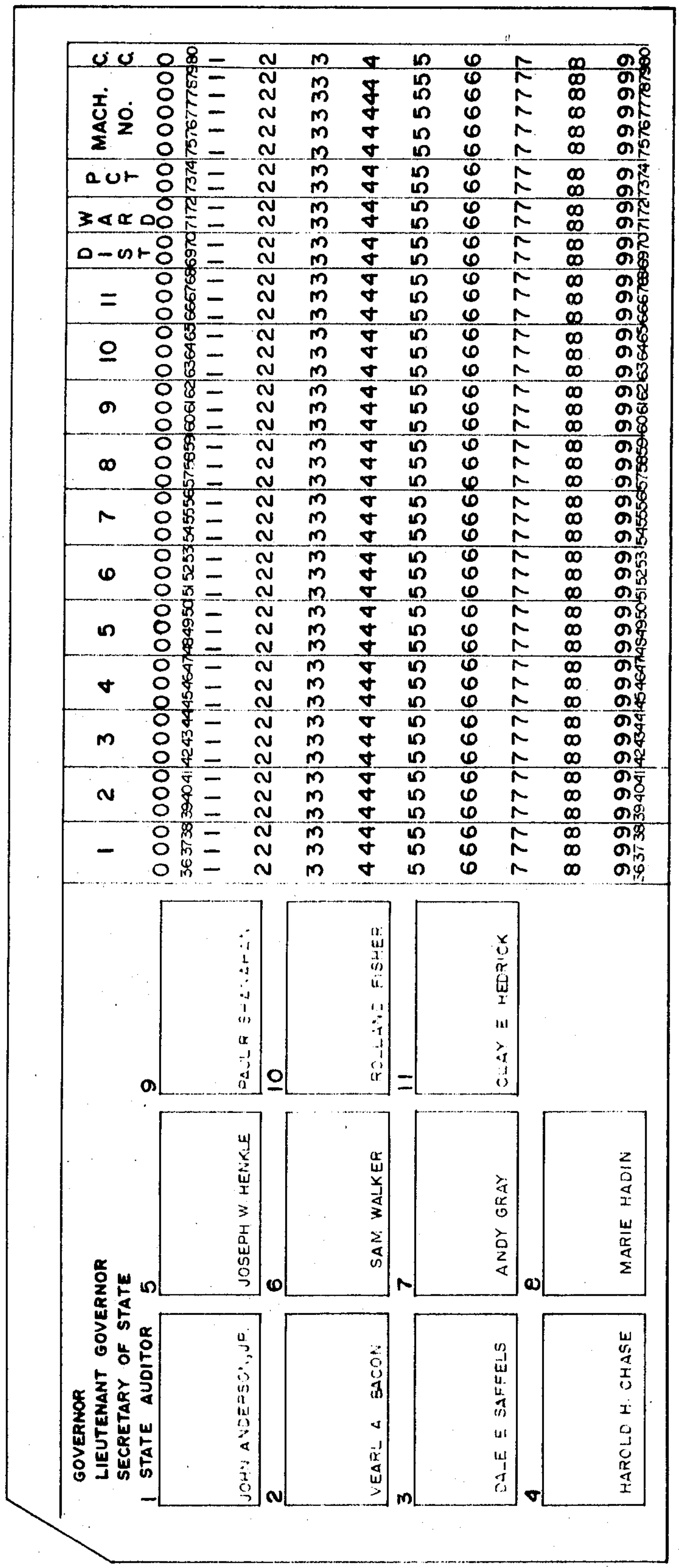


FIG. 2

Fig. 3

PRIMARY ELECTION--DEMONSTRATION--MAY 1963
UNOFFICIAL RETURN--DEMOCRATIC PARTY

OFFICE	CODE	CANDIDATE	PREVIOUS-TOTALS		THIS-REPORT		TOTALS-TO-DATE	
			PREC	VOTES	PREC	VOTES	PREC	VOTES
REPR/CONG DIST 1	00001	HUNT	20	2526	5	808	25	3334
	00002	CARMODY	20	2551	5	810	25	3361
	00003	ERICK	20	2604	5	786	25	3390
	00004	RUDOLPHE	20	2607	5	817	25	3424
	00005	MCDONALD	20	2651	5	814	25	3465
REPR/CONG DIST 2	00006	KADER			25	2980	25	2980
	00007	CHALUPKA			25	3103	25	3103
	00008	SMITH			25	3020	25	3020
	00009	ROSSMAN			25	3042	25	3042
JUDGE CIRC CT DIST 19	00010	KEMPF	20	1501	30	2432	50	3933
	00011	BARRIE	20	1498	30	2433	50	3931
	00012	DALEY	20	1479	30	2417	50	3896
	00013	FORD	20	1413	30	2472	50	3885
	00014	DEUTCH	20	1407	30	2433	50	3840
	00015	HAGELE	20	1470	30	2484	50	3954
	00016	AVERY	20	1502	30	2469	50	3971
PROS ATTY DIST 19	00017	NOWICKI	20	1518	30	2167	50	3685
	00018	MALLORY	20	1400	30	2260	50	3660
	00019	JARNOT	20	1415	30	2351	50	3766
	00020	LAPORTE	20	1312	30	2257	50	3569
	00021	KRAEMET	20	1424	30	2163	50	3587
	00022	HODAN	20	1477	30	2224	50	3701
JUDGE SUP CT RM 1	00023	PROCTOR	20	1461	30	2225	50	3686
	00024	MENIAT	20	1462	30	2294	50	3756
JUDGE SUP CT RM 2	00025	TOTARO	20	1424	30	2265	50	3689
	00026	WEBSTER	20	1503	30	2372	50	3875
	00027	WELLEN	20	1446	30	2327	50	3773
JUDGE SUP CT RM 3	00028	NOKOVICH	20	1671	30	2637	50	4306
	00029	POLLARD	20	1664	30	2666	50	4330

Fig - 4

PRIMARY ELECTION- -DEMONSTRATION--MAY 1963
OFFICIAL RETURN--DEMOCRATIC PARTY

PREC NO	REPR/CONG DIST 1 HUNT 00001	REPR/CONG DIST 1 CARMODY 00002	REPR/CONG DIST 1 ERICK 00003	REPR/CONG DIST 1 RUDOLPHE 00004	REPR/CONG DIST 1 MCDONALD 00005	REPR/CONG DIST 2 KADER 00006	REPR/CONG DIST 2 CHALUPKA 00007	REPR/CONG DIST 2 SMITH 00008	REPR/CONG DIST 2 ROSSMAN 00009	JUDGE CIRC CT DIST 19 KEMPF 00010
01	102	113	89	110	115					79
02	123	105	109	92	112					93
03	114	125	107	118	122					44
04	41	118	138	109	132					57
05	124	54	111	142	143					64
06	139	127	95	116	133					71
07	137	141	129	106	113					76
08	117	142	139	134	105					57
09	112	115	146	143	131					101
10	146	108	121	152	139					67
11	126	143	145	135	112					83
12	116	129	146	147	132					57
13	136	119	132	143	142					74
14	147	129	136	118	146					62
15	124	156	127	139	149					57
16	147	129	151	134	142					76
17	154	149	123	146	151					112
18	146	151	152	126	149					95
19	141	153	158	145	136					89
20	134	145	150	152	147					87
21	163	149	152	171	156					103
22	162	165	151	149	174					78
23	165	168	152	164	159					86
24	162	161	173	154	162					67
25	156	167	158	179	163					85
26						167	148	156	169	106
27						154	157	161	172	85
28						170	152	159	163	104
29						159	167	158	162	87
48						89	119	42	133	32
49						127	86	115	51	32
50						62	109	79	105	77
TOTAL	3334	3361	3390	3424	3465	2980	3103	3020	3042	3933

OFFICES	1 2 Repr./Cong.Dist.1	3 Judge Circ.Ct. Dist.19	49 Comm.Woman Prec. 1	50
DEMOCRATIC A	005 001 Mc Donald Hunt	010 Kempf	265 Radiki	
DEMOCRATIC B	002 003 Carmody Erick	012 Daley	266 Guppenberg	
DEMOCRATIC C	004 Rudolphe	014 Deutch		
OFFICES	Repr./Cong. Dist. 1	Judge Circ.Ct. Dist.19	Comm.Woman Prec. 1	
REPUBLICAN D		462 Tretter	892 Jenkins	
REPUBLICAN E		464 Levitus	893 Dracup	
OFFICES	Repr./Cong. Dist. 1	Judge Circ.Ct. Dist.19	Comm.Woman Prec. 1	
PROHIBITION F				

Fig. 5A

OFFICES		1 2 Repr./Cong.Dist.1	3 Judge Circ.Ct. Dist.19	49 Comm.Woman Prec. 1	50
DEMOCRATIC	A	004 005 Rudolphe McDonald	014 Deutch	266 Guppenberg	
	B	001 002 Hunt Carmody	010 Kempf	265 Radiki	
	C	003 Erick	012 Daley		
OFFICES		Repr./Cong. Dist. 1	Judge Circ.Ct. Dist.19	Comm.Woman Prec. 1	
REPUBLICAN	D		464 Levitus	893 Dracup	
	E		462 Tretter	892 Jenkin	
OFFICES		Repr./Cong. Dist. 1	Judge Circ.Ct. Dist.19	Comm.Woman Prec. 1	
PROHIBITION	F				

Fig-5B

50	49 PRECINCT COMMITTEE WOMEN	48 PRECINCT COMMITTEE MAN	47	46 TOWNSHIP ADVISORY BOARD	45 TOWNSHIP CLERK	44 TOWNSHIP CONSTABLE	43 TOWNSHIP JUSTICE OF THE PEACE	42 TOWNSHIP ASSESSOR	41	40 TOWNSHIP TRUSTEE	39 COUNTY COUNCILMAN AT LARGE
50 A	49 A 0265	48 A 0261	47 A 0122	46 A 0121	45 A 0115	44 A 0113	43 A 0111	42 A 0109	41 A 0105	40 A 0104	39 A 0102
000	076	065	073	093	076	064	067	078	089	077	106
000	000	000	000	000	000	000	000	000	000	000	000
50 B	49 B 0266	48 B 0262	47 B 0118	46 B 0117	45 B 0116	44 B 0114	43 B 0112	42 B 0110	41 B 0107	40 B 0106	39 B 0103
000	102	098	065	054	072	105	078	056	097	104	094
000	000	000	000	000	000	000	000	000	000	000	000
50 C	49 C	48 C	47 C 0120	46 C 0119	45 C	44 C	43 C	42 C 0108	41 C	40 C	39 C
000	000	000	045	069	000	000	000	039	000	000	000
000	000	000	000	000	000	000	000	000	000	000	000
50 D	49 D 0892	48 D	47 D	46 D	45 D	44 D	43 D	42 D	41 D	40 D	39 D
000	000	000	000	000	000	000	000	000	000	000	000
000	000	000	000	000	000	000	000	000	000	000	000

Fig. 6A

50 E 000 000	49 E 0893 000 000	48 E 000 000	47 E 000 000	46 E 000 000	45 E 000 000	44 E 000 000	43 E 000 000	42 E 000 000	41 E 000 000	40 E 000 000	39 E 000 000
50 F 000 000	49 F 079 000	48 F 0263 087 000	47 F 0232 042 000	46 F 0231 065 000	45 F 0225 082 000	44 F 0223 087 000	43 F 0221 102 000	42 F 0217 029 000	41 F 0214 075 000	40 F 0213 047 000	39 F 0211 073 000
50 G 000 000	49 G 0268 092 000	48 G 0264 094 000	47 G 0228 044 000	46 G 0227 059 000	45 G 0226 109 000	44 G 0224 089 000	43 G 0222 091 000	42 G 0218 037 000	41 G 0216 089 000	40 G 0215 074 000	39 G 0212 072 000
50 H 000 000	49 H 000 000	48 H 000 000	47 H 0230 038 000	46 H 0229 047 000	45 H 000 000	44 H 000 000	43 H 000 000	42 H 0219 038 000	41 H 000 000	40 H 000 000	39 H 000 000
50 I 000 000	49 I 000 000	48 I 000 000	47 I 000 000	46 I 000 000	45 I 000 000	44 I 000 000	43 I 000 000	42 I 0220 056 000	41 I 000 000	40 I 000 000	39 I 000 000

Fig. 8B

11	10	9	8	7	6	5	4	3	2	1	
JUDGE OF THE SUPERIOR COURT ROOM FIVE	JUDGE OF THE SUPERIOR COURT ROOM FOUR	JUDGE OF THE SUPERIOR COURT ROOM THREE	JUDGE OF THE SUPERIOR COURT ROOM TWO	JUDGE OF THE SUPERIOR COURT ROOM ONE	PROSECUTING ATTORNEY 19TH JUDICIAL DISTRICT		JUDGE OF THE CIRCUIT COURT 19TH JUDICIAL DISTRICT		REPRESENTATIVE IN CONGRESS 1ST DISTRICT		
11 A	10 A	9 A	8 A	7 A	6 A	5 A	4 A	3 A	2 A	1 A	
0031	0030	0029	0027	0024	0018	0017	0011	0010	0001	0005	2000 PUBLIC COUNTER
066	118	087	078	086	092	106	062	057	124	143	
000	000	000	000	000	000	000	000	000	000	000	000
11 B	10 B	9 B	8 B	7 B	6 B	5 B	4 B	3 B	2 B	1 B	
0032		0028	0026	0023	0021	0022	0013	0012	0003	0002	
045	000	065	071	072	038	073	064	073	111	054	AFTER POLLS CLOSE
000	000	000	000	000	000	000	000	000	000	000	BEFORE POLLS OPEN
11 C	10 C	9 C	8 C	7 C	6 C	5 C	4 C	3 C	2 C	1 C	
0033			0025		0019	0020	0015	0014		0004	MACHINE NUMBER 123005
074	000	000	062	000	036	069	051	062	000	142	123005
000	000	000	000	000	000	000	000	000	000	000	
11 D	10 D	9 D	8 D	7 D	6 D	5 D	4 D	3 D	2 D	1 D	
							0016	0462			
000	000	000	000	000	000	000	000	096	000	000	AFTER POLLS CLOSE
000	000	000	000	000	000	000	000	000	000	000	BEFORE POLLS OPEN

Fig. 6c

11E	10E	9E	8E	7E	6E	5E	4E	3E	2E	1E	
								0464			
000	000	000	000	000	000	000	000	000	000	000	AFTER POLLS CLOSE
000	000	000	000	000	000	000	000	000	000	000	BEFORE POLLS OPEN
11F	10F	9F	8F	7F	6F	5F	4F	3F	2F	1F	
0145	0143	0141	0138	0134	0131	0130	0129				
068	106	046	086	061	057	091	069	084	000	000	AFTER POLLS CLOSE
000	000	000	000	000	000	000	000	000	000	000	BEFORE POLLS OPEN
11G	10G	9G	8G	7G	6G	5G	4G	3G	2G	1G	
0146	0144	0142	0139	0135	0133	0132		0127			
081	109	062	053	023	058	083	000	086	000	000	AFTER POLLS CLOSE
000	000	000	000	000	000	000	000	000	000	000	BEFORE POLLS OPEN
11H	10H	9H	8H	7H	6H	5H	4H	3H	2H	1H	
		0140		0136							
000	000	086	000	047	000	000	000	000	000	000	AFTER POLLS CLOSE
000	000	000	000	000	000	000	000	000	000	000	BEFORE POLLS OPEN
11I	10I	9I	8I	7I	6I	5I	4I	3I	2I	1I	
				0137							
000	000	000	000	062	000	000	000	000	000	000	AFTER POLLS CLOSE
000	000	000	000	000	000	000	000	000	000	000	BEFORE POLLS OPEN

Fig - 6d

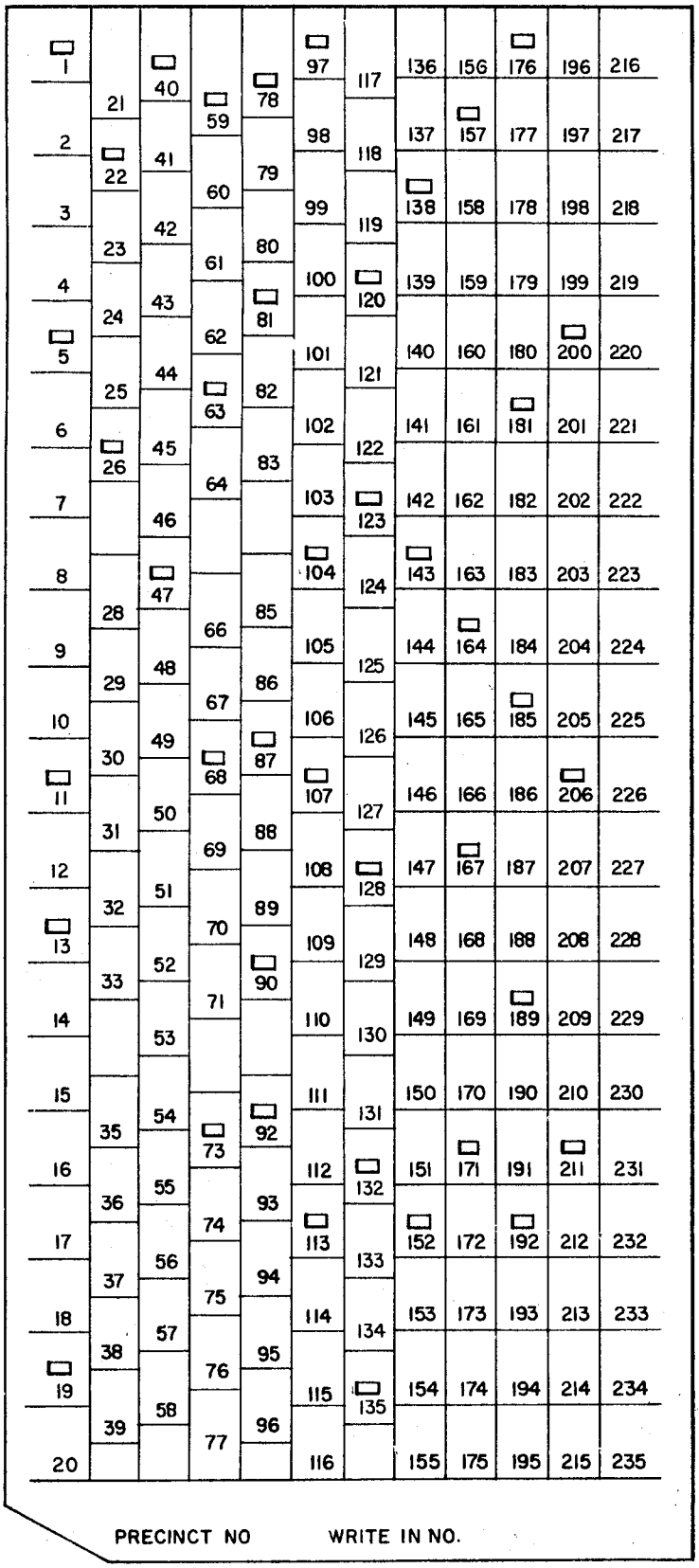
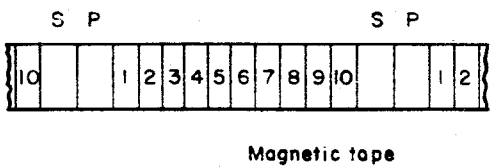

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
21 22 23 24 25 26 28 29 30 31 32 33 35 36 37 38 39
40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58
59 60 61 62 63 64 66 67 68 69 70 71 73 74 75 76 77
78 79 80 81 82 83 85 86 87 88 89 90 92 93 94 95 96
97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116
117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135
136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155
156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175
176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195
196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215
216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235
PRECINCT NO
WRITE IN NO.

FIG. 7

Fig. 11



Magnetic tape

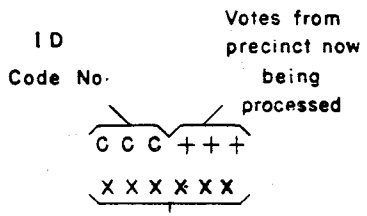


Fig. 8

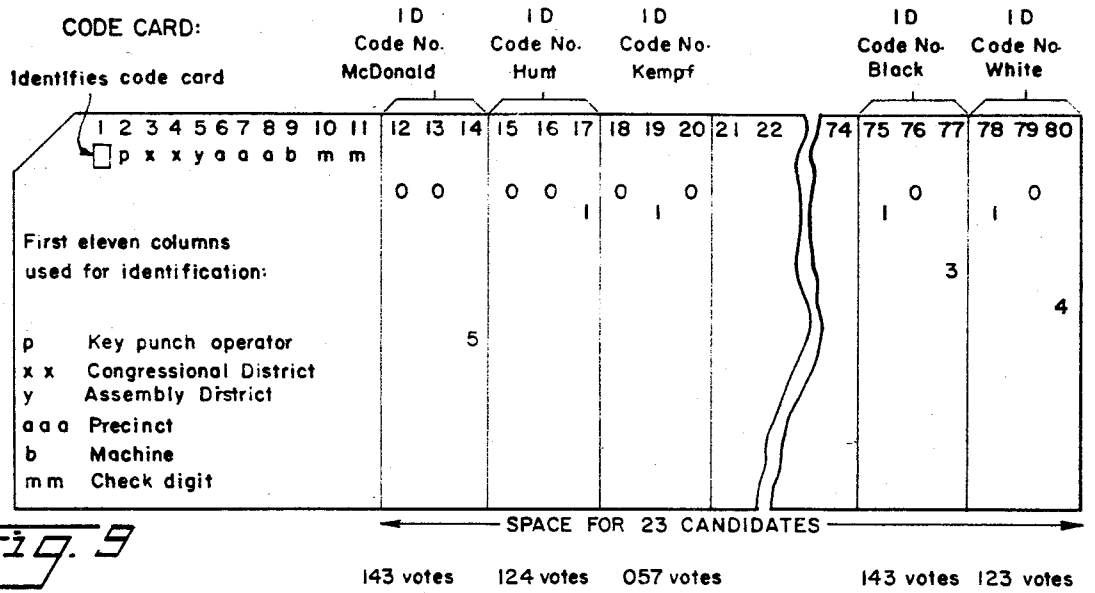


Fig. 9

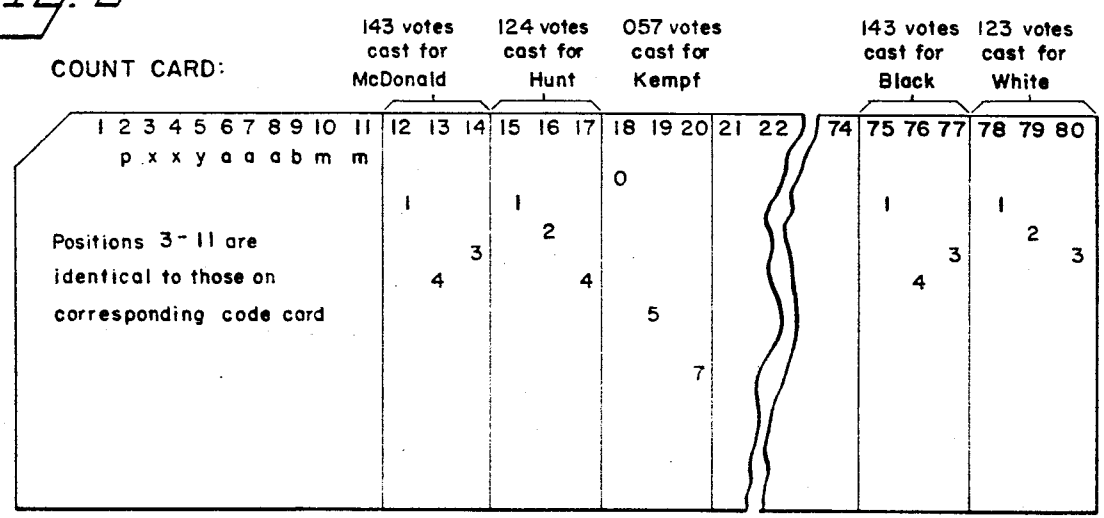


Fig. 10

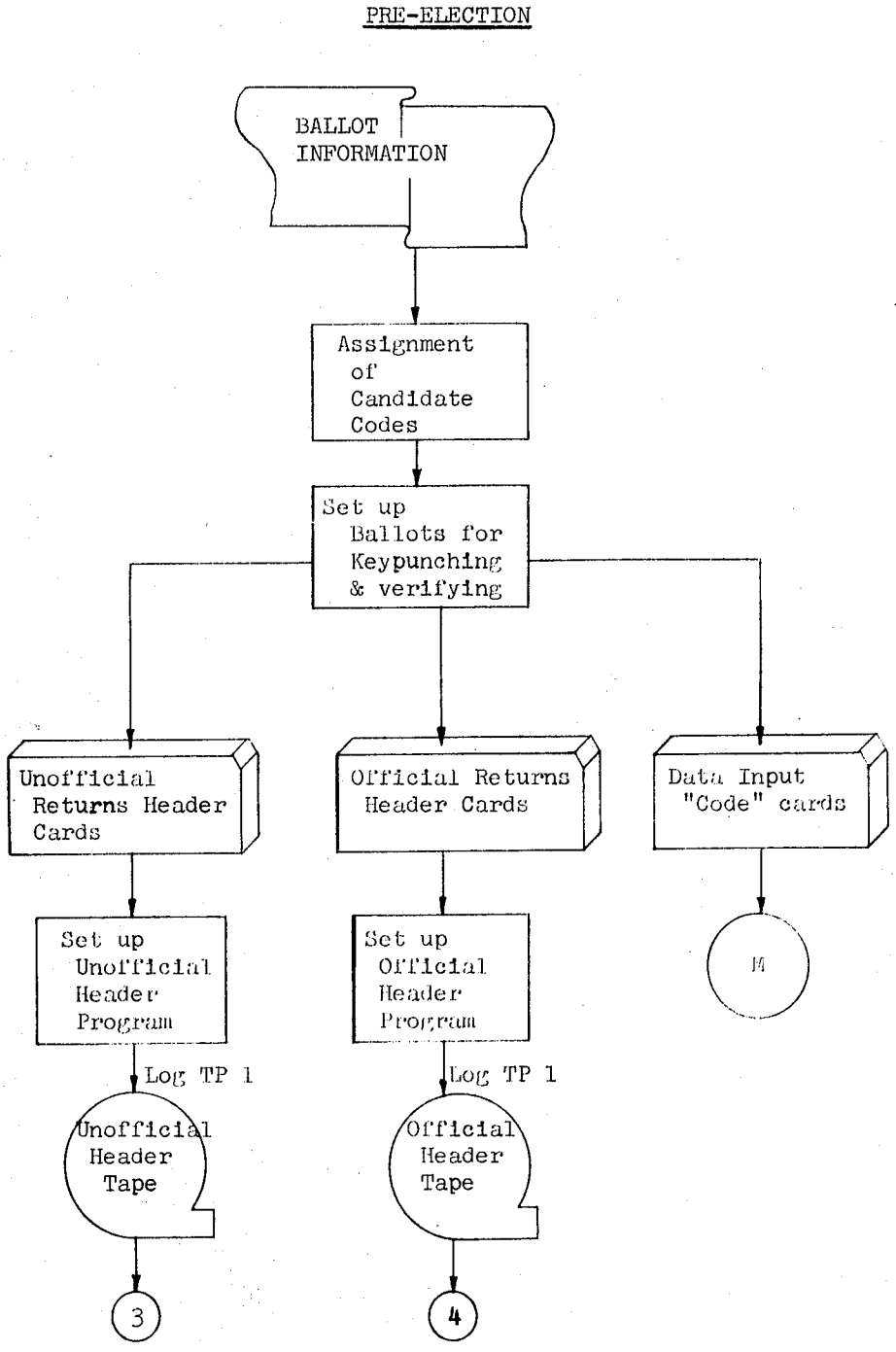

PRE-ELECTION
BALLOT INFORMATION
Assignment of Candidate Codes
Set up Ballots for Keypunching & verifying
Unofficial Returns Header Cards
Official Returns Header Cards
Data Input "Code" cards
Set up Unofficial Header Program
Set up Official Header Program
M
Log TP 1
Log TP 1
Unofficial Header Tape
Official Header Tape
3
4

Fig. 12

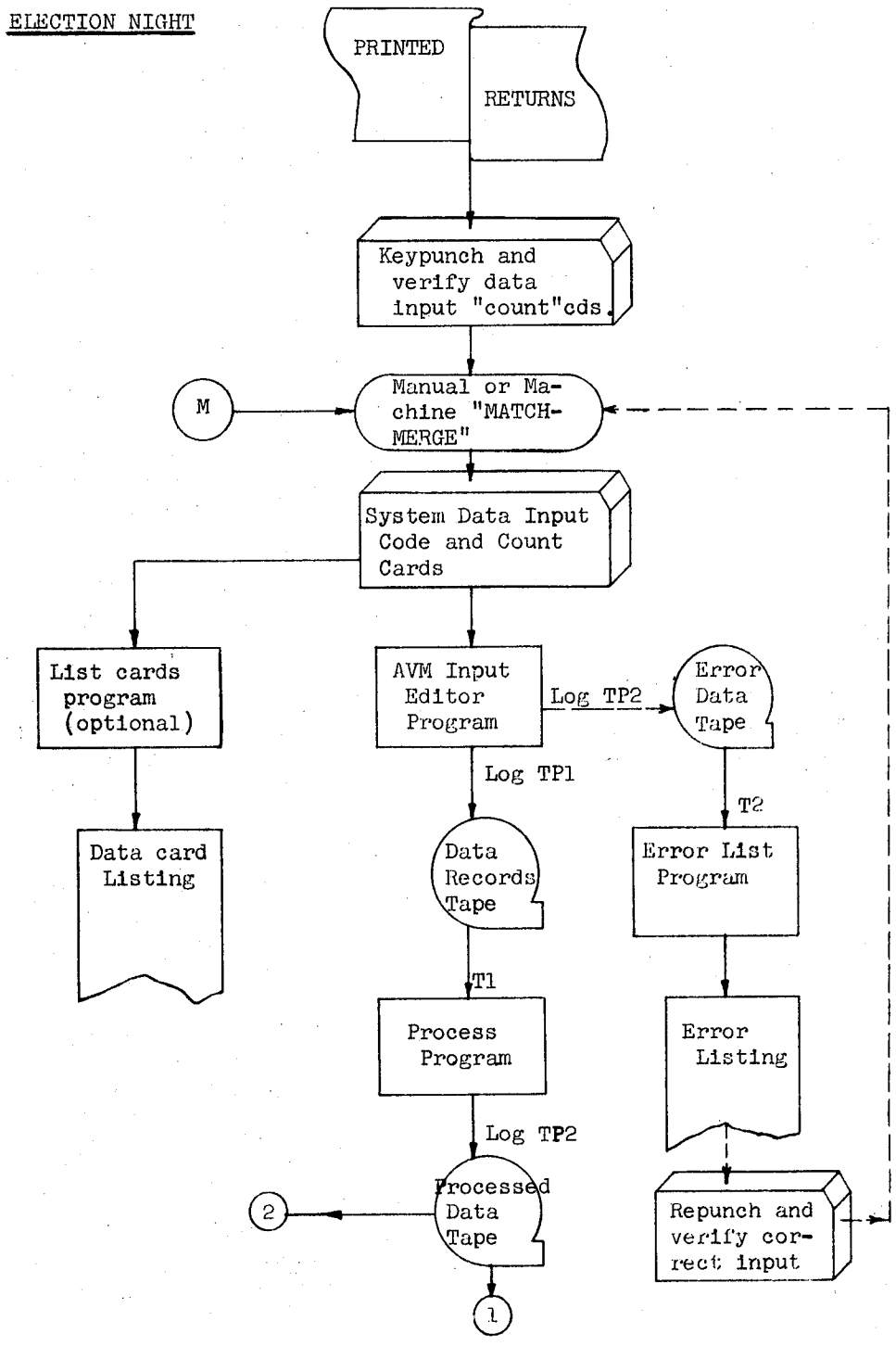

ELECTION NIGHT
PRINTED
RETURNS
Keypunch and verify data input "count"cds.
M
Manual or Machine "MATCH-MERGE"
System Data Input Code and Count Cards
List cards program (optional)
AVM Input Editor Program
Log TP2
Error Data Tape
Log TP1
T2
Data card Listing
Data Records Tape
Error List Program
T1
Process Program
Error Listing
Log TP2
Processed Data Tape
2
Repunch and verify correct input
1

Fig 13

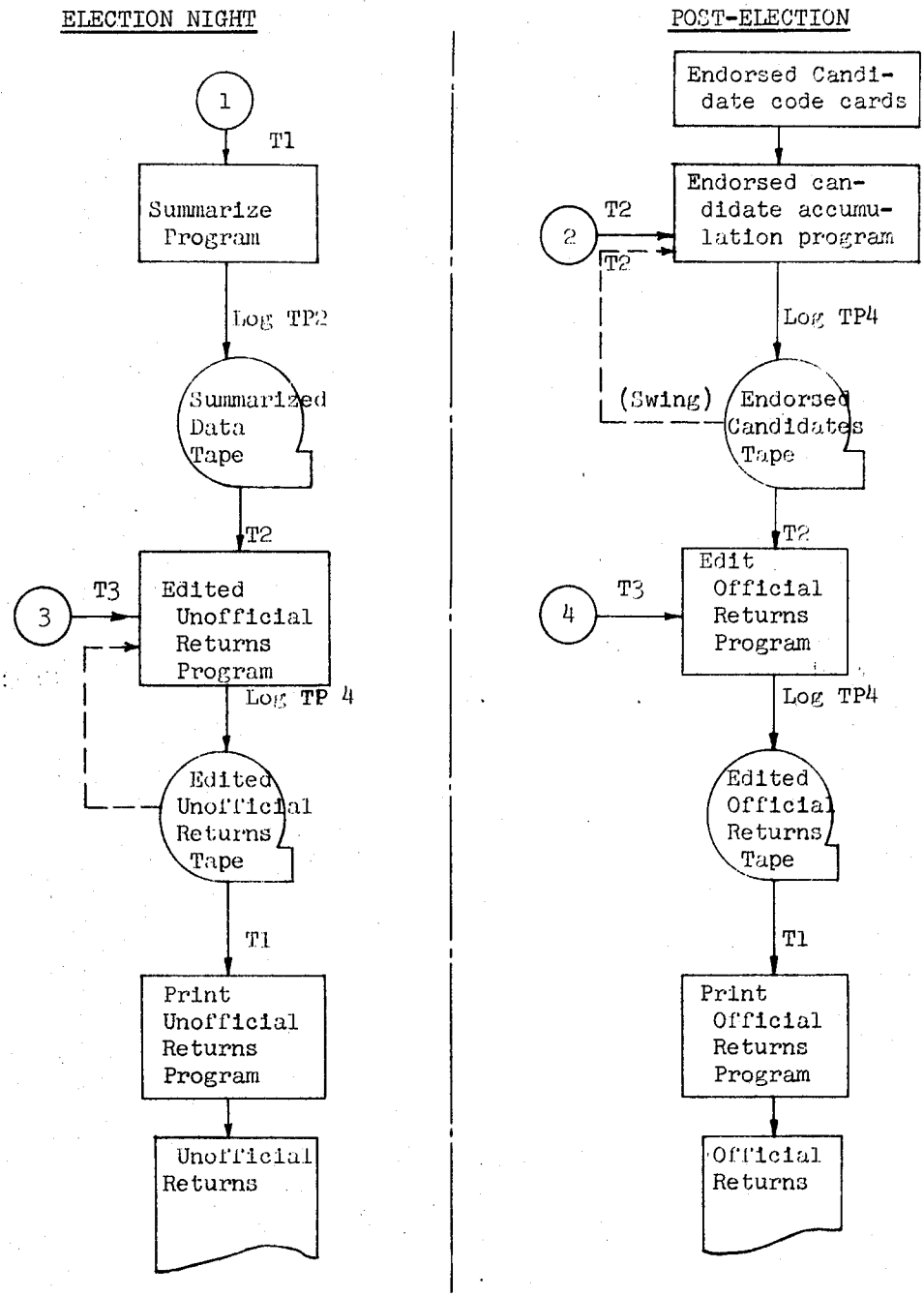

ELECTION NIGHT
POST-ELECTION
1
T1
Summarize Program
Log TP2
Summarized Data Tape
T2
3
T3
Edited Unofficial Returns Program
Log TP 4
Edited Unofficial Returns Tape
T1
Print Unofficial Returns Program
Unofficial Returns
Endorsed Candidate code cards
Endorsed candidate accumulation program
2
T2
T2
Log TP4
(Swing)
Endorsed Candidates Tape
T2
Edit Official Returns Program
4
T3
Log TP4
Edited Official Returns Tape
T1
Print Official Returns Program
Official Returns

Fig. 14

PRIMARY ELECTION - MAY 1964
UNOFFICIAL RETURN - DEMOCRATIC PARTY

OFFICE	CODE	CANDIDATE	PREVIOUS MACH	TOTALS VOTES	TOTALS THIS REPORT MACH	TOTALS THIS REPORT VOTES	TOTALS-TO-DATE MACH	TOTALS-TO-DATE VOTES
GOVERNOR	00001	HUNT	50	2014	25	1003	75	3017
	00002	CARMODY	50	1642	25	972	75	2614
	00003	MCDONALD	50	1973	25	841	75	2814
	00004	BARRIE	50	2111	25	1152	75	3263
	00005	FORD	50	1473	25	816	75	2289
LIEUTENANT GOVERNOR	00006	AVERY	50	2243	25	1471	75	3714
	00007	MALLORY	50	2617	25	1123	75	3740
	00008	LAPORTE	50	1841	25	973	75	2814
	00009	PROCTOR	50	1458	25	652	75	2110
SECRETARY OF STATE	00010	WEBSTER	50	2136	25	1070	75	3206
	00011	MEAD	50	2718	25	1581	75	4299
	00012	SAVER	50	1974	25	862	75	2836
	00013	WILSON	50	2446	25	1311	75	3757
ATTORNEY GENERAL	00014	MILLER	50	1871	25	963	75	2834
	00015	KELLEY	50	2342	25	1311	75	3653
	00016	SMITH	50	1744	25	888	75	2632
	00017	WHITE	50	1509	25	762	75	2271
	00018	CRAWFORD	50	1922	25	1015	75	2937
TREASURER	00019	WORTHMORE	50	1906	25	1152	75	3058
	00020	GRIFFIN	50	1666	25	917	75	2583
	00021	JACKSON	50	2327	25	1244	75	3571
	00022	DAVIDSON	50	2644	25	1409	75	4053
UNITED STA SENATOR	00023	PRINCE	50	3011	25	1411	75	4422
	00024	SWANSON	50	3433	25	1662	75	4095
	00025	JONES	50	2987	25	1519	75	4506

Fig. 15

REPR/CONG	DIST 1	00026	APPLEBAUM	25	1203	10	688	35	1891
		00027	LYMAN	25	1471	10	704	35	2175
		00028	HANCOCK	25	1009	10	613	35	1622
		00029	PARKER	25	1531	10	842	35	2373
REPR/CONG	DIST 2	00030	FLYNN	20	871	5	213	25	1084
		00031	UNDERWOOD	20	1022	5	298	25	1320
		00032	WILLIAMS	20	961	5	207	25	1168
		00033	KENNEDY	20	471	5	114	25	585
		00034	LUDWIG	20	842	5	192	25	934
REPR/CONG	DIST 3	00035	MAURER	5	314	10	652	15	966
		00036	WILLIAMS	5	408	10	917	15	1325
		00037	ALLEN	5	271	10	511	15	782

Fig 15A

PRIMARY ELECTION - MAY 1964
OFFICIAL RETURN - DEMOCRATIC PARTY

DI PRE MA	GOVERNOR HUNT 00001	GOVERNOR CARMODY 00002	GOVERNOR MCDONALD 00003	GOVERNOR BARRIE 00004	GOVERNOR FORD 00005	LT GOVERNOR AVERY 00006	LT GOVERNOR MALLORY 00007	LT GOVERNOR LAPORTE 00008	LT GOVERNOR PROCTOR 00009	SEC OF STA WEBSTER 00010
01 001 01	32	29	37	42	41	55	53	47	46	50
01 001 02	43	32	41	43	47	54	50	52	50	56
01 001 03	21	31	43	41	38	50	43	51	45	52
01 001	96*	92*	121*	126*	126*	159*	146*	150*	141*	164*
01 002 01	31	41	38	41	42	55	56	58	41	59
01 002 02	38	38	33	45	38	50	49	47	33	52
01 002	69*	79*	71*	86*	80*	105*	105*	105*	74*	111*
01 003	41*	35*	42*	29*	37*	48*	47*	42*	46*	53*
01	206	206	234	241	243	312	298	297	261	328
02 001 01	33	38	43	41	36	56	53	51	45	55
02 001 02	51	35	41	28	35	60	50	48	49	58
02 001 03	20	37	39	31	41	49	56	43	46	51
02 001 04	37	31	36	39	43	51	55	52	53	49
02 001 05	43	33	35	41	46	50	46	49	51	56
02 001	184*	174*	194*	180*	201*	266*	260*	243*	244*	269*
02 002	42*	36*	41*	35*	39*	55*	39*	46*	52*	52*
02 003	39*	40*	45*	38*	33*	50*	52*	51*	51*	59*
02 004 01	37	29	46	37	28	47	52	51	45	61
02 004 02	25	32	29	33	39	55	58	48	47	49
02 004 03	29	38	38	43	39	49	52	46	46	53
02 004	91*	99*	113*	113*	106*	149*	166*	145*	138*	163*

Fig. 16

02 005 01	35	45	36	32	42	53	46	51	47	55
02 005 02	41	39	37	39	45	55	52	49	53	57
02 005	76*	84*	73*	71*	87*	108*	98*	100*	100*	112*
02	435	433	466	437	466	628	615	585	587	655
03 001 01	19	28	35	36	41	47	47	53	57	56
03 001 02	29	40	37	37	30	62	51	54	50	57
03 001 03	25	37	36	42	37	58	56	50	48	59
03 001 04	37	42	39	39	36	53	49	42	45	55
03 001	110*	147*	147*	154*	144*	220*	203*	199*	200*	227*
03	110	147	147	154	144	220	203	199	200	227
TOTALS	751	786	847	832	853	1160	1116	1081	1048	1210

Fig. 16A

GENERAL ELECTION - NOVEMBER 3 1964
UNOFFICIAL RETURN

OFFICE	CODE	CANDIDATE	PREVIOUS TOTALS MACH	PREVIOUS TOTALS VOTES	TOTALS THIS REPORT MACH	TOTALS THIS REPORT VOTES	TOTALS-TO-DATE MACH	TOTALS-TO-DATE VOTES
GOVERNOR	00001	ADAMS	50	5234	25	2511	75	7745
	00002	BAKER - D	50	4187	25	2097	75	6284
	00003	BAKER - L	50	639	25	358	75	997
	00004	BAKER - I	50	271	25	191	75	462
	00005	BAKER - **	50	5097	25	2646	75	7743
LIEUTENANT GOVERNOR	00006	SMITH	50	5361	25	2489	75	7850
	00007	JONES - D	50	4251	25	2103	75	6354
	00008	JONES - L	50	587	25	238	75	825
	00009	JONES - I	50	306	25	115	75	421
	00010	JONES - **	50	5144	25	2456	75	7600

Fig. 17

GENERAL ELECTION - NOVEMBER 3 1964
OFFICIAL RETURN

	GOVERNOR	GOVERNOR	GOVERNOR	GOVERNOR	GOVERNOR	LT GOVERNOR	LT GOVERNOR	LT GOVERNOR	LT GOVERNOR	SEC OF STA
DI PRE MA	ADAMS 00001	BAKER-D 00002	BAKER-L 00003	BAKER-I 00004	BAKER-** 00005	SMITH 00006	JONES-D 00007	JONES-L 00008	JONES-** 00009	GREEN 00010
01 001 01	133	118	15	7	140	121	105	22	127	137
01 001 02	121	94	9	10	113	105	112	15	127	122
01 001 03	106	109	12	4	125	117	101	9	110	125
01 001	360*	321*	36*	21*	378*	343*	318*	46*	364*	384*
01 002 01	134	116	11	9	136	123	100	25	125	114
01 002 02	129	117	6	12	135	128	98	31	129	123
01 002	263*	233*	17*	21*	271*	251*	198*	56*	254*	237*

Fig. 17A

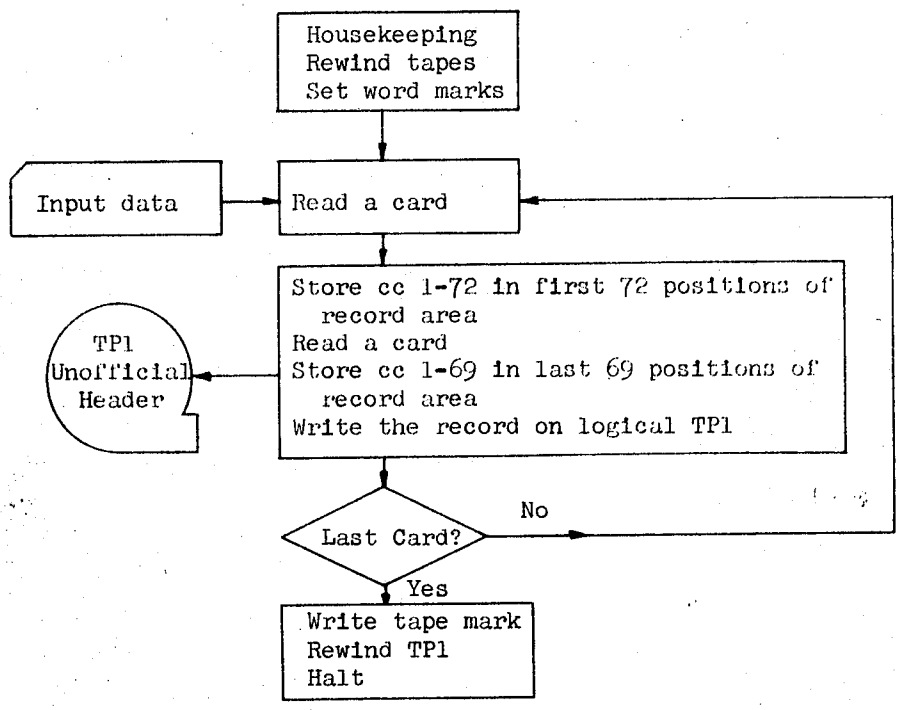

Housekeeping
Rewind tapes
Set word marks
Input data
Read a card
Store cc 1-72 in first 72 positions of record area
Read a card
Store cc 1-69 in last 69 positions of record area
Write the record on logical TP1
TP1 Unofficial Header
Last Card?
No
Yes
Write tape mark
Rewind TP1
Halt

Fig. 1B

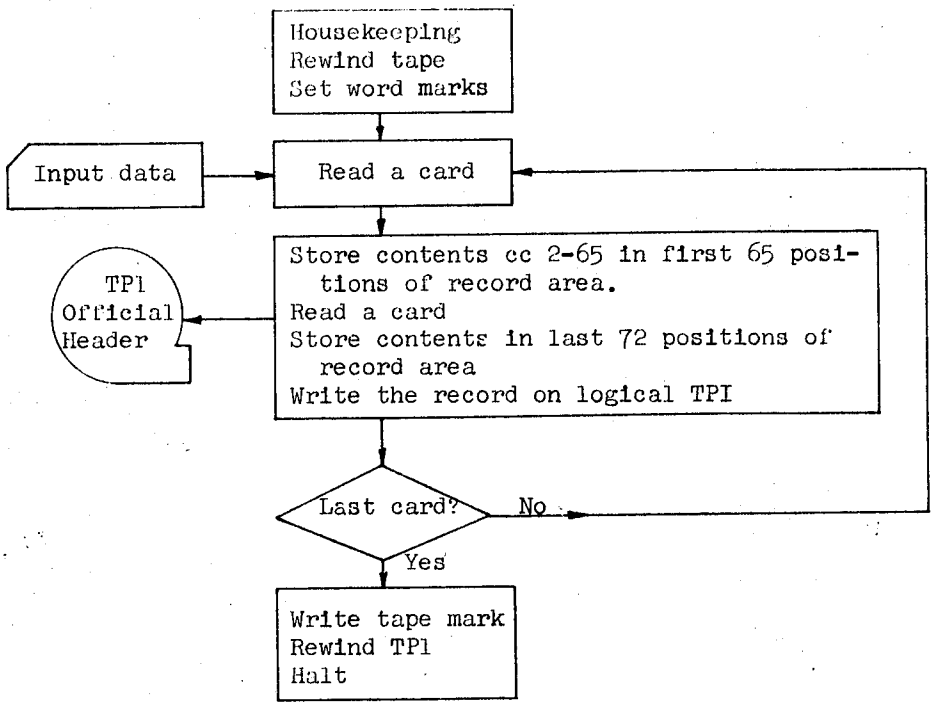

Housekeeping
Rewind tape
Set word marks
Input data
Read a card
Store contents cc 2-65 in first 65 positions of record area.
Read a card
Store contents in last 72 positions of record area
Write the record on logical TPI
TPI
Official
Header
Last card?
No
Yes
Write tape mark
Rewind TPI
Halt

Fig. 19

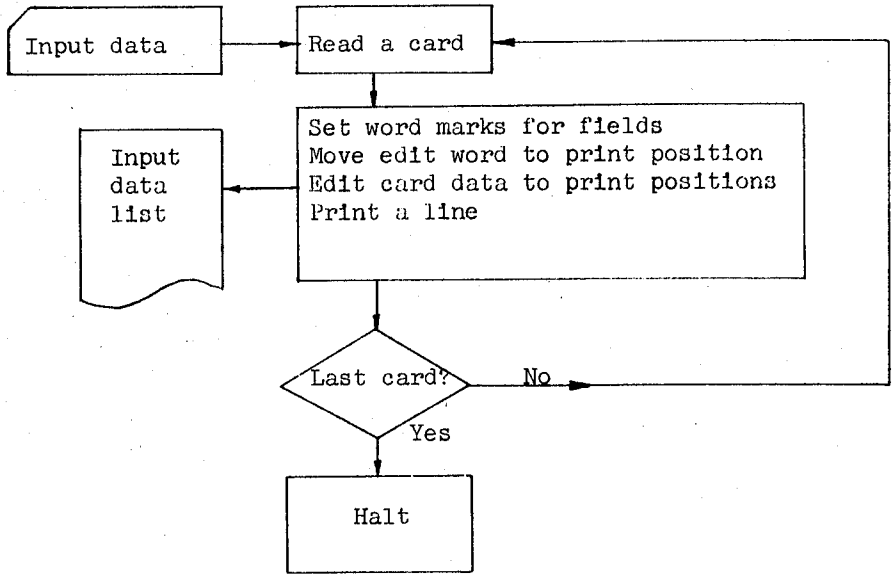

Input data
Read a card
Set word marks for fields
Move edit word to print position
Edit card data to print positions
Print a line
Input
data
list
Last card?
No
Yes
Halt

Fig. 20

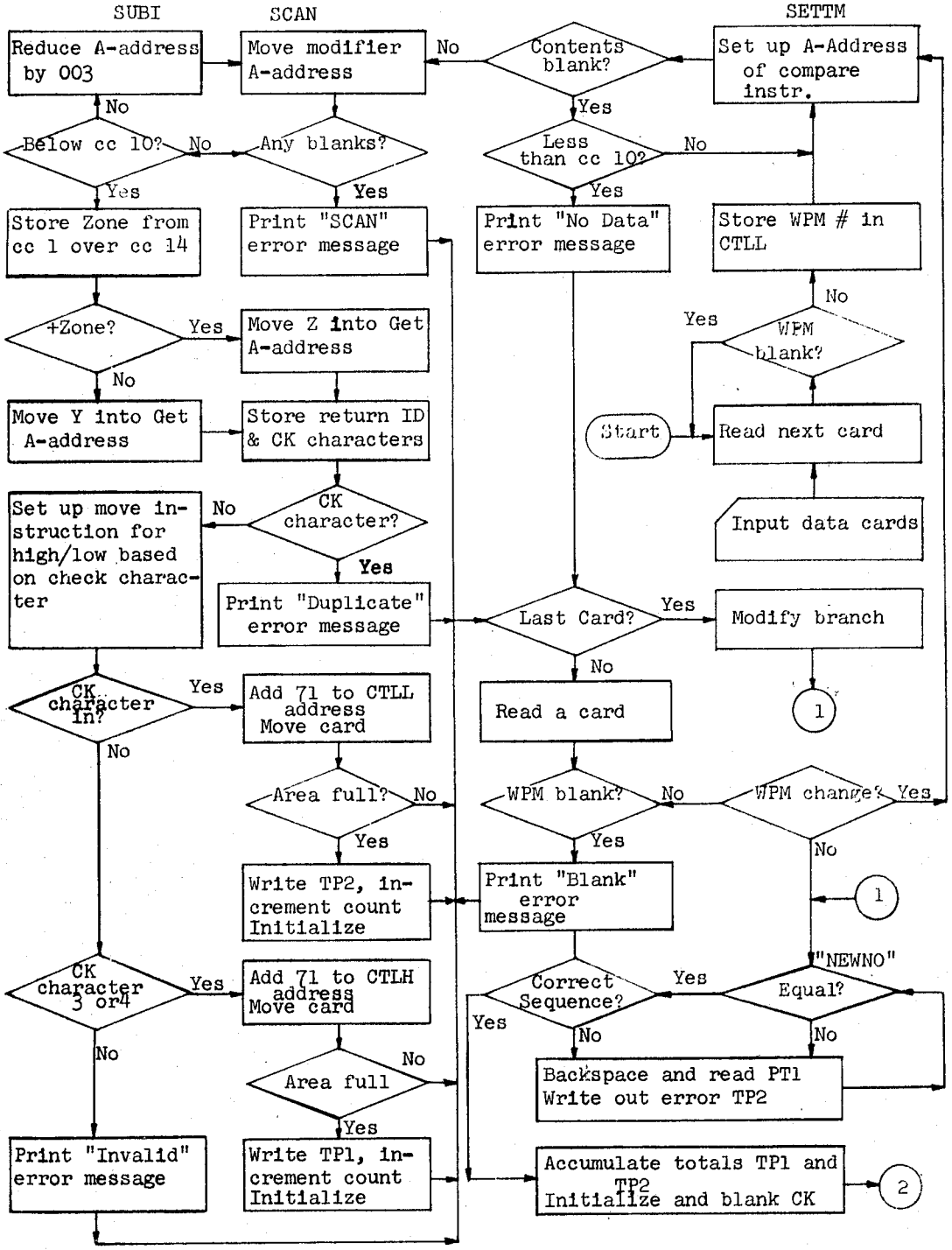

SUBI
SCAN
SETTM
Reduce A-address by 003
Move modifier A-address
Contents blank?
No
Yes
Set up A-Address of compare instr.
No
Below cc 10?
No
Any blanks?
Less than cc 10?
No
Yes
Yes
Yes
Store Zone from cc 1 over cc 14
Print "SCAN" error message
Print "No Data" error message
Store WPM # in CTLL
+Zone?
Yes
Move Z into Get A-address
No
WPM blank?
No
Yes
Move Y into Get A-address
Store return ID & CK characters
Start
Read next card
Set up move instruction for high/low based on check character
No
CK character?
Yes
Input data cards
Print "Duplicate" error message
Last Card?
Yes
Modify branch
No
CK character in?
Yes
Add 71 to CTLL address Move card
Read a card
1
No
Area full?
No
WPM blank?
No
WPM change?
Yes
Yes
Yes
No
Write TP2, increment count Initialize
Print "Blank" error message
1
"NEWNO"
CK character 3 or4
Yes
Add 71 to CTLH address Move card
Correct Sequence?
Yes
Equal?
Yes
No
No
No
Area full
No
Backspace and read PT1 Write out error TP2
Yes
Print "Invalid" error message
Write TP1, increment count Initialize
Accumulate totals TP1 and TP2 Initialize and blank CK
2

Fig. 21

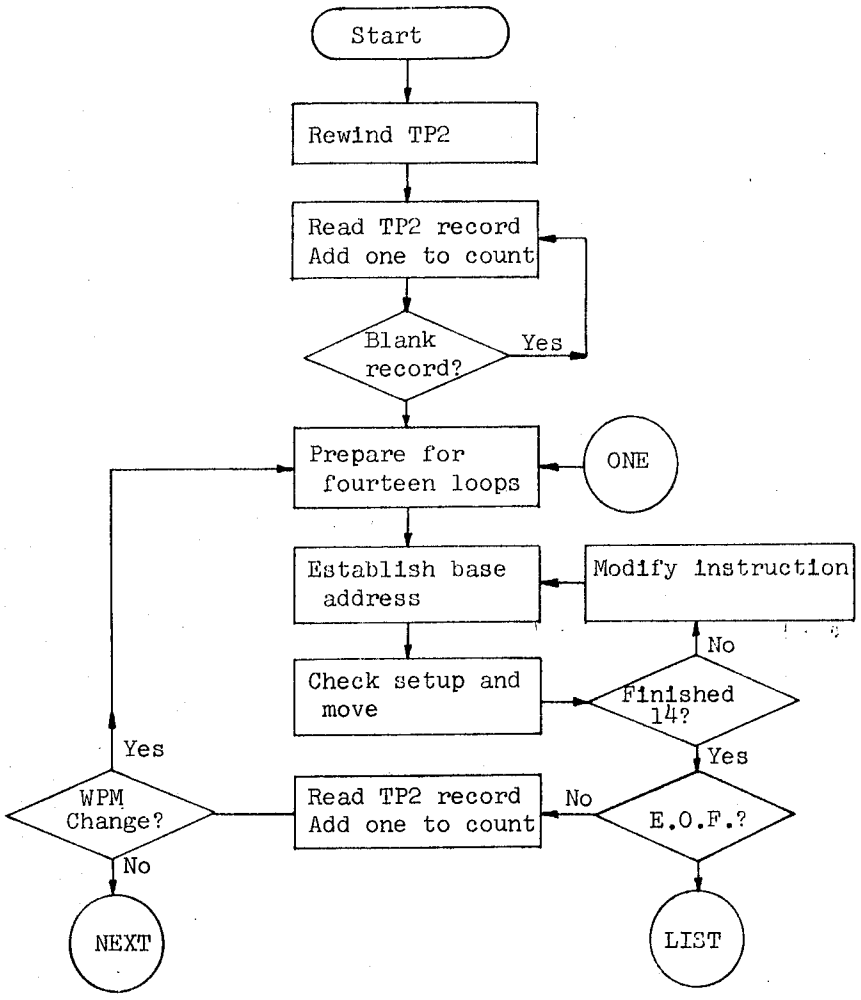

Start
Rewind TP2
Read TP2 record
Add one to count
Blank record?
Yes
Prepare for fourteen loops
ONE
Establish base address
Modify instruction
Check setup and move
Finished 14?
No
Yes
WPM Change?
Yes
Read TP2 record
Add one to count
No
E.O.F.?
No
NEXT
LIST

Fig. 22A

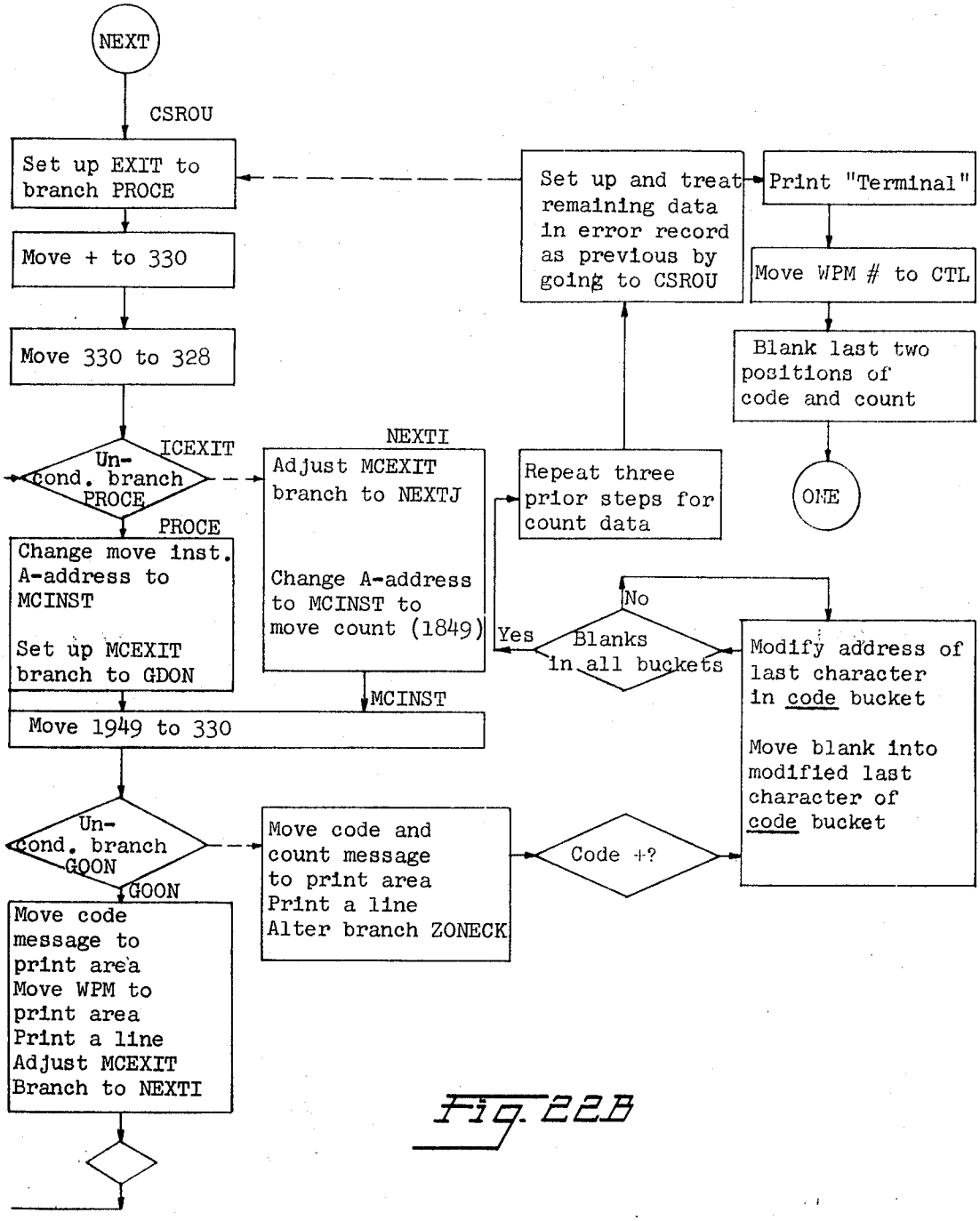

NEXT
CSROU
Set up EXIT to branch PROCE
Move + to 330
Move 330 to 328
Un-cond. branch PROCE
ICEXIT
PROCE
Change move inst. A-address to MCINST
Set up MCEXIT branch to GDON
NEXTI
Adjust MCEXIT branch to NEXTJ
Change A-address to MCINST to move count (1849)
MCINST
Move 1949 to 330
Un-cond. branch GOON
GOON
Move code message to print area
Move WPM to print area
Print a line
Adjust MCEXIT Branch to NEXTI
Move code and count message to print area
Print a line
Alter branch ZONECK
Code +?
No
Yes
Blanks in all buckets
Modify address of last character in code bucket
Move blank into modified last character of code bucket
Repeat three prior steps for count data
Set up and treat remaining data in error record as previous by going to CSROU
Print "Terminal"
Move WPM # to CTL
Blank last two positions of code and count
ONE

Fig. 22B

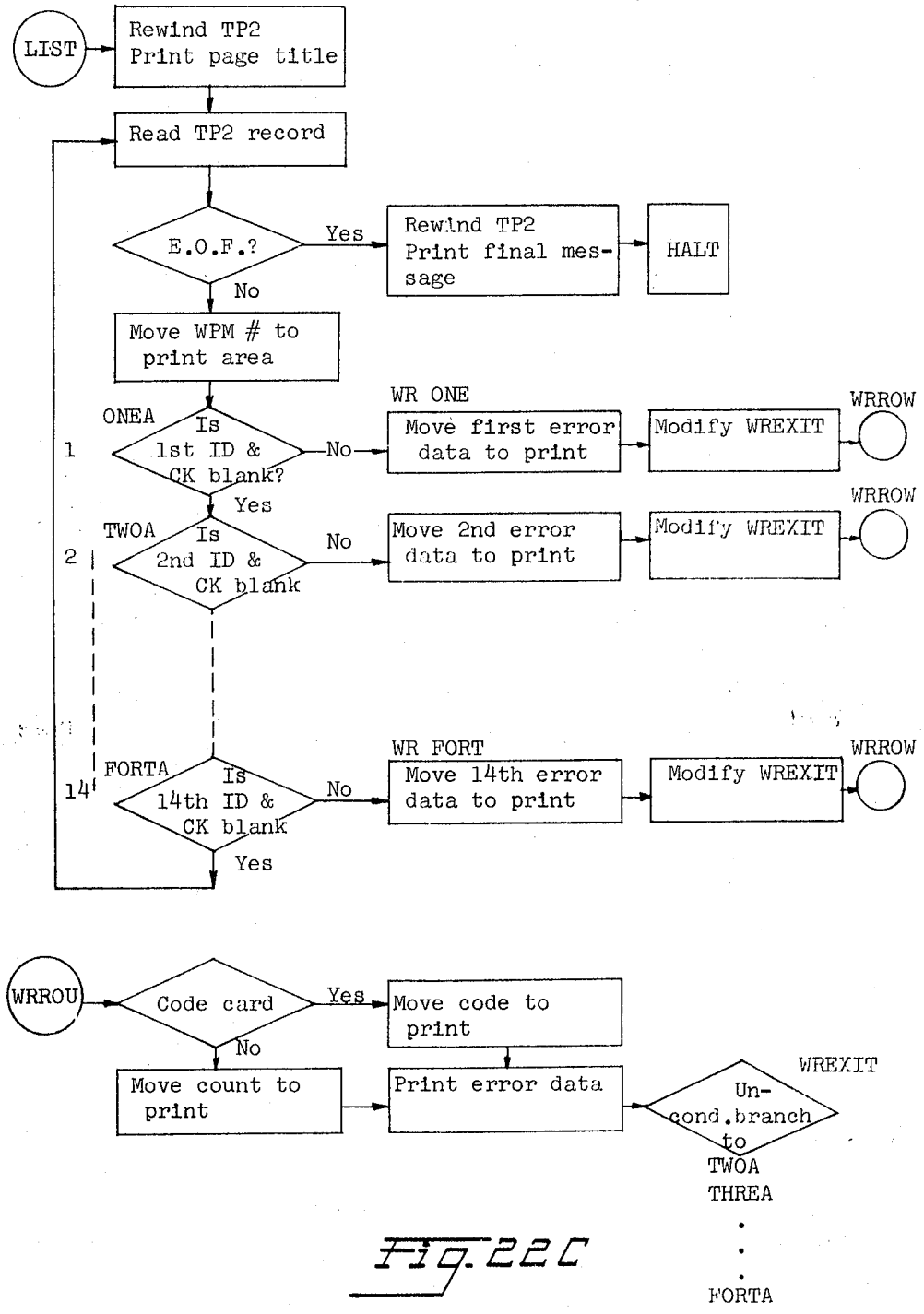

LIST
Rewind TP2
Print page title
Read TP2 record
E.O.F.?
Yes
Rewind TP2
Print final message
HALT
No
Move WPM # to print area
WR ONE
ONEA
Is 1st ID & CK blank?
1
No
Move first error data to print
Modify WREXIT
WRROW
Yes
TWOA
Is 2nd ID & CK blank
2
No
Move 2nd error data to print
Modify WREXIT
WRROW
WR FORT
FORTA
Is 14th ID & CK blank
14
No
Move 14th error data to print
Modify WREXIT
WRROW
Yes
WRROU
Code card
Yes
Move code to print
No
Move count to print
Print error data
WREXIT
Uncond.branch to
TWOA
THREA
FORTA

Fig. 22C

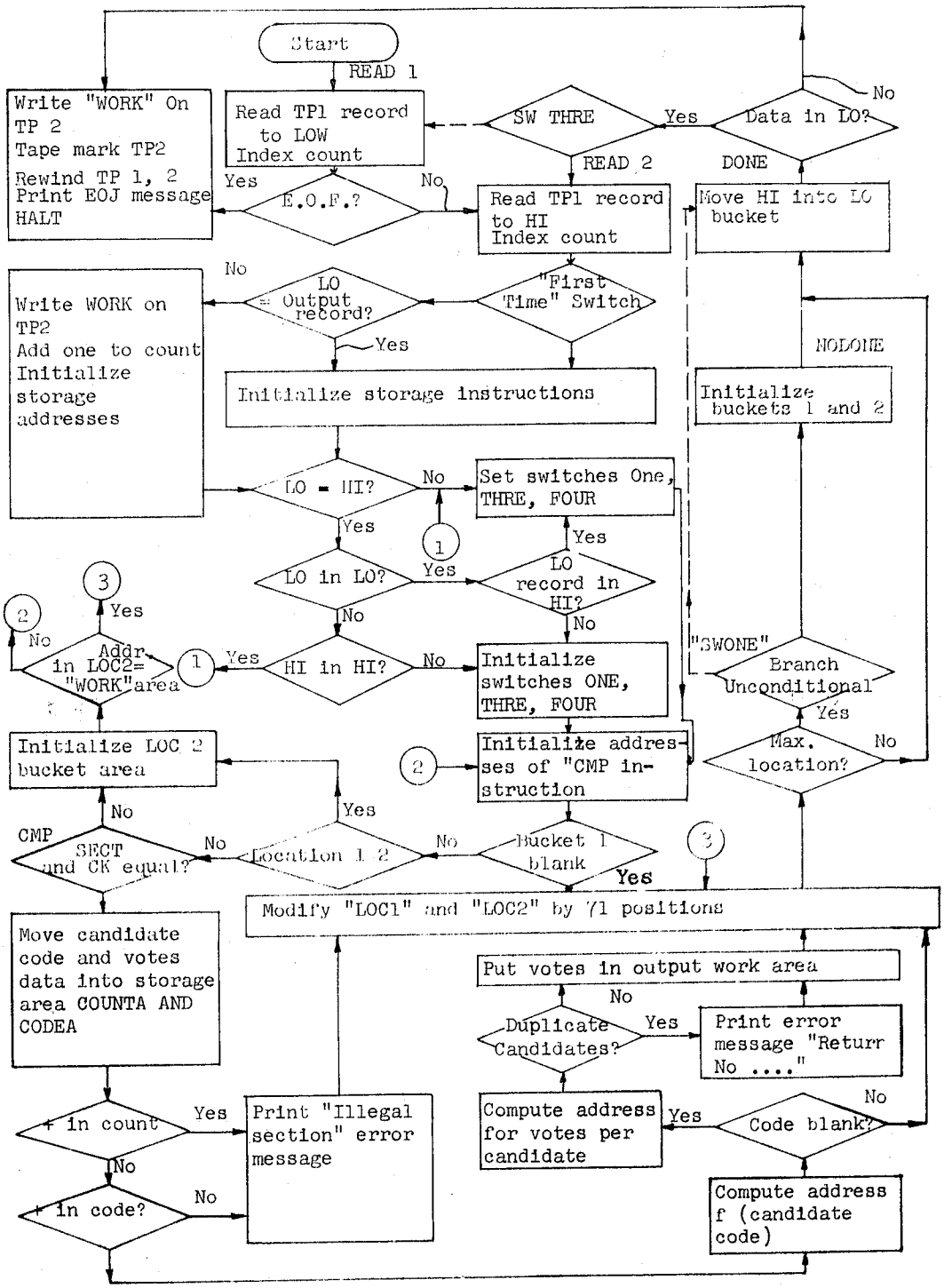

Start
READ 1
Write "WORK" On TP 2
Tape mark TP2
Rewind TP 1, 2
Print EOJ message
HALT
Read TP1 record to LOW Index count
E.O.F.?
Yes
No
SW THRE
Yes
READ 2
Data in LO?
No
DONE
Read TP1 record to HI Index count
Move HI into LO bucket
Write WORK on TP2
Add one to count
Initialize storage addresses
No
LO = Output record?
Yes
"First Time" Switch
Initialize storage instructions
NODONE
Initialize buckets 1 and 2
LO = HI?
No
Yes
Set switches One, THRE, FOUR
LO in LO?
Yes
No
LO record in HI?
Yes
No
HI in HI?
Yes
No
Initialize switches ONE, THRE, FOUR
"SWONE"
Branch Unconditional
Addr in LOC2= "WORK"area
Yes
No
Initialize LOC 2 bucket area
Initialize addresses of "CMP instruction
Max. location?
No
Yes
CMP SECT and CK equal?
No
Yes
Location 1 2
No
Bucket 1 blank
Yes
Modify "LOC1" and "LOC2" by 71 positions
Move candidate code and votes data into storage area COUNTA AND CODEA
Put votes in output work area
Duplicate Candidates?
No
Yes
Print error message "Returr No ...."
+ in count
Yes
No
+ in code?
No
Print "Illegal section" error message
Compute address for votes per candidate
Yes
Code blank?
No
Compute address f (candidate code)

Fig. 23

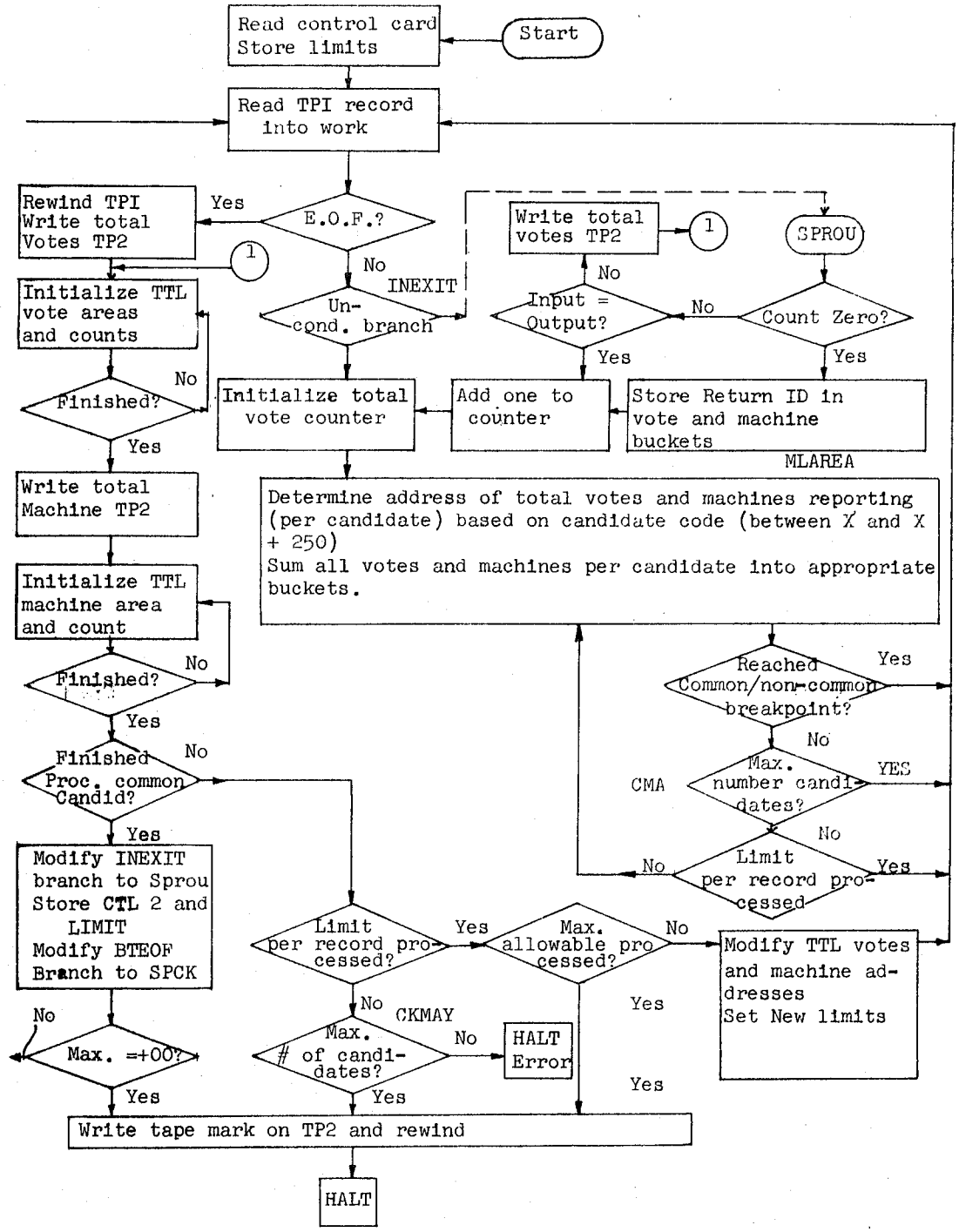

Read control card
Store limits
Start
Read TPI record into work
Rewind TPI
Write total
Votes TP2
Yes
E.O.F.?
No
INEXIT
Un-cond. branch
Write total votes TP2
1
SPROU
No
Input = Output?
No
Count Zero?
Yes
Yes
Initialize TTL vote areas and counts
No
Finished?
Yes
Initialize total vote counter
Add one to counter
Store Return ID in vote and machine buckets
MLAREA
Write total Machine TP2
Determine address of total votes and machines reporting (per candidate) based on candidate code (between X and X + 250)
Sum all votes and machines per candidate into appropriate buckets.
Initialize TTL machine area and count
No
Finished?
Yes
Reached Common/non-common breakpoint?
Yes
No
CMA
Max. number candi-dates?
YES
No
No
Limit per record pro-cessed
Yes
Finished Proc. common Candid?
No
Yes
Modify INEXIT branch to Sprou
Store CTL 2 and LIMIT
Modify BTEOF Branch to SPCK
Limit per record pro-cessed?
Yes
Max. allowable pro cessed?
No
Modify TTL votes and machine ad-dresses
Set New limits
No
Max. =+00?
Yes
No
CKMAY
Max. # of candi-dates?
No
HALT Error
Yes
Yes
Yes
Write tape mark on TP2 and rewind
HALT

Fig. 24

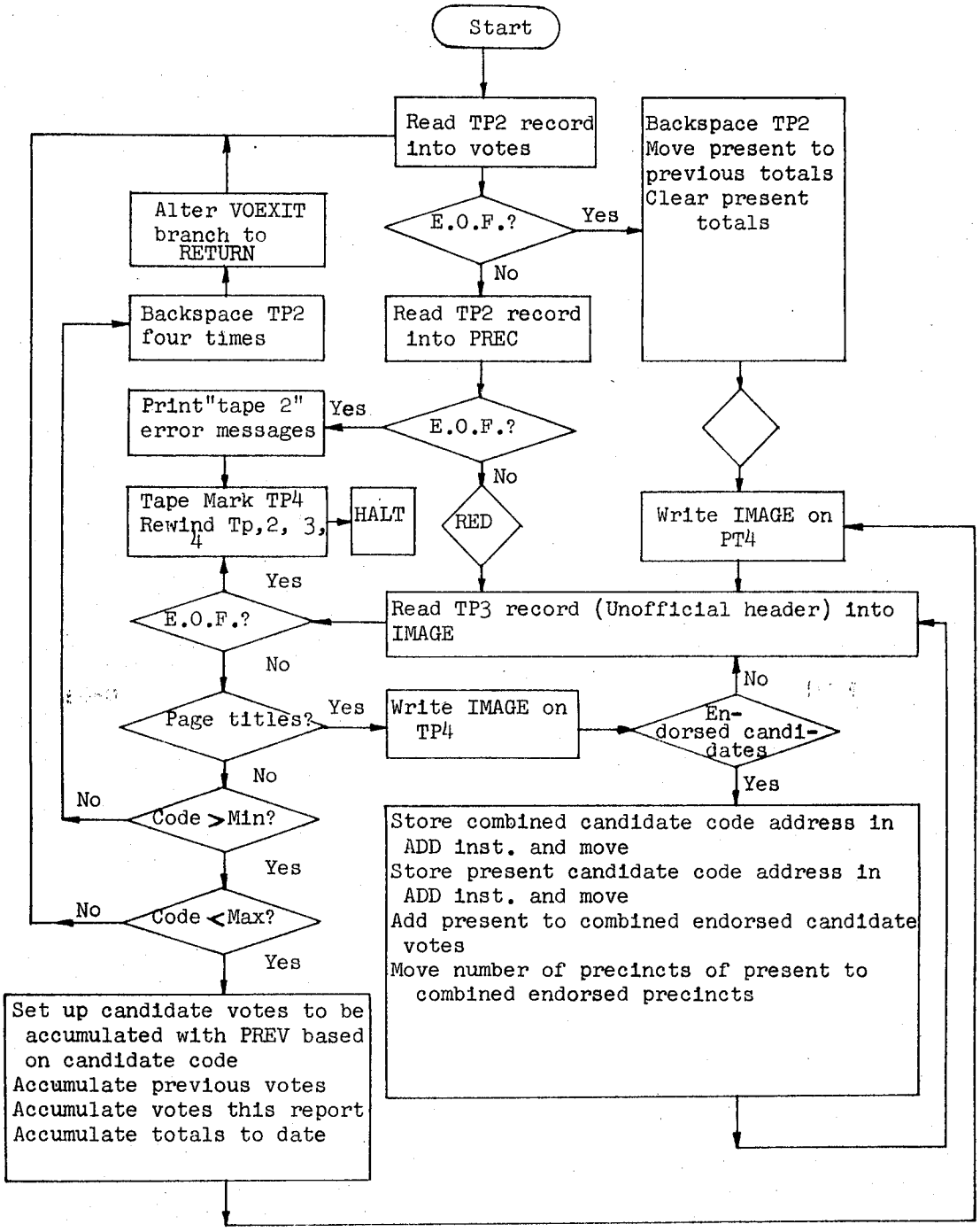

Start
Read TP2 record into votes
E.O.F.?
Yes
No
Backspace TP2
Move present to previous totals
Clear present totals
Alter VOEXIT branch to RETURN
Backspace TP2 four times
Read TP2 record into PREC
Print"tape 2" error messages
Yes
E.O.F.?
No
Tape Mark TP4 Rewind Tp,2, 3, 4
HALT
RED
Write IMAGE on PT4
Yes
E.O.F.?
Read TP3 record (Unofficial header) into IMAGE
No
No
Page titles?
Yes
Write IMAGE on TP4
En-dorsed candi-dates
Yes
No
No
Code >Min?
Yes
No
Code <Max?
Yes
Store combined candidate code address in ADD inst. and move
Store present candidate code address in ADD inst. and move
Add present to combined endorsed candidate votes
Move number of precincts of present to combined endorsed precincts
Set up candidate votes to be accumulated with PREV based on candidate code
Accumulate previous votes
Accumulate votes this report
Accumulate totals to date

Fig. 25

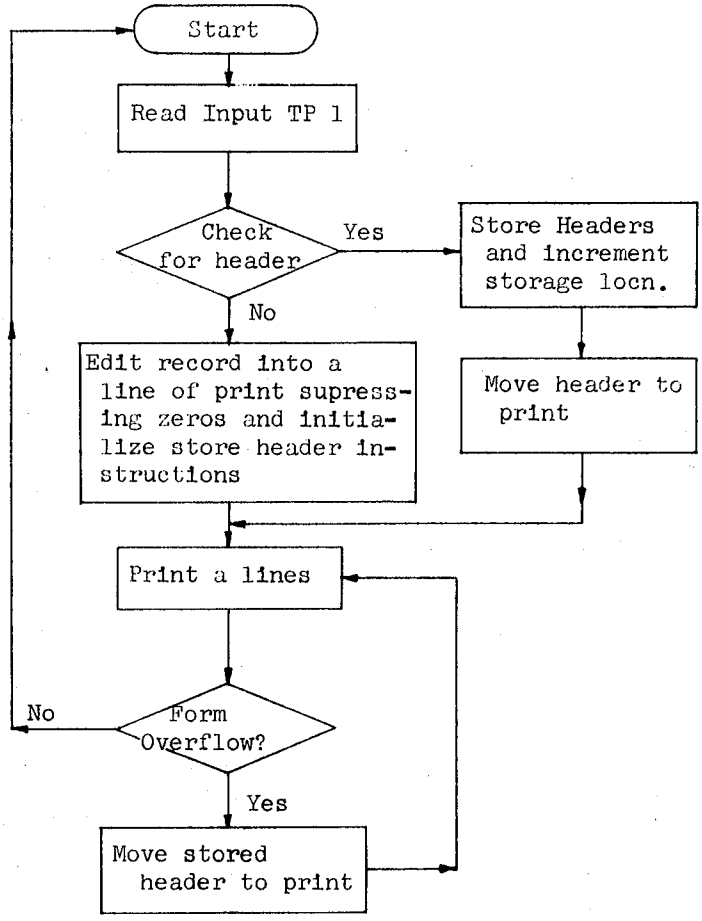

Start
Read Input TP 1
Check for header
Yes
Store Headers and increment storage locn.
No
Edit record into a line of print supressing zeros and initialize store header instructions
Move header to print
Print a lines
No
Form Overflow?
Yes
Move stored header to print

Fig. 26

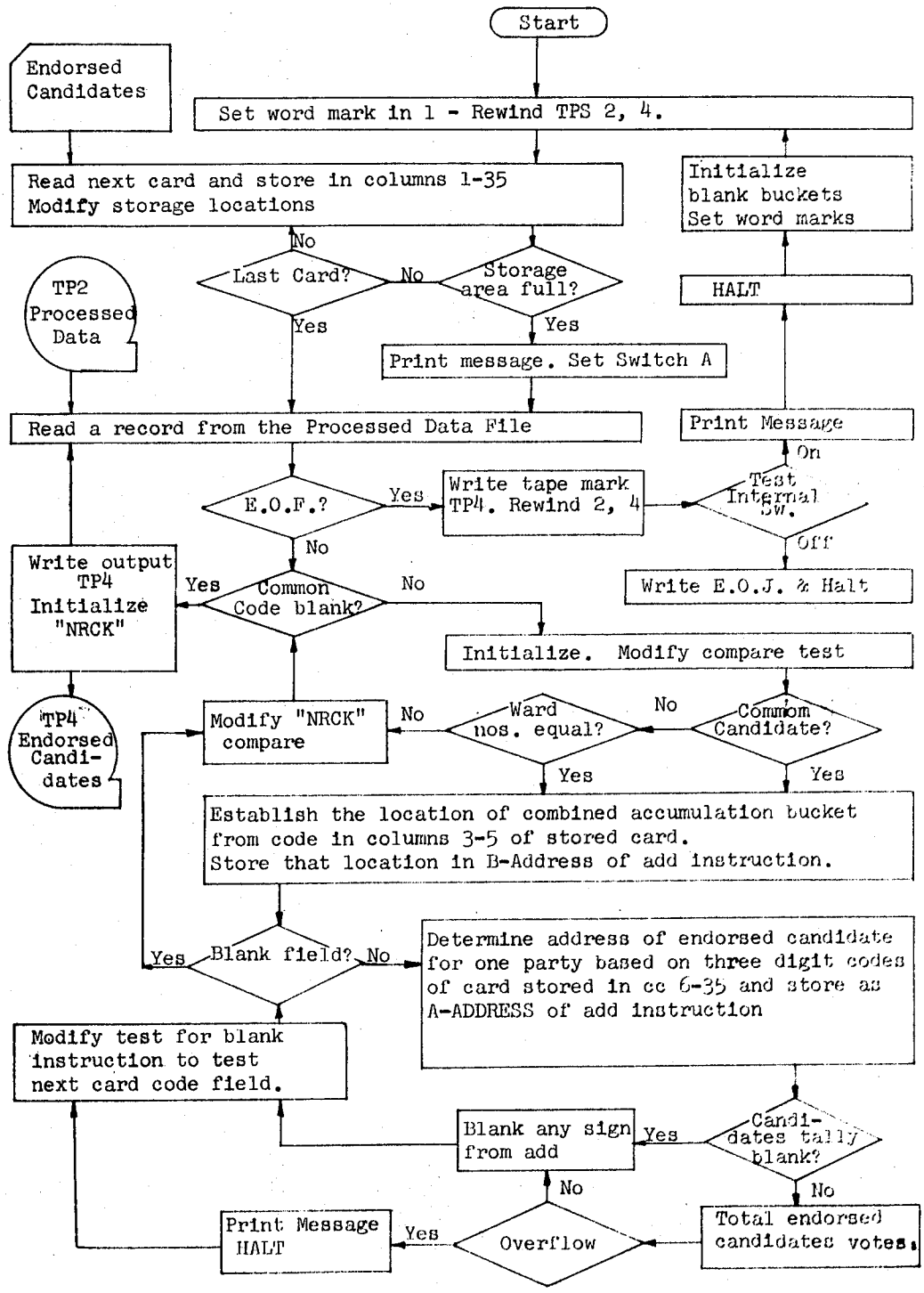

Start
Endorsed Candidates
Set word mark in 1 - Rewind TPS 2, 4.
Read next card and store in columns 1-35 Modify storage locations
Initialize blank buckets Set word marks
No
Last Card?
No
Storage area full?
Yes
Yes
TP2 Processed Data
Print message. Set Switch A
HALT
Read a record from the Processed Data File
Print Message
On
E.O.F.?
Yes
Write tape mark TP4. Rewind 2, 4
Test Internal Sw.
Off
No
Write output TP4 Initialize "NRCK"
Yes
Common Code blank?
No
Write E.O.J. & Halt
Initialize. Modify compare test
TP4 Endorsed Candi-dates
Modify "NRCK" compare
No
Ward nos. equal?
No
Common Candidate?
Yes
Yes
Establish the location of combined accumulation bucket from code in columns 3-5 of stored card. Store that location in B-Address of add instruction.
Yes
Blank field?
No
Determine address of endorsed candidate for one party based on three digit codes of card stored in cc 6-35 and store as A-ADDRESS of add instruction
Modify test for blank instruction to test next card code field.
Blank any sign from add
Yes
Candi-dates tally blank?
No
No
Print Message HALT
Yes
Overflow
Total endorsed candidates votes

Fig. 27

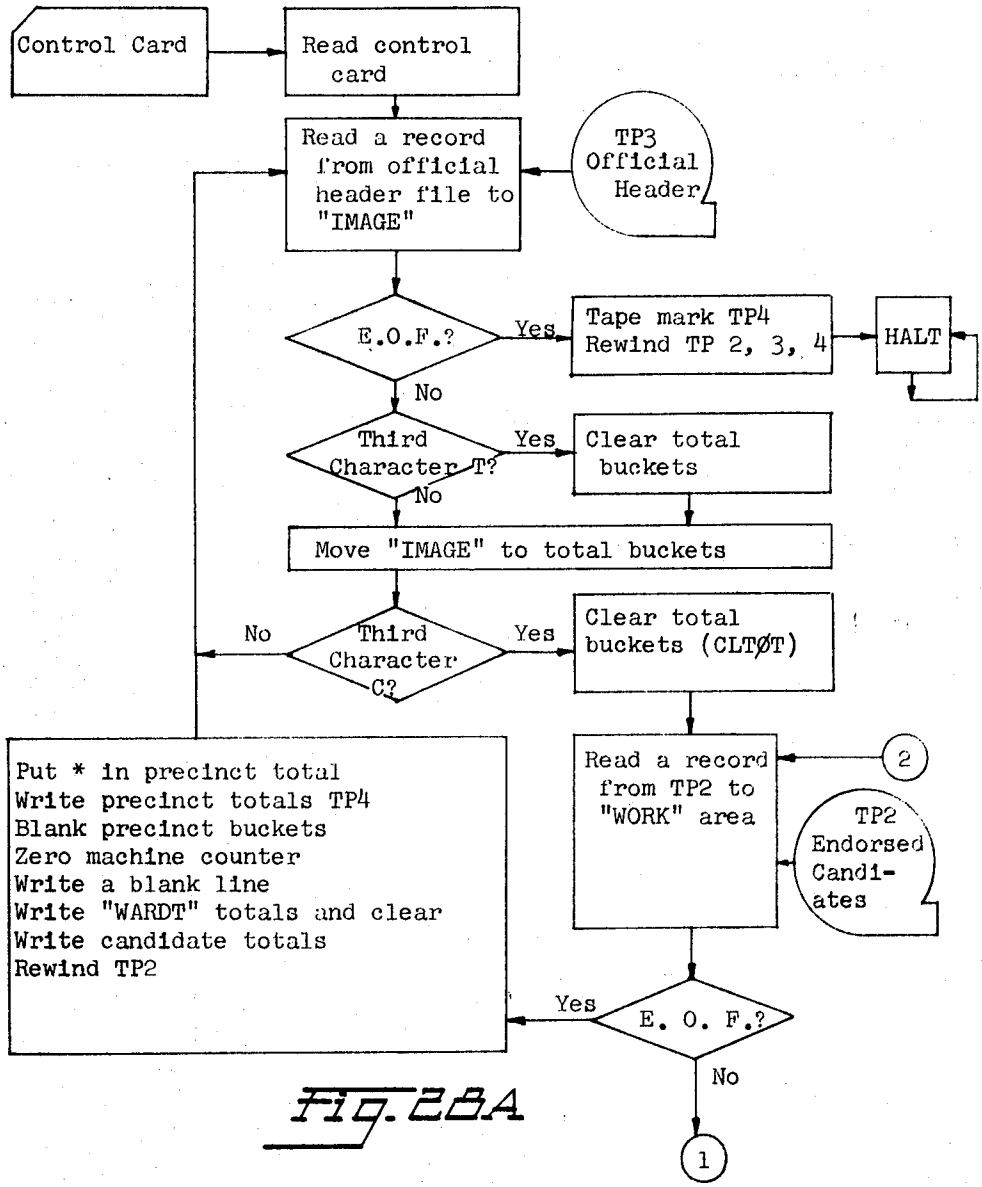

Control Card
Read control card
Read a record from official header file to "IMAGE"
TP3 Official Header
E.O.F.?
Yes
Tape mark TP4 Rewind TP 2, 3, 4
HALT
No
Third Character T?
Yes
Clear total buckets
No
Move "IMAGE" to total buckets
No
Third Character C?
Yes
Clear total buckets (CLTØT)
Put * in precinct total
Write precinct totals TP4
Blank precinct buckets
Zero machine counter
Write a blank line
Write "WARDT" totals and clear
Write candidate totals
Rewind TP2
Read a record from TP2 to "WORK" area
2
TP2 Endorsed Candi-ates
Yes
E. O. F.?
No
1

FIG. 28A

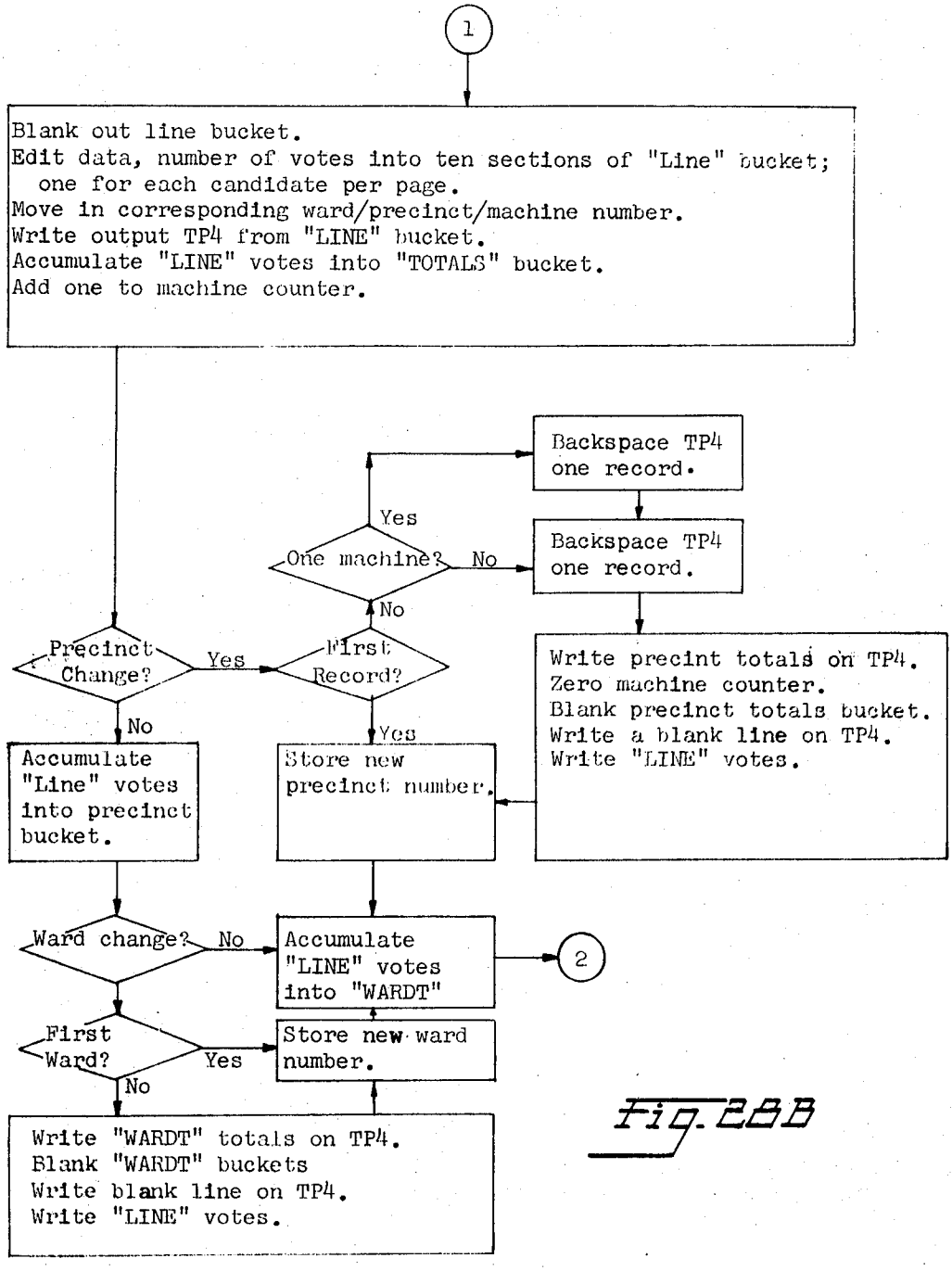

1
Blank out line bucket.
Edit data, number of votes into ten sections of "Line" bucket;
one for each candidate per page.
Move in corresponding ward/precinct/machine number.
Write output TP4 from "LINE" bucket.
Accumulate "LINE" votes into "TOTALS" bucket.
Add one to machine counter.
Backspace TP4 one record.
Yes
One machine?
No
Backspace TP4 one record.
No
Precinct Change?
Yes
First Record?
Write precint totals on TP4.
Zero machine counter.
Blank precinct totals bucket.
Write a blank line on TP4.
Write "LINE" votes.
No
Yes
Accumulate "Line" votes into precinct bucket.
Store new precinct number.
Ward change?
No
Accumulate "LINE" votes into "WARDT"
2
First Ward?
Yes
Store new ward number.
No
Write "WARDT" totals on TP4.
Blank "WARDT" buckets
Write blank line on TP4.
Write "LINE" votes.

Fig. 28B

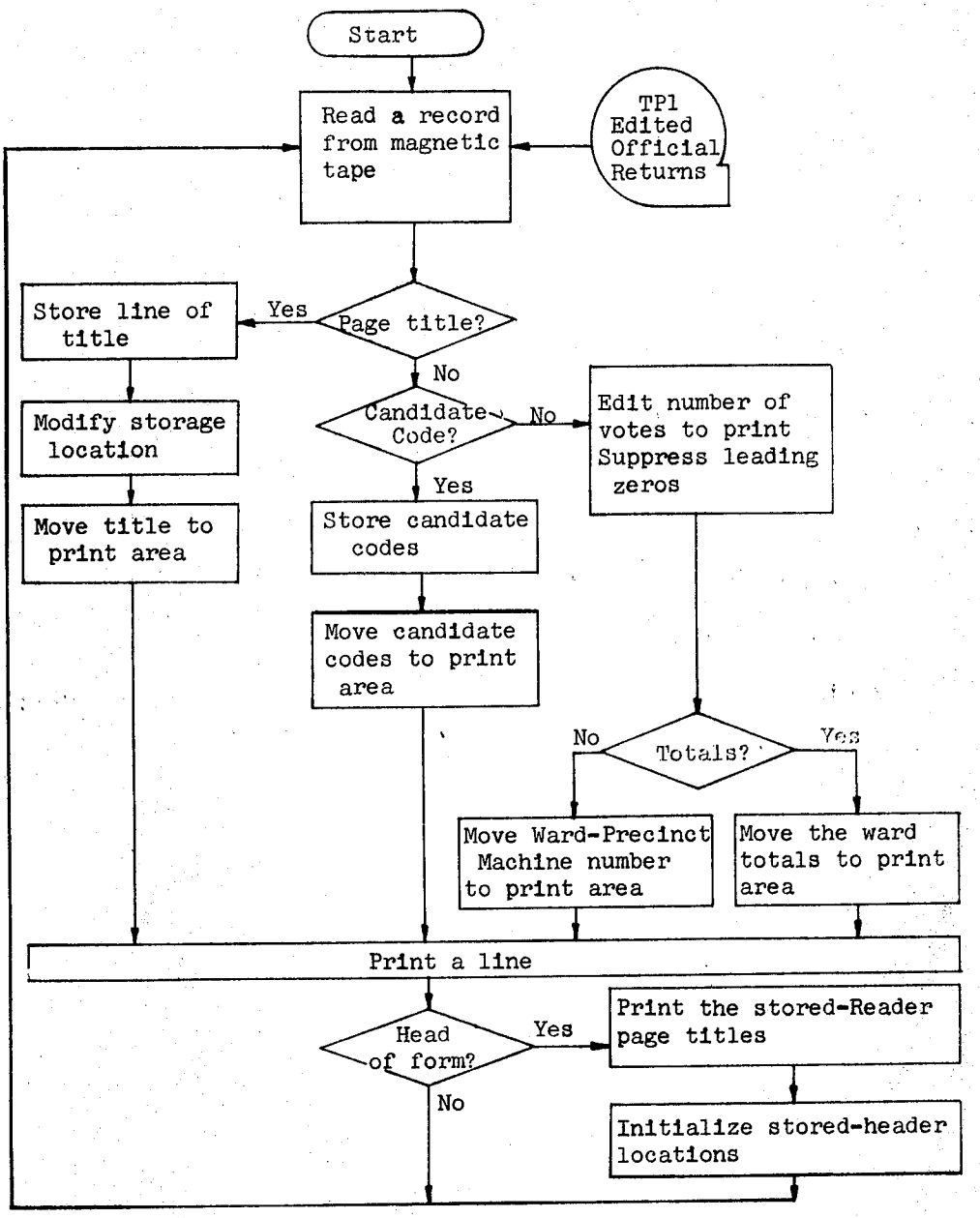
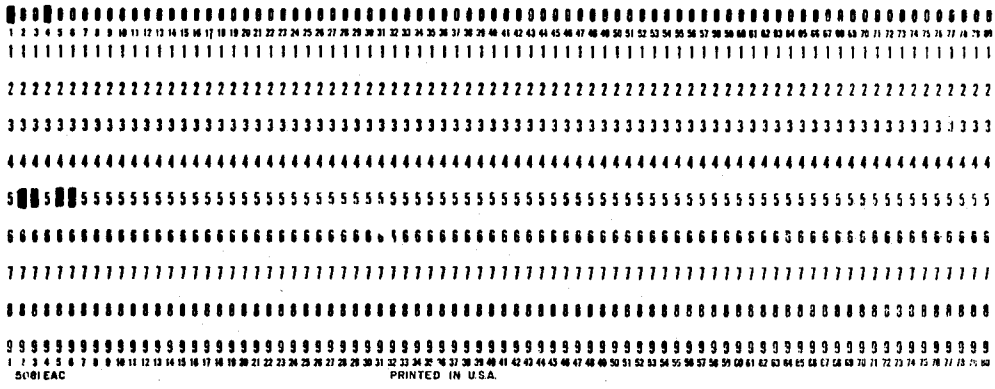

Start
Read a record from magnetic tape
TP1 Edited Official Returns
Page title?
Yes
Store line of title
No
Candidate Code?
No
Edit number of votes to print Suppress leading zeros
Yes
Modify storage location
Move title to print area
Store candidate codes
Move candidate codes to print area
Totals?
No
Yes
Move Ward-Precinct Machine number to print area
Move the ward totals to print area
Print a line
Head of form?
Yes
Print the stored-Reader page titles
No
Initialize stored-header locations

Fig. 29

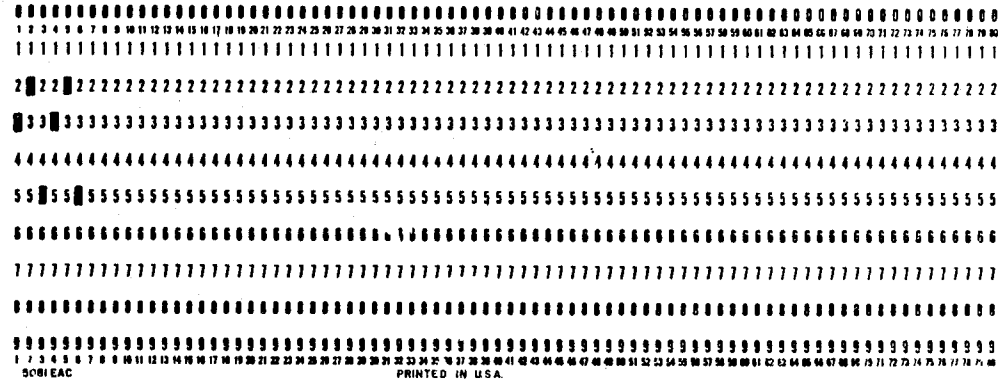
055055



Card Column 1 - 3: A three-digit number which represents the BREAKING POINT between the "COMMOM" and "NON-COMMOM" Candidates.

Fig. 30

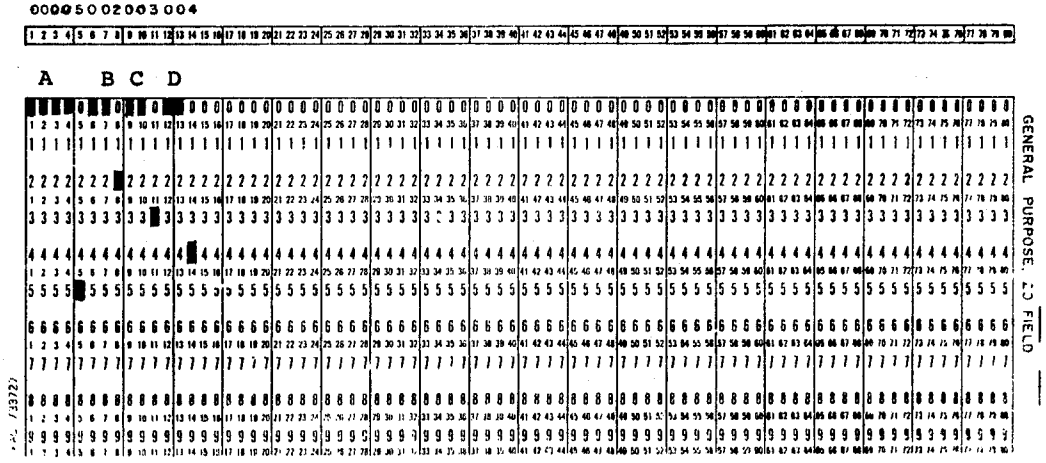
326525



Card Column 4 - 6: A three-digit number which represents the MAXIMUM NUMBER OF CANDIDATES in the System.

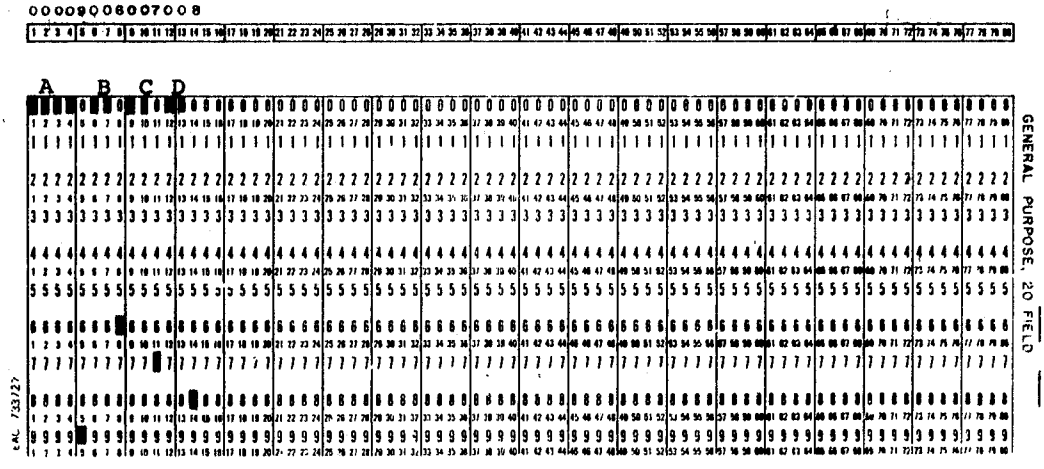
Fig. 31

ENDORSED CANDIDATE CONTROL CARD



A - Endorsed Candidate "Combined" Code
B, C, D, ... - All Codes assigned Endorsed Candidate one for each party

Fig. 32A



Note: The maximum number of three-digit "codes" (or parties) under which any one Endorsed Candidate may be represented per card is TEN

(Only card columns 1 - 35 are read by the ENDORSED CANDIDATE ACCUMULATION program.)

Fig. 32B

```
        HI                                                    PRIMARY ELECTI
ON - MAY 1964
        H                                                     UNOFFICIAL RETURN
- DEMOCRATIC PARTY
        HL          OFFICE            CODE        CANDIDATE
PREVIOUS TOTALS      TOTALS THIS REPORT      TOTALS-TO-DATE
        H
 MACH     VOTES          MACH      VOTES       MACH      VOTES
         J   GOVERNOR                00001    HUNT
                                      00002    CARMODY
                                      00003    MCDONALD
                                      00004    BARRIE
                                      00005    FORD
         J   LIEUTENANT GOVERNOR      00006    AVERY
                                      00007    MALLORY
                                      00008    LAPORTE
                                      00009    PROCTOR
         J   SECRETARY OF STATE       00010    WEBSTER
                                      00011    MEAD
                                      00012    SAVER
                                      00013    WILSON
         J   ATTORNEY GENERAL         00014    MILLER
                                      00015    KELLEY
                                      00016    SMITH
                                      00017    WHITE
                                      00018    CRAWFORD
         J   TREASURER                00019    WORTHMORE
                                      00020    GRIFFIN
                                      00021    JACKSON
                                      00022    DAVIDSON
```

1 ····10····20····30····40····50····60····70····80

Fig. 33A

J	UNITED STA SENATOR	00023	PRINCE	53
		00024	SWANSON	55
		00025	JONES	57
J	REPR/CONG DIST 1	00026	APPLEBAUM	59
		00027	LYMAN	61
		00028	HANCOCK	63
		00029	PARKER	65
J	REPR/CONG DIST 2	00030	FLYNN	67
		00031	UNDERWOOD	69
		00032	WILLIAMS	71
		00033	KENNEDY	73
		00033	LUDWIG	75
J	REPR/CONG DIST 3	00035	MAURER	77
		00036	WILLIAMS	79
		00037	ALLEN	81

1 10 20 30 40 50 60 70 80

Fig. 33B

Fig. 33C

```
+ 020010411006007008009023024025026027028029030031032033034038039040041042043044
  020010411076043042048038403304706103203711209206905204906704609112309309409505 2
+ 020010412045046050051
  020010412088094065097
+ 020020111006007008009023024025026027028029030031032033034038039040041042043044
  020020111108074065049056048062029109112103081089091073079073126073045083071082
+ 020020112045046050051
  020020112069039041077
+ 020030111006007008009023024025026027028029030031032033034038039040041042043044
  020030111076111059073057082038109106093042066094064067109089046055081071014048
+ 020030112045046050051
  020030112042044081056
+ 020040111006007008009023024025026027028029030031032033034038039040041042043044
  020040111143085068051062087091102088051079103102066057089072044067049074066084
+ 020040112045046050051
  020040112079047045051
+ 020040211006007008009023024025026027028029030031032033034038039040041042043044
  020040211056064046069076069064059105056064057039082065039045019066058029044049
+ 020040212045046050051
  020040212095081078075
+ 020040311006007008009023024025026027028029030031032033034038039040041042043044
  020040311191184153147187166181167161085076059114109054105064116051085118167347
+ 020040312045046050051
  020040312033049038035
+ 030010111023024025026027028029030031032033034
  030010111082107071068057088043092099097039071
+ 030010211023024025026027028029030031032033034
  030010211042029086052048112082071066082047048
+ 030020111023024025026027028029030031032033034
  030020111186089062054066084095059093055069094
+ 030020211023024025026027028029030031032033034
  030020211072081049067082074061071098058067062
```

Fig. 33D

```
   H1                                                    PRIMARY ELECTI
ON -  MAY 1964
   H                                                  OFFICIAL RETURN -
 DEMOCRATIC PARTY
1  HK            GOVERNOR    GOVERNOR    GOVERNOR    GOVERNOR
GOVERNOR    LT GOVRNOR  LT GOVRNOR  LT GOVRNOR  LT GOVRNOR  SEC OF STA
I  H
I  H             HUNT        CARMODY     MCDONALD    BARRIE
FORD        AVERY       MALLORY     LAPORTE     PROCTOR     WEBSTER
   C  DI PRE MA       00001       00002       00003       00004
     00005       00006       00007       00008       00009       00010
```

Card Column Scale:

1 10 20 30 40 50 60 70 80

Fig. 34

```
       HI                                                    GENERAL ELECTION
- NOVEMBER 3 1964                                                      UNOFFICI
       H
AL RETURN
       H1          OFFICE              CODE        CANDIDATE
PREVIOUS TOTALS      TOTALS THIS REPORT      TOTALS-TO-DATE
       H
 MACH     VOTES         MACH     VOTES          MACH     VOTES
        J   GOVERNOR                 00001   ADAMS
                                     00002   BAKER - D
                                     00003   BAKER - L
                                     00004   BAKER - I
                                     00005   BAKER - **
        J   LIEUTENANT GOVERNOR      00006   SMITH
                                     00007   JONES - O
                                     00008   JONES - L
                                     00009   JONES - I
                                     00010   JONES - **

Card Column Scale:
1.....10.....20.....30.....40.....50.....60.....70.....80
```

```
   HL                                                GENERAL ELECTION
-  NOVEMBER 3 1964
   H                                                        OFFICIAL
 RETURN
1  HK            GOVERNOR    GOVERNOR    GOVERNOR    GOVERNOR
GOVERNOR     LT GOVRNOR  Lt GOVRNOR  LT GOVRNOR  LT GOVRNOR  SEC OF STA
1  H
1  H             ADAMS       BAKER - D   BAKER - L   BAKER - I
BAKER - **  SMITH       JONES - D   JONES - L   JONES -**   GREEN
   C  DI PRE MA       00001       00002       00003       00004
     00005       00006       00007       00008       00009       00010
```

Fig. 35

B. PASS TITLE SETUP UNOFFICIAL HEADERS PASS NO. 00.1

1. MAGNETIC TAPE (MODELS 729 or 7330)

Drive	Use	External Label Identification	Save or Release	Used as Input to
1	Ø/P	UNOFFICIAL HEADER DATA	SAVE	UNOFFICIAL EDIT 04.0

11. MODEL 1402 CARD READER/PUNCH

Pocket	Card ID or Format	Disposition
N/R 1 8/2 4 N/R	UNOFFICIAL HDR. CDS.	BOX & SAVE

111. MODEL 1403 PRINTER

☐ Six lines/inch ☐ Eight lines/inch

FORM # ---

NUMBER OF PARTS ---

CARRIAGE TAPE: ---

DISPOSITION OF OUTPUT: ---

1V. SENSE SWITCH SETTING

Switch	Purpose
A	LAST CARD INDICATOR

V. SPECIAL OPERATING INSTRUCTIONS

1. LOAD "SETUP UNOFFICIAL HDR" PROGRAM.
2. DATA INPUT - UNOFFICIAL HDR. CDS.
3. NO MESSAGES APPEAR.

V1. HALT LIST

Location	Meaning	Action for Proceeding
0404	*EØJ*	HOLD TAPE 1 FOR FUTURE INPUT TO UNOFFICIAL EDIT PROGRAM - GO TO PASS 00.2
0111	Tape Write Error	DISPLAY B-ADDRESS REGISTER. B-REGISTER WILL CONTAIN 00XY WHERE X= 6 IF TAPE WRITE ERROR, Y= LOGICAL NUMBER OF TAPE DRIVE CAUSING ERROR. - HIT START: TO TRY 50 MORE RE-WRITES.

Fig. 36

C. PASS TITLE SETUP OFFICIAL HEADERS PASS NO. 00.2

I MAGNETIC TAPE (Models 729 or 7330)

Drive	Use	External Label Identification	Save or Release	Used as Input to
1	Ø/P	OFFICIAL HEADER DATA	SAVE	OFFICIAL EDIT 06.0

II. MODEL 1402 CARD READER/PUNCH

Pocket	Card ID or Format	Disposition
N/R 1 8/2 4 N/R	OFFICIAL HDR. CARDS	BOX & SAVE

III. MODEL 1403 PRINTER

☐ Six lines/ inch ☐ Eight lines/ inch

FORM # ---

NUMBER OF PARTS ---

CARRIAGE TAPE: ---

DISPOSITION OF OUTPUT: ---

IV. SENSE SWITCH SETTING

Switch	Purpose
A	LAST CARD INDICATOR

V. SPECIAL OPERATING INSTRUCTIONS

1. LOAD "SETUP OFFICIAL HDR" PROGRAM
2. DATA INPUT - OFFICIAL HDR. CDS.
3. NO MESSAGES APPEAR.

VI. HALT LIST

Location	Meaning	ACTION FOR PROCEEDING
0404	*EØJ*	HOLD TAPE 1 FOR FUTURE INPUT TO OFFICIAL EDIT PROGRAM - GO TO PASS 01.0 - INPUT EDITOR,
0111	Tape Write Error	DISPLAY B-ADDRESS REGISTER. B-REGISTER WILL CONTAIN 00XY WHERE X = 6 IF TAPE WRITE ERROR. Y = LOGICAL NUMBER OF TAPE DRIVE CAUSING ERROR - HIT START: TO TRY 50 MORE RE-WRITES.

Fig. 37

D. PASS TITLE LIST CARDS PASS NO. 00.5

I. MAGNETIC TAPE (Models 729 or 7330)

Drive	Use	External Label Identification	Save or Release	Used as Input to
---	---	----		

II. MODEL 1402 CARD READER/PUNCH

Pocket	Card ID or Format	Disposition
N/R 1 8/2 4 N/R	INPUT DATA	INPUT TO INPUT EDITOR

III. MODEL 1403 PRINTER

☒ Six Lines/inch ☐ Eight Lines/inch

FORM # STOCK
NUMBER OF PARTS 1
CARRIAGE TAPE: STANDARD

DISPOSITION OF OUTPUT: TO SUPERVISOR TO REVIEW & HOLD FOR FUTURE REFERENCE.

IV. SENSE SWITCH SETTING

Switch	Purpose
A	LAST CARD INDICATOR

V. SPECIAL OPERATING INSTRUCTIONS

1. LOAD "LIST CARD" PROGRAM FOLLOWED IMMEDIATELY BY INTENDED SYSTEM INPUT DATA
2. OUTPUT LIST MAY SERVE AS FUTURE REFERENCE - PROGRAM IS OPTIONAL***

VI. HALT LIST

Location	Meaning	Action for proceeding
0542	*ĖØJ*	GO TO INPUT EDITOR PROGRAM - PASS 01.0

Fig. 3B

E. PASS TITLE INPUT EDITOR PASS NO. 01.0

1. MAGNETIC TAPE (Models 729 or 7330)

Drive	Use	External Label Identification	Save or Release	Used as Input to
1	ø/P	INPUT DATA - RETURNS	SAVE	PROCESS 02.0
2	ø/P	ERRORS - INPUT DATA	SAVE	ERROR LIST 01.5

11. MODEL 1402 CARD READER/PUNCH

Pocket	Card ID or Format	Disposition
N/R 1 8/2 4 N/R	INPUT DATA	TO STORAGE

111. MODEL 1403 PRINTER

☒ Six Lines/inch ☐ Eight lines/inch

FORM# STOCK

NUMBER OF PARTS 1

CARRIAGE TAPE: STANDARD

DISPOSITION OF OUTPUT: HOLD FOR ACTION AS INDICATED BY MESSAGE.

IV. SENSE SWITCH SETTING

Switch	Purpose
A	LAST CARD INDICATOR

V. SPECIAL OPERATING INSTRUCTIONS

1. LOAD "EDIT INPUT" PROGRAM FOLLOWED BY INPUT DATA.
2. FOR PRINTER MESSAGES & CORRESPONDING ACTION SEE MESSAGE LIST.

VI. HALT LIST

Location	Meaning	Action for Proceeding
1304	*EØJ*	GO TO JOB # 02.0 IF NO ERRORS.
0111	Tape Read-Write Error	DISPLAY B-ADDRESS REGISTER. B-ADDRESS REGISTER WILL CONTAIN 00XY, WHERE X = 9 IF TAPE READ ERROR, 6 IF TAPE WRITE ERROR. Y = LOGICAL NUMBER OF TAPE DRIVE CAUSING ERROR. - HIT START: TO TRY 30 MORE RE-READS- TO TRY 50 MORE RE-WRITES.

Fig. 39

F. PASS TITLE ERROR LIST PASS NO. 01.5

I. MAGNETIC TAPE (Models 729 or 7330)

Drive	Use	External Label Identification	Save or Release	Used as Input to
2	I/P	ERRORS - INPUT DATA	RELEASE	

II. MODEL 1402 CARD READER/PUNCH

Pocket	Card ID or Format	Disposition
N/R 1 8/2 4 N/R	---	

III. MODEL 1403 PRINTER

[XX] Six lines/inch [ ] Eight lines/inch

FORM # STOCK

NUMBER OF PARTS 1

CARRIAGE TAPE: STANDARD

DISPOSITION OF OUTPUT: TO SUPERVISOR TO MAKE CORRECTIONS

IV. SENSE SWITCH SETTING

Switch	Purpose

V. SPECIAL OPERATING INSTRUCTIONS

1. LOAD "ERROR LIST" PROGRAM.
2. THE PRINT-OUT WILL LIST THOSE CARDS IN ERROR IN COLUMNS LABELED a) RETURN (i.e., WARD/PREC/MACH/ b) TYPE (CODE, COUNT CARD), c) SECT-CK (cc 10-11), d) DATA(cc 12-80).

NOTE: THE THIRD DATA CHARACTER OF A CODE CARD WILL BE ALPHA DUE TO THE FACT THAT THE "4" IS STORED IN cc 14 OF THE DATA.

VI. HALT LIST

Location	Meaning	Action for Proceeding
2630	*EØJ*	SEND Ø/P LIST SO THAT CORRECTIONS CAN BE KEYPUNCHED & RE-READ INTO THE SYSTEM - RETURN TO INPUT PASS 01.0 TO ACCOMPLISH THIS.
0111	Tape Read Error	DISPLAY B-ADDRESS REGISTER. B-REGISTER WILL CONTAIN 00XY. WHERE X - 9 IF TAPE READ ERROR. Y = LOGICAL NUMBER OF TAPE DRIVE CAUSING THE ERROR. - HIT START: TO TRY 30 MORE RE-READS.

Fig. 40

G. PASS TITLE PROCESS PASS NO. 02.0

1. MAGNETIC TAPE (Models 729 or 7330)

Drive	Use	External Label Identification	Save or Release	Used as Input to
1	I/P	INPUT DATA - RETURNS	SAVE	---
2	Ø/P	PROCESSED INPUT DATA	SAVE	SUMMARIZE 03.0 Official Edit 06.0 ENDORSED or CANDIDATE 05.5

11. MODEL 1402 CARD READER/PUNCH

Pocket	Card ID or Format	Disposition
N/R 1 8/2 4 N/R	---	

111. MODEL 1403 PRINTER

☒ Six lines/inch ☐ Eight lines/inch

FORM # STOCK

NUMBER OF PARTS 1

CARRIAGE TAPE: STANDARD

DISPOSITION OF OUTPUT: HOLD FOR ANALYSIS OF MESSAGE, IF ANY.

IV. SENSE SWITCH SETTING

Switch	Purpose
---	---

V. SPECIAL OPERATING INSTRUCTIONS

1. LOAD IN "PROCESS" PROGRAM
2. THE OUTPUT ON LOG DRIVE 2 GOES IMMEDIATELY TO THE UNOFFICIAL SUMMARIZE PROGRAM BUT IS ALSO HELD FOR LATER INPUT TO THE OFFICIAL EDIT PROGRAM.
3. FOR PRINTER MESSAGES AND CORRESPONDING ACTION SEE MESSAGE LIST.

VI. HALT LIST

Location	Meaning	Action for Proceeding
1359	*EØJ*	GO TO JOB # 03.0 or 06.0 IF NO ERRORS.
0111	Tape Read Write Error	DISPLAY B-ADDRESS REGISTER. B-ADDRESS REGISTER WILL CONTAIN 00XY, WHERE X - 9 IF TAPE READ ERROR, 6 IF TAPE WRITE ERROR, Y = LOGICAL NUMBER OF TAPE DRIVE CAUSING ERROR. - HIT START: TO TRY 30 MORE RE-READS; TO TRY 50 MORE RE-WRITES.

Fig. 41

H. PASS TITLE SUMMARIZE PASS NO. 03.0

I. Magnetic Tape (Models 729 or 7330)

Drive	Use	External Label Identification	Save or Release	Used as Input to
1	I/P	PROCESSED INPUT DATA	SAVE	
2	Ø/P	SUMMARIZED UNOFFICIAL DATA	SAVE	UNOFFICIAL EDIT 04.0.

II. MODEL 1402 CARD READER/PUNCH

Pocket	Card ID or Format	Disposition
N/R 1 8/2 4 N/R	Control Card	HOLD FOR FURTHER USE

III. MODEL 1403 PRINTER

☒ Six lines/inch ☐ Eight lines/inch

FORM # STOCK

NUMBER OF PARTS 1

CARRIAGE TAPE: STANDARD

DISPOSITION OF OUTPUT: ---

IV. SENSE SWITCH SETTING

Switch	Purpose
A	LAST CARD INDICATOR

V. SPECIAL OPERATING INSTRUCTIONS

1. Load Program "SUMMARIZE" FOLLOWED BY CONTROL CARD
2. CONTROL CARD CONFIGURATION: cc 1-3 ENTER TOTAL NUMBER OF CANDIDATES +1,
   cc 4-6 ENTER TOTAL NUMBER OF CANDIDATES +1,
   (LEADING ZEROS WHERE APPLICABLE).
   -(THIS PRESUMES ALL CANDIDATES ARE COMMON)-

VI. HALT LIST

Location	Meaning	Action for Proceeding
0849	*EØJ*	GO TO JOB # 04.0.
1101	RECORD ERROR	INPUT ERROR - DATA RECORD EXCEEDS MAXIMUN 250 PER BLOCK, PULL JOB AND RERUN FROM PASS 01.0. INPUT EDITOR.
0111	TAPE READ WRITE ERROR	DISPLAY B-ADDRESS REGISTER. B-ADDRESS REGISTER WILL CONTAIN 00XY, WHERE X = 9 IF TAPE READ ERROR, 6 IF TAPE WRITE ERROR. Y = LOGICAL NUMBER OF TAPE DRIVE CAUSING ERROR. - HIT START: TO TRY 30 MORE RE-READS, TO TRY 50 MORE RE-WRITES.

Fig. 42

I. PASS TITLE EDIT UNOFFICIAL RETURNS PASS NO. 04.0

I. MAGNETIC TAPE (Models 729 or 7330)

Drive	Use	External Label Identification	Save or Release	Used as Input to
2	I/P	SUMMARIZED UNOFFICIAL DATA	SAVE	
3	I/P	UNOFFICIAL HEADER	RELEASE	
4	Ø/P	EDITED UNOFFICIAL DATA	SAVE	PRINT UNOFFICIAL 05.0 EDIT UNOFFICIAL 04.0**

II. MODEL 1402 CARD READER/PUNCH

Pocket	Card ID or Format	Disposition
N/R	---	
1	---	
8/2	---	
4	---	
N/R	---	

III. MODEL 1403 PRINTER

[XX] Six lines/inch [ ] Eight lines/inch

FORM # STOCK

NUMBER OF PARTS 1

CARRIAGE TAPE: STANDARD

DISPOSITION OF OUTPUT: ---

IV. SENSE SWITCH SETTING

Switch	Purpose
---	---

V. SPECIAL OPERATING INSTRUCTIONS

1. LOAD "EDIT UNOFFICIAL" RETURNS PROGRAM.
2. NO ACTION REQUIRED FOR PRINTED MESSAGE - "TAPE 2 HAS ODD NUMBER OF RECORDS".
3. **NOTE: Ø/P TP 4 MAY BE USED AS I/P TP 3 (IN PLACE OF HEADER TAPE) IN ORDER TO UPDATE AND EXTEND INFORMATION. TP 4 IS THUS USED AS A "SWING" TAPE FOR EACH GROUP OF INPUT DATA THAT IS ULTIMATELY PRINTED AS AN UNOFFICIAL RETURN.

VI. HALT LIST

Location	Meaning	Action for Proceeding
0942	* EØJ *	GO TO JOB # 05.0.
0111	TAPE READ WRITE ERROR	DISPLAY B-ADDRESS REGISTER. B-ADDRESS REGISTER WILL CONTAIN 00XY, WHERE X = 9 IF TAPE READ ERROR, 6 IF TAPE WRITE ERROR. Y = LOGICAL NUMBER OF TAPE DRIVE CAUSING ERROR. HIT START: TO TRY 30 MORE RE-READS: TO TRY 50 MORE RE-WRITES.

Fig. 43

J. PASS TITLE PRINT UNOFFICIAL RETURNS PASS NO. 05.0

I. MAGNETIC TAPE (Models 729 or 7330)

Drive	Use	External Label Identification	Save or release	Used as Input to
1	1/P	EDITED UNOFFICIAL DATA	RELEASE	

II. MODEL 1402 CARD READER/PUNCH

Pocket	Card ID or Format	Disposition
N/R	---	
1	---	
8/2	---	
4	---	
N/R	---	

III. MODEL 1403 PRINTER

☐ Six lines/inch ☐ Eight lines/inch

FORM # STOCK

NUMBER OF PARTS AS DESIRED

CARRIAGE TAPE: STANDARD

Disposition of Output: To Presiding Officials

IV. SENSE SWITCH SETTING

Switch	Purpose
----	---

V. SPECIAL OPERATING INSTRUCTIONS

1. LOAD "UNOFFICIAL PRINT" PROGRAM.
2. AT EOJ
   a) DELIVER OUTPUT IMMEDIATELY TO DESIGNATED OFFICIALS.
   b) EITHER BEGIN SYSTEMS RUN AGAIN WITH NEW INPUT FOR UNOFFICIAL REPORT, OR
   c) DO OFFICIAL REPORTS - PROGRAM 06.0

VI. HALT LIST

Location	Meaning	Action for Proceeding
0534	*EØJ*	UNOFFICIAL RETURNS REPORTED: DO AGAIN WITH NEW INPUT DATA PROGRAM 01.0, OR GO TO OFFICIAL RETURN PROGRAM 06.0
0111	TAPE READ ERROR	DISPLAY B-ADDRESS REGISTER. B-ADDRESS REGISTER WILL CONTAIN 00XY, WHERE X = 9 IF TAPE READ ERROR, Y = LOGICAL NUMBER OF TAPE DRIVE CAUSING ERROR. HIT START: TO TRY 30 MORE RE-READS.

Fig. 44

K. PASS TITLE ENDORSED CANDIDATE ACCUMULATION PASS NO. 05.5

1. MAGNETIC TAPE (Models 729 or 7330)

Drive	Use	External Label Identification	Save or Release	Used as Input to
2	I/P	PROCESS DATA	SAVE	
4	ø/P	ENDORSED CANDIDATES	SAVE	Official Edit 06.0 or ENDORSED CANDIDATE 05.5*

11. MODEL 1402 CARD READER/PUNCH

Pocket	Card ID or Format	Disposition
N/R 1 8/2 4 N/R	Endorsed Code Cards	Box & Save

111. MODEL 1403 PRINTER

☒ Six lines/inch ☐ Eight lines/inch

FORM # STOCK

NUMBER OF PARTS 1

CARRIAGE TAPE: STANDARD

DISPOSITION OF OUTPUT: ---

IV. SENSE SWITCH SETTING

Switch	Purpose
A	LAST CARD INDICATOR

V. SPECIAL OPERATING INSTRUCTIONS

1. LOAD "ENDORSED CANDIDATE" PROGRAM FOLLOWED BY
2. ENDORSED CANDIDATE CODE CARDS.
3. OPERATOR TO NOTE ANY PRINTED MESSAGES AND TAKE ACTION AS DIRECTED.
   *MORE THAN 25 INPUT CARDS REQUIRE USING ø/P TAPE 4 AS INPUT ON TAPE 2 FOR CONTINUED PROCESSING.

VI. HALT LIST

Location	Meaning	Action for Proceeding
0823	*EØJ*	GO TO EDIT OFFICIAL RETURNS PASS 06.0
0111	TAPE READ WRITE ERROR	DISPLAY B-ADDRESS REGISTER. B-ADDRESS REGISTER WILL CONTAIN 00XY, WHERE X = 9 IF TAPE READ ERROR. HIT START: TO TRY 30 MORE RE-READS: TO TRY 50 MORE RE-WRITES.

Fig 45

L. PASS TITLE EDIT OFFICIAL RETURNS PASS NO. 06.0

1. MAGNETIC TAPE (Models 729 or 7330

Drive	Use	External Label Identification	Save or Release	Used as Input to
2	I/P	PROCESSED INPUT DATA	SAVE	---
3	I/P	OFFICIAL HEADER DATA	SAVE	---
4	ø/P	EDITED OFFICIAL RETURNS	SAVE	PRINT OFFICIAL RETURN 07.0

11. MODEL 1402 CARD READER/PUNCH

Pocket	Card ID or Format	Disposition
N/R 1 8/2 4 N/R	CONTROL CARD	HOLD TILL COMPLETION OF RUN

111. MODEL 1403 PRINTER

☐ Six lines/inch ☐ Eight lines/inch

FORM # ---

NUMBER OF PARTS ---

CARRIAGE TAPE: ---

DISPOSITION OF OUTPUT: ---

IV. SENSE SWITCH SETTING

Switch	Purpose
A	LAST CARD INDICATOR

V. SPECIAL OPERATING INSTRUCTIONS

1. LOAD "EDIT OFFICIAL" PROGRAM FOLLOWED BY CONTROL CARD WITH CONFIGURATION AS FOLLOWS:
   a) cc 1-3 MAXIMUM NUMBER OF CANDIDATES ENTERED IN ELECTION +1.
   b) cc 4-6 MAXIMUM NUMBER OF CANDIDATES ENTERED IN ELECTION +1.

(LEADING ZEROS MUST BE PRESENT IF NUMBER DOES NOT EXCEED 99, IN BOTH a) and b).)

VI. HALT LIST

Location	Meaning	Action for Proceeding
1557	*EØJ*	GO TO PRINT OFFICIAL RETURNS PASS 07.0
0111	TAPE READ WRITE ERROR	DISPLAY B-ADDRESS REGISTER. B-REGISTER WILL CONTAIN 00XY, WHERE X = 9 IF TAPE READ ERROR; = 6 IF TAPE WRITE ERROR. Y = LOGICAL NUMBER OF TAPE DRIVE CAUSING ERROR. HIT START TO TRY 30 MORE RE-READS; TO TRY 50 MORE RE-WRITES.

Fig. 46

M. PASS TITLE PRINT OFFICIAL RETURNS PASS NO. 07.0

1. MAGNETIC TAPE (Models 729 or 7330)

Drive	Use	External Label Identification	Save or Release	Used as Input to
1	I/P	EDITED OFFICIAL RETURNS	RELEASE	

II. MODEL 1402 CARD READER/PUNCH

Pocket	Card ID or Format	Disposition
N/R	---	
1	---	
8/2	---	
4	---	
N/R	---	

III. MODEL 1403 PRINTER

☒ Six lines/inch ☐ Eight lines/inch

FORM # STOCK

NUMBER OF PARTS AS DESIRED

CARRIAGE TAPE: STANDARD

DISPOSITION OF OUTPUT: TO PRESIDING OFFICIALS

IV. SENSE SWITCH SETTING

Switch	Purpose
---	---

V. SPECIAL OPERATING INSTRUCTIONS

1. LOAD "OFFICIAL RETURNS" PROGRAM.
2. AT E.O.J. DELIVER OUTPUT IMMEDIATELY TO DESIGNATED OFFICIALS.

VI. HALT LIST

Location	Meaning	ACTION FOR PROCEEDING
0952	*EØJ*	OFFICIAL RETURNS REPORTED - FINAL - SYSTEM REPORTING COMPLETED
0111	Tape Read Error	DISPLAY B-ADDRESS REGISTER. B-REGISTER WILL CONTAIN 00XY, WHERE X = 9 IF READ ERROR. Y = LOGICAL NUMBER OF TAPE DRIVE CAUSING ERROR. HIT START TO TRY 30 MORE RE-READS.

Fig. 47

METHOD FOR TABULATING ELECTION RETURNS

This is a continuation of Ser. No. 509,911 filed Nov. 26, 1965, now abandoned.

The present invention relates to the processing of ballots after an election in such a manner as to provide an itemized total of votes cast for each candidate or choice. More specifically, the present invention is adapted to accommodate large elections in which the numbers of candidates (and/or issues) and voters is large, as in city, county or state political elections, and in which ballot variation including local offices and candidate rotation is provided on the ballot formats. Tabulation of votes in smaller elections can, of course, also be readily processed by the method and apparatus of the present invention.

With the increased number of voters in many regions of the country, the task of tabulating the votes becomes increasingly more complicated and more time consuming each year. For example, in Los Angeles County, California, there are approximately 3 million registered voters each having available over 200 choices at each of over 11,000 voting precincts. The total number of choices available in the 1962 election throughout that county was over 1,400. Though many of these choices were local in nature such as those pertaining to water districts, school districts and special assessment districts, and not countywide in scope, still many crossed precinct lines and were not included in the ballots of all voters within a single precinct. However, the preparation of the summary return or unofficial return as it will be referred to hereinafter, involved the segregation of approximately 714 million items of information into over 1,500 classes. At the 1962 election, this required a tremendous number of election workers a period of over 2½ days.

One object of the present invention is to provide a novel method and system for reducing the time required to produce the summary of unofficial returns for a political election to a period of no more than about 6 hours for an election of the size and complexity mentioned above.

One factor that greatly complicates ballot tabulation procedures is the variation between successive ballot formats. Contests that are local in nature have ballot formats which list candidates or vote choices only for those precincts or geographical areas effected which in some cases cross precinct boundaries, and thus the ballot format customarily varies from precinct to precinct. Also, a requirement of many states is that the order of the names of the candidates for a single office must vary from precinct to precinct. This is frequently referred to as "candidate rotation" and adds a significant element of complexity which is totally separate from the other variations. The reason for such requirement is that a candidate whose name appears first on the ballot under a particular office has a preferred position which has been found statistically to receive a greater number of votes than when his name appears at a later position on the ballot format. The effect is much more pronounced for those offices where little public controversy exists and for offices such as boards for which there are multiple-candidates and the voter is given, for example, the choice of voting for five out of 20 candidates.

Once ballot format variation is encountered, the geography of, or physical location of the vote choices on, the ballot format can no longer be directly utilized in the processing of the individual vote choices to obtain the total votes in an election. Therefore, totalizing such ballots directly cannot be effected by the usual data processing systems which might otherwise appear feasible.

It is a major object of the present invention to provide a novel ballot counting method and system utilizing data processing equipment which accommodates ballot format variation including candidate rotation.

The invention relates primarily to the processing at a central station the total vote cast at a plurality of precincts. The input information is normally that which is referred to as the precinct summary. The precinct summary is the source data from the ballots, whether they be individually marked ballots or return sheets whether prepared by hand or produced

directly from a voting machine. The information which would make up a customary precinct summary is, in accord with the present invention placed on a record form which is machine acceptable for processing in suitable data processing equipment such as a computer. Once all the candidates or vote choices are listed in a predetermined sequence together with their votes from each precinct, the further processing of votes can be accomplished in a known manner to produce both the summary unofficial return and the final official return. Hence, the present invention as applied to political elections may more precisely be stated to be directed to the handling of the vote total data obtained at the precinct level in a manner to provide a total for each vote choice throughout a voting district with the results from each precinct identified and with the candidates or vote choices listed in a predetermined sequence in fraudproof manner that is free from error. Where there is no substantial variation in the ballot format, providing such results raises few problems and there is only limited advantage in utilizing the present invention. However, where there is variation in the ballot format including candidate rotation in a large election, prior to the present invention, it has been regarded impracticable to use data processing equipment to handle the tabulation procedures in an economically feasible manner and produce legally acceptable returns within a few hours after the polls have closed.

Another and more specific object of the invention therefore is to provide a novel procedure for processing ballots from an election having ballot format variation, including if desired candidate rotation, by assigning a unique vote choice code identification indicia to the several vote choices on the ballot. In an illustrative process exemplifying the present invention, a first machine acceptable record would be prepared prior to the election which contains the identification indicia for each vote choice listed in a sequence determined by the geography of each ballot format; then after the election a second machine acceptable record would be prepared which contains the vote cast for each choice listed in the same sequence determined by the geography of each ballot format; and thereafter the two records for each discrete ballot format may be collated by means of electronic data processing equipment to provide a correlation of each candidate code identification indicia with the corresponding vote total to enable tabulation of the total vote for each code identification indicia by data processing equipment to produce a printed summary return sheet in the conventional format.

Briefly, the present invention in its preferred form involves the use of voting machines such, for example as shown in U.S. Pat. No. 2,787,414 issued Apr. 2, 1957. In a typical voting district 5,000 voting machines may be distributed among 3,000 precincts or voting places. The format of each is provided by variation of the pattern of the format on the machine. Thus, with machines used in different precincts, the position of the candidates' names may be varied in accordance with the requirements of the laws of the state. Items that are peculiar to certain precincts and not present in other precincts will be provided on the appropriate machine in accordance with statute or prior custom.

In accordance with a preferred procedure of the present invention, prior to the election, each candidate or vote choice is assigned a unique code identification number. The code identification number, or a part thereof, may appear with the name of the candidate on the ballot or on the voting machine return sheet from the voting machine. The candidate code identification number may be a three-digit number even for very large elections having 1,500 choices since many choices are local and the same three-digit-code identification number can be used in different precincts in conjunction with the precinct code number to identify the different choices in the different precincts using the same three-digit number. This number may be carried along through the mechanized vote tallying process and utilized as the address in the computer for channeling the vote total for each candidate into a separate register of the computer, and for reading out the results and cor-

relating the vote total with the name of the appropriate candidate when summary returns are printed.

To produce the summary unofficial return as rapidly as possible after the polls close, one additional feature incorporated in the preferred embodiment of the present invention resides in producing prior to the election, a record containing the codes for each different ballot format. One practical type of record is a punched card which for convenience of terminology will hereafter be referred to as a "code" card. It should be understood however, that other types of machine acceptable records such as for example magnetic tape or cards, are equally usable for this purpose.

The "code" cards contain in addition to precinct identifying information for the "code" card per se, a listing of the candidate code identification number for each candidate in a sequence determined by the physical location of the candidate's name on the particular ballot format involved. Each ballot or voting machine return sheet format may be provided with similar precinct identifying information so that it can be matched to a particular deck of "code" cards. After the polls close, the precinct total is placed on a record which may be in a form similar to that used for the code identification number. With the present state of technology, it has been concluded that punched cards prepared by keypunch machines would be the preferred type of machine acceptable record. The cards containing vote totals, hereinafter referred to as "count" cards are supplied together with the "code" cards for the same precinct to the input of a computer, and the vote total for each vote choice can then be collated on an intermediate record such as a magnetic tape with suitable checks as outlined below to assure absolute accuracy.

Therefore, as a further novel feature of the present invention, there is provided an intermediate record, such as a magnetic tape, which is formed from the source material composed of the "code" cards and the "count" cards prepared from the precinct total or voting machine return sheets. This intermediate record may be produced by a computer which is suitably programmed to detect the duplication or omission of vote totals from a particular voting machine or precinct. In the case of voting machine return sheets which provide printed totals for each candidate, those totals must first be placed on a machine readable record. Where this record is a punched card, several punched cards are required for each return sheet. Hence, by use of this feature of the invention, errors in preparing such punched cards may also be detected at the time the intermediate record (magnetic tape) is made, or prior thereto, and erroneous material kept off the intermediate record.

The error free intermediate record (magnetic tape) containing the candidate code identification number and his vote, and optionally information concerning the precinct, is then available for use in any suitable electronic digital computer which has a memory to provide a separate register for at least a portion of the total number of candidates. The candidate code identification number may be used as the address for the computer, and the associated vote as the information to be successively accumulated in the memory.

Prior to the election programs may be prepared for the computer to effect a readout from the computer at various time intervals during the tabulation operation to produce unofficial returns for all of the precincts reporting up to that time, and for producing the final unofficial return with all precincts reporting. Also, the intermediate record is available after election night for use at a later date to produce readily the official return for a cost far less than that required by prior techniques, particularly in heavily populated centers having large numbers of choices on the ballot.

The foregoing and other objects will become more fully apparent from the claims, and from the specification as it proceeds in connection with the appended drawings wherein:

FIG. 1 is a block diagram of the preferred procedure in accordance with the present invention;

FIG. 2 illustrates a perforated card which has been used to capture the precinct vote data in a comparatively simple election;

FIG. 3 is a view illustrating a portion of an unofficial election return sheet;

FIG. 4 is a view illustrating a portion of an official election return sheet;

FIG. 5A is a view of a portion of a voting machine console;

FIG. 5B is a view of a voting machine console similar to the view shown in FIG. 5A, but demonstrating candidate rotation;

FIG. 6 shows how FIGS. 6A–6D fit together to illustrate a printed voting machine return sheet;

FIGS. 6A through 6D are views of the portions of a printed return sheet from the voting machine indicated in FIG. 6;

FIG. 7 is a view of a card that may be used as a ballot with the voter using a stylus to mark his vote choices on the card by use of a vote recorder kit such as that shown in U.S. Pat. No. 3,201,038;

FIG. 8 illustrates the manner by which the votes from various precincts are accumulated in a memory of an electronic computer;

FIG. 9 is a view of an 80-column perforated card as used in the present invention as the code card;

FIG. 10 is a view of a card similar to the card of FIG. 9 and used as the count card;

FIG. 11 is a diagram of the magnetic tape showing the pattern in which the vote and candidate identification code number are recorded for subsequent processing to produce the information contained in the unofficial return sheet of FIG. 3 and in the official return sheet of FIG. 4;

FIGS. 12, 13, and 14 chronologically represent the flow of work in accordance with one specific example; FIG. 12 indicates those procedures which are to be accomplished prior to election day; FIG. 13 indicates those procedures to be performed election night to provide Unofficial Return Sheets updated from time to time; FIG. 14 indicates those procedures required to obtain the detailed Official Return Sheets;

FIGS. 15 and 15A together show a representative portion of an Unofficial Return Sheet for a Primary Election to be produced;

FIGS. 16 and 16A together show a representative portion of an Official Return Sheet for a Primary Election to be produced;

FIGS. 17 and 17A show representative portions of Unofficial and Official Return Sheets for a General Election;

FIG. 18 shows a flow diagram of the system used to set up Unofficial Return Sheet Headers;

FIG. 19 shows a flow diagram of the system used to set up Official Return Sheet Headers;

FIG. 20 shows a flow diagram of the system used to list cards;

FIG. 21 shows a flow diagram of the system used as an input editor;

FIGS. 22A, B and C are flow diagrams of the systems used to produce the error list;

FIG. 23 is a flow diagram of the system used to organize all the counts within a particular printed return number by candidate code number;

FIG. 24 is a flow diagram for summarizing the totals of all the information from the various printed returns;

FIG. 25 is a flow diagram for "Edit Unofficial Returns" program and the information for the Unofficial Headers;

FIG. 26 is the flow diagram for printing Unofficial Returns;

FIG. 27 is the endorsed candidate accumulation flow diagram;

FIGS. 28A and 28B are flow diagrams for part 1 and part 2 respectively of the "Edit Official Returns";

FIG. 29 is the flow diagram for printing Official Returns;

FIG. 30 is a view of an IBM card used as a control card—Summarize/Edit Official—containing a three-digit number which represents the breaking point between the "common" and "noncommon" candidates;

FIG. 31 is a view similar to FIG. 30 showing in columns 4–6 a three-digit number which represents the maximum number of candidates in the system;

FIGS. 32A and B are views of the Endorsed Candidate Control Cards;

FIGS. 33A, B, C and D give instructions for preparation of the Header Cards for the Primary Unofficial Return Sheet shown in FIG. 15;

FIG. 34 gives instructions for preparation of the Header Cards for the Primary Official Return Sheet shown in FIG. 16;

FIG. 35 gives instructions for preparation of the Header Cards for the Endorsed Candidates at a general election, both on Unofficial Return Sheets and Official Return Sheets;

FIGS. 36 through 47 are program run sheets for the procedures described in connection with FIGS. 18 through 29 respectively.

Referring now to the drawings, FIG. 1 illustrates a sequence of steps which are taken to tabulate the votes from an election in accordance with the present invention. It will be apparent from the diagram that certain steps are taken prior to the election day and that other steps are taken after the polls are closed. Before explaining the various steps in FIG. 1, a few of the factors that must be taken into consideration when evaluating various systems for tabulation of ballots will be discussed.

The major problem in a large election is to capture the individual votes for each of the candidates or choices and provide them on a machine acceptable record so that they may then be processed by high-speed, data processing techniques. Various techniques have been investigated and some attempted in the past, for tabulation of votes in a political election by means of electronic computers. One serious proposal would have provided that voters cast their vote by telephone. Those familiar with registration procedures and the inherent difficulties in qualifying voters on election day can well appreciate that on this basis along, such system must be rejected.

It has also been proposed that voting machines should be connected by leased wires to a central computer. In theory, vote totals would be accumulated throughout election day, and at the close of the polls final returns would be immediately available from the computer. Assuming sufficient data transmission equipment to be available, the possibility of tapping these lines is present. Lines could be tapped to determine the trend of the election, or worse, to introduce false data into the computer. With erroneous data being fed to the computer, the system must be rejected.

It has therefore been concluded that any great changes in voting procedures are not acceptable and that to produce a record in a form acceptable to a data processing machine the raw source data consisting of the votes cast at each precinct, i.e., the precinct summary as indicated in FIG. 1, must be utilized.

In preparing coded records, many practical problems arise. First, the time element is such that the results from all precincts should be processed to provide the complete unofficial returns as soon as possible, i.e., within about no more than 6 hours after the polls close. As it is illegal to begin counting at the precinct level until after the polls are closed to avoid publication of election trends while the polls are open, the counting must be conducted during the critical time period.

Absolute accuracy is an essential requirement since any errors whatsoever may change the outcome of a contest. Therefore, the system must be capable not only of being error free, but also of being checked against duplicate processing of the same ballots or precinct summaries, omission of any ballots or precinct summaries or the substitution of a wrong ballot or precinct summary for the correct one.

It has been found that electronic computers can be used for tabulation of selection results with success. For elections that are small and ballots uncomplicated, a sample card of the type shown in FIG. 2 may be used. The votes at the precinct level may be tallied and the totals entered on the card numerically in the boxes provided on each card. The card may be punched by a keypunch. Each card thus contains the total precinct vote for each of 11 candidates, the three digits in the fields for each candidate being used to identify the vote for the listed candidate. The cards for each precinct have the same format and may be processed by use of data processing equipment.

After keypunching with the vote total from each precinct, the cards may be verified and errors corrected by a separate keypunch verifier team. Upon completion, the cards may be delivered as a group to the computer for tabulation.

The precinct returns may be conveniently processed in batches of 25. The 25 cards like those of FIG. 2, which relate for example to section 1 of the ballot, are read, the results for each candidate totalized and a summary card punched. The cards which relate to section 2 of the ballots for the same 25 precincts may then be processed and a summary card punched. This procedure can be repeated for sections 3–11 in sequence. After the 11 sections are processed, it is then possible to obtain an unofficial summary return for the first 25 precincts from the summary cards punched.

The unofficial summary return such as that illustrated in FIG. 3, may be prepared by a computer. As additional blocks of 25 precincts are counted and the results made available on separate cards, previous candidate totals may be updated providing totals to date. The computer may be readily programmed to handle candidates in groups of up to 11 for each section on each summary card having a format similar to that shown in FIG. 2.

Column headings for the printout represent the only information that needs to be stored on a record such as a magnetic tape or punched card in this system. The unofficial return sheet, the formation of which is shown in FIG. 3, indicates the number of precincts counted in a previous report; the number of precincts added to this report; and the individual vote total for each choice accumulated by the candidate named to give total votes to date. It is customary to provide such unofficial return sheets on partial results to indicate trends approximately every 30 minutes during the counting of the ballots.

The official return, the format of which is shown in FIG. 4, may also be prepared by use of a separate program stored on a record. As precinct numbers are carried on each of the first cards prepared from the precinct canvas sheets, the total for each candidate on a precinct basis as used in the preparation of the official return is already available so that the printing of the official return may be completed very quickly after the polls close. The real time of operation on the computer is a small portion of the time between the close of the polls and the completion of the unofficial return.

Where there is ballot variation between precincts, and where there is rotation of candidates on the different ballots, either within the same precinct or in the several precincts, the time required to prepare the card like that in FIG. 2 will be greatly increased. Since the keypunch operation is the bottleneck in the operation even with the comparatively small and uniform ballot, there could be no realistic possibility of obtaining within 6 hours after the polls close the complete unofficial summary return as shown in FIG. 3 in a large election like in Los Angeles county with its number of voters and choices coupled with ballot variation including candidate rotation. The requirement of the keypunch operation would be so staggering that it would offset any advantage achieved from the use of electronic computers.

Referring now to FIG. 5A of the drawings, the invention will be described in connection with the use of a voting machine of the type disclosed in U.S. Pat. No. 2,787,414 issued Apr. 2, 1957 that produces a printed return sheet shown in FIGS. 6A–6D, the return sheet being shown also in U.S. Pat. Nos. 2,943,786 issued July 5, 1960 and 2,945,433 issued July 19, 1960. Instead of a printed return sheet, other types of records could be provided. For example, the counters on the voting machine could be photographed; the reading of the counters could be entered on a keyboard that provides a printed or perforated record; or the voting machine itself could be modified to produce a record that could be used directly in data processing equipment.

The format of a portion of the voting machine illustrated in FIG. 5A is for a primary election. Five Democratic candidates for the office of Representative to Congress for the First District are Hunt, Carmody, Erick, Rudolphe and McDonald. They have been assigned, in accordance with the present invention, candidate code identification numbers 001, 002, 003, 004 and 005 respectively and are listed in the first and second vertical columns. No candidates for the Republican or Prohibition Party are shown in FIG. 5A for this office solely to simplify this description.

In the third vertical column, three Democratic candidates for the office of Judge for the Circuit Court, District 19, are Kempf, Daley and Deutch whose candidate code identification numbers are 010, 012 and 014 respectively. The Republican candidates for the same office are Tretter and Levitus who have candidate code identification numbers 462 and 464 respectively.

The face of the voting machine is shown broken, and only columns **49** and **50** representing the right-hand margin of the voting machine are illustrated where the candidates for precinct committeewoman are shown together with their respective candidate code numbers.

The voting machine printed return sheet is shown diagrammatically in FIG. **6** of the drawings and may be of the type described in the above-identified patents. Enlarged portions of the left-hand side of the return sheet are shown in FIGS. **6A** and **6B**, which correspond to the right-hand side of the voting machine as viewed from the front. Enlarged portions of the right-hand side of the return sheet are shown in FIGS. **6C** and **6D**. The central portion of the voting machine printed return sheet is not shown in the drawings since it is merely repetitious of the portions illustrated, and it is not believed necessary to discuss this portion for an understanding of the invention.

FIG. **6C** contains the candidate code identification numbers of the Democratic candidates for the office of Representative to Congress for the First District, that are shown in FIG. 5A. The physical position of the candidate identification number 005 at ballot position **1A** corresponds with the physical position of the candidate McDonald's name on the ballot format of FIG. **3**.

FIG. **6C** in vertical columns **1** and **2**, the other candidate code identification numbers positioned in a manner to correspond with the order in which the names appear on that portion of the voting machine shown in FIG. 5A. It can be seen from FIG. 5A that each candidate and his code identification number are physically located together on the ballot format, and from the FIG. **6C** that the vote total for the candidate and the candidate's code identification number are physically located together on the printed return sheet.

The use of a candidate code identification number is an important feature of the present invention particularly for large, complex ballots because it makes possible a reduction in the effort and time required to prepare a machine acceptable record such for example as the card of FIG. **2**. Where candidate rotation is used, the ballot formats for all the voting machines are so laid out prior to each election that the order of the democratic candidate's names in vertical columns **1** and **2** of FIG. 5A will be changed to enable each to appear in each of the positions **1A**, **2A**, **1B**, **2B** and **1C** approximately an equal number of times. Candidate rotation within each office is effected through the ballot in a similar manner. Candidate rotation is, as mentioned above, a requirement of the election laws in a large number of states, and is a factor which significantly complicates the tallying of votes in comparatively large elections.

The effect of candidate rotation is to move the physical location of any one candidate's vote on the printed return sheet of FIG. **6** so that it will not appear always in any one location. For example, the vote for candidate McDonald (see FIG. 5A) having code identification number 005 will appear at position **1A** on the voting machine return sheet illustrated in FIG. **6C**, but it will appear on the return sheet from other voting machines at positions **2A**, **1B**, **2B** or **1C**.

The portion of a second voting machine ballot format is shown in FIG. **5B** which corresponds to the portion of the ballot format shown in FIG. 5A. In the ballot format shown in FIG. **5B**, the candidate appearing in position **1A** is Rudolphe. His code identification number is 004. This number appears on printed return sheet for that machine (not shown) at the **1A** position. The position of the other candidates on the ballot of FIG. **5** to illustrate candidate rotation.

It is thus evident that in any system for tallying the ballots in an election involving candidate rotation, the geography of the ballot cannot be utilized as the sole identifying feature for the vote cast for each candidate. Once nonuniformity of the ballot is encountered, the identity of candidates in certain sections of the ballot or precinct summary will vary from precinct to precinct. Once this nonuniformity is encountered, the tabulation procedures used as outlined above in connection with FIG. **2** cannot be effective.

The same considerations apply where instead of using voting machines a ballot like that shown in FIG. **7** is marked in such a way as to be tallied by hand or by data processing equipment such as photoelectric readers or the lie. Where the vote marking area for a particular candidate can be maintained on all ballots at a fixed distance from a reference point such for example as illustrated in U.S. Pat. No. 3,201,038 to Harris, mechanized scanning of the ballots and totalization of the votes for each candidate is readily obtainable. In the Harris patent, a card like that shown in FIG. **7** is used as the ballot for each voter. The voter marks his choice by perforating the area of the ballot containing the candidate or choice identification number. Whether the counting actually occurs at the precinct as is the present common practice or whether the marked ballots for each precinct are transported to a central data processing center for counting, the precinct summary must still be prepared and that information utilized as input data.

When ballot variation occurs, the ballot formats from precinct to precinct or even within a precinct will be different from each other. Capturing the totals from the precinct summary ballot sheet is not easy since these documents are of such physical size that one cannot with accuracy quickly locate the vote total for a particular candidate for preparation of a machine acceptable record.

Considering a voting district such as Los Angeles County, which has currently about 3 million voters and about 12,000 precincts (which gives an average of 250 votes per precinct) in the 1962 primary, there were 177 "ballot areas" which offered four partisan ballots, that is, Republican, Democratic, Prohibition and Nonpartisan, and 708 ballot variations including candidate rotation. The amount of work considered from the standpoint of actual effort associated with correlating the votes for each choice from precinct summaries onto a machine acceptable record for machine data processing would be of astronomical proportions if checks for accuracy at each transfer operation were provided. Obviously without such accuracy checks, the entire system would be rejected.

With a total of 1,400 vote choices in the election and each ballot format having on the order of only 200 choices, it is immediately apparent that if a separate register is provided for the 1,400 vote choices, only about one-seventh of the registers would contain vote information from any one precinct summary, and the density of information on the input record **22** of FIG. **1** to the computer would be too low to be acceptable. The assignment of an identifying indicia for each vote choice at the precinct summary return sheet level in accord with the present invention eliminates this major problem of low information density.

Turning now to the voting machine, return sheet of FIG. **6**, it is provided with 50 vertical columns and nine horizontal rows [plus one row at the top of the sheet (not shown) normally used for "questions" put to the voters], and thus has room for up to 500 choices. However, few elections have a number greater than the 177 to 200 vote choices or "ballot areas" referred to above. As the voting machine counters pro-

vide a three-digit number (0–999) and as a three-digit number is assigned as the code identification number or identifying indicia for each candidate, it is apparent that six digits will be adequate for processing each candidate and his vote through the precinct level. While on FIGS. **6A–6D**, the candidate code identification is shown as a four-digit number, the highest order digit is not used for the candidate but could be used for other identification.

In FIG. **6C**, the voting machine number is printed on the return sheet in row C. In each position such as **1A**, the lower three-digit number gives the reading of each counter at the next three-digit number is the counter reading taken after the polls close. The four-digit number immediately below the candidate position, i.e., **1A**, is the candidate code identification number. The last three digits in the described embodiment are utilized as the identifying indicia for each vote choice.

In the computer, a storage area composed of 12 units each capable of handling a decimal digit is required for candidate or choice on the ballot. The computer memory for each ballot choice may thus be diagrammatically represented as shown in FIG. **8**. The three digits *ccc* in the left-hand half of the upper row are used to identify the candidate; the three digits *ttt* in the right-hand half of the upper row represent the vote on the record being processed as applied to a buffer storage; and the six-digit figure *xxxxxx* is the total vote accumulated for the candidate or choice from the return sheets already processed.

When it is desired to print out an unofficial return as illustrated in FIG. **3**, the computer may be programmed in a manner as described below to read out of storage the total vote in the accumulate register associated with each can;idate identification number, and to produce a printed record in the form of FIG. **3**. In FIG. **3**, the order of the candidates is such that the code identification number increases beginning with the number 001.

Where a punched card record such as an 80-column card of FIG. **2** is utilized as a record form acceptable to the data processing equipment, a heavy keypunch requirement exists beginning from the time the polls close until all the voting machine return sheets are processed into punched card form. In view of the facts that six columns are required for each candidate or choice and that a maximum of 80 columns per card is available where no space is utilized for other information, only 12 choices can be coded completely on a single card. For a "177 choice" ballot like discussed above, this would require a minimum of 15 cards per return sheet. Of course in other voting districts which normally have fewer ballot choices, fewer cards per return sheet will be required. But with over 10,000 precincts in one voting district, this would require keypunching effort for approximately 150,000 cards following the closing of the polls.

To reduce the keypunch effort required on election night after the polls close, the present invention in its preferred form contemplates a prepunching of what are denominated "code" cards. A preferred "code" card form is shown in FIG. **9**. Then on election night, it is only necessary to punch in the total vote for each choice. These may be added to the same card where the code is already punched in appropriately provided space, or in separate cards. Such separate cards may be "count" cards such as shown in FIG. **10**. Several advantages result from this procedure.

First, the number of cards to be punched on election night is now only half of the total required.

Second, the "code" cards can be prepared and checke; against each voting machine format (or precinct ballot) prior to election day. A dummy run of the "code" cards with sample "count" cards is contemplated prior to election day to assure smooth operation on election night as indicated in FIG. **1**. This permits careful control to assure that one and only one "code" card is provided for each voting machine.

When the results from the precincts are available for entering on the coded record, the prior existance of a verified deck of "code" cards will provide an automatic check assuring that the votes from each voting machine or precinct are counted and counted only once. This is a very important consideration in political elections, and by law, in many states, marked ballots or voting machine return sheets are required to be under police guard when transported from a polling place to a central counting or storage station. By the advance preparation of "code" cards, it is readily detectable if any voting machine return sheet has been omitted or if any attempt is made to process the same return sheet more than once.

A third advantage is that the "code" card can be prepared following the physical layout of the ballot format. When the vote from that ballot is applied to either the same card or a separate "count" card, the keypunch operator can follow the physical layout of the ballot format. Thus it is optional whether or not the vote total is placed on the very same "-code" card that carries the candidate's code identification number. Advantages arise from use of an entirely separate "-count" card as will be explained below. In any event, the geography of the ballot or return sheet can be used during the keypunch operation both prior to the election and during the critical time period immediately after the polls close just as if a uniform ballot with no candidate rotation were used even though the ballot formats for each precinct or voting machine contain different choices and candidate rotation.

Referring now to FIGS. **9** and **10** together, the "code" card is shown in FIG. **9** and is prepared prior to election day. The "-count" card is shown in FIG. **10** and is prepared as soon as the polls close and the results from the voting machine return sheet or precinct are available. The "code" card carries a readily visible identifying punch in the **12** zone in column **1** which the "count" card does not have, and may optionally carry a second identifying punch in other columns for the data processing system.

In both cards, column **2** may be used arbitrarily such as to identify the keypunch operator. Columns **3–9** contain a seven-digit number which will be referred to as the ballot number. The first two digits *xx* identify the congressional district; the third digit *y* identifies the assembly district within the congressional district, the next three digits *aaa* identify the precinct; and the digit *b* can identify the ballot or voting machine within the precinct. As more than one card will be required for each voting machine return sheet or precinct return, the digit *m* in column **10** will be available. The digit in column **11** may supplement the column **10** digit if necessary, and the check character may also be punched to assure alignment of the cards and assist in validating the keypunch operation.

Beginning with column **12**, the code card of FIG. **9** is provided with candidate code identification number in blocks of three columns. Thus, the code number 005 for candidate McDonald is provided in columns **12–14** corresponding to the **1A** position on the ballot of FIG. **5** and voting machine return sheet of FIGS. **6** and **6C**; the code number 001 for candidate Hunt is provided in columns **15–17** corresponding to the **2A** position; the code number 010 for candidate Kempf is provided in columns **18–20** corresponding to the **3***a* position; etc.

The code card of FIG. **9** thus corresponds to the voting machine printed return sheet shown in FIG. **5A**, and the candidates therein and in FIG. **6C** with their code identification numbers for 23 candidates.

In locations on the voting machine where no choice is listed, the space is ignored insofar as preparation of code cards are concerned. Thus, with a moderate sized election having a total of 115 candidates and/or choices, each individual voting machine return sheet will require the preparation of five code cards prior to the election.

Referring now to FIG. **10**, the count card is prepared from the same voting machine return sheet. The voting machine return sheet contains the data necessary for the keypunch operator to supply the information for columns **3–11**. The keypunch operator then continues by providing in columns **12–14** the total vote cast in the **1A** ballot position (see FIG. **6C**) which is 143 representing the votes cast for candidate McDonald having the code identification number 005. Nothing but the vote total is punched into the count card of

FIG. 10. The keypunch operator continues by providing in columns 15–17 the vote of 124 for candidate Hunt; in columns 18–20 the vote of 057 for candidate Kempf, etc., across the return sheet in the order the names appear on the ballot. Again, any blank spaces are skipped to thus follow the same procedure as is used in preparing the code card.

When the count cards of FIG. 10 are prepared and verified for an entire precinct or voting machine, the deck is then carried to a location where the code cards of FIG. 9 have been stored. The count cards and the code cards for the same precinct are then combined into one group and are then ready for the first step of processing. This step is shown in block 20 FIG. 1. Before proceeding further with the description of the processing, it is important to give consideration to not only the feasibility of the foregoing operation from the number of persons required to produce the count cards, but also the possibility of inadvertant errors and intentional scheming to introduce factors which will change the results shown in the final summary returns from their correct values.

The number of keypunch operators required on election night is less than might be expected. Assuming a hypothetical election involving 5,000 voting machines, 5,000 return sheets, and 115 candidates and/or choices per return sheet, a total of 60 keypunch operators has been found to be all that are required on election night. This assumes the code cards of FIG. 9 are prepared prior to the election. Assuming the polls close at 6:00 p.m., return sheets would start becoming available from the nearby polling places or precincts for keypunching at 7:00 p.m., and from the more remote polling places or precincts as the evening proceeds. The entire keypunch operation could be completed by 11:00 p.m. The final unofficial return would then be available by midnight, or within 6 hours after the close of the polls.

It is important to note that of the 60 keypunch operators, 30 will be involved with keypunch and 30 will be involved with verifying. The accuracy of this operation is well established and accepted. With both keypunching and verifying involved, accuracy is of the order of 1 part in 100 million.

With this procedure for preparing input data, the accuracy of the overall system is extremely high. The printed voting machine return sheet of FIG. 6 provides an immediate, fully accurate and unalterable record of the votes cast at the precinct level. The keypunch operation captures this data with the accuracy outlined above. With accuracy checks built into the system as will be explained and into the computer itself, the overall accuracy represents the ultimate which can be obtained in the tabulation of election returns.

To obviate the keypunch operation, the voting machine return sheet or other precinct summary may be fed into an optical scanner which would produce the machine acceptable record of the votes cast and optionally also the vote choice identifying indicia.

With the approach outlined above, all keypunch operators will be stationed at a central tabulating section located adjacent to the computer. Since the printed return sheet is available immediately after the close of the polls, return sheets from those precincts located nearby will be immediately available. Experience has shown that within 1 hour after the close of the polls, the central tabulating section will be saturated with return sheets, and keypunching can thereafter continue on an uninterrupted basis. Even in voting installations covering geographically large areas, return sheets from outlying districts can be delivered prior to the end of the 4-hour punch operation.

One major advantage in this operation is the fact that return sheets can be accepted and processed in completely random order. The code cards of FIG. 9 which were prepared prior to the election for a particular precinct may be pulled as soon as the corresponding count cards of FIG. 10 are prepared and these then are processed as a unit. Thus, the order in which the return sheets are processed is completely immaterial.

Where each ballot is a machine acceptable record such for example the perforated card of FIG. 7, the ballots may be bundled together after the polls close at each precinct and transported to a central data processing center. There the ballots may be counted by machine and the precinct totals prepared to provide information on a precinct basis which corresponds to that on a voting machine return sheet. This precinct summary information can also be provided on a further machine acceptable record such as a perforated card or magnetic tape for further processing.

However, where ballot variation is present, it will be necessary that a code identification number be assigned each choice since the geography of the ballot card of FIG. 7 for each precinct cannot be used solely as the choice identification indicia. For example, the choice listed in ballot position 90 in precinct 195 will be very likely to be different from the choice listed in the corresponding ballot position for other precincts. Thus, the choice code identification may consist of the precinct number shown at the bottom of the ballot card plus the ballot position number, and the code card or an equivalent machine acceptable record may be prepared prior to the election in accord with the ballot format for each precinct.

Thereafter, the machine acceptable record containing the vote count information for each precinct may be collated with the previously prepared machine acceptable record having the choice code information by a procedure similar to that described in connection with the use of voting machine return sheets. One advantage here is that the keypunch operation for transferring vote totals from the voting machine printed return sheet to a machine acceptable record would be obviated.

The processor at block 20 of FIG. 1 performs the following functions:

1. It collates the code and count cards or other machine acceptable records, and places the candidate or choice code identification number and the corresponding vote received in that precinct or on that voting machine together in the memory. These two items of information are then retained together throughout the balance of the processing operation. The output from processor 20 constitutes another machine acceptable record such as a magnetic tape.

2. A check is provided to assure that a count card properly matches up with a code card, that the fields of these cards are consistent and contain no blanks, that there are no duplicate entries, and that no entry exceeds the total voters at that machine. These checks are aimed primarily at keypunch validation where keypunches are used. However, where the votes are cast initially on a machine acceptable record, these checks are useful to detect the omission of votes from any precinct and that the votes from each precinct are processed only once.

When errors are discovered, the incorrect data is prevented from being applied on the output tape 22 which is the output of input-editor 21. Input-editor 21 may be appropriately programmed to cause printing of a message identifying the particular code or count cards of a pair which do not properly match to expedite corrective procedures.

3. Errors in either card can be corrected at this point. In general this will be done by preparing a new count card with corrected information which will replace the defective card since the code cards will have been checked prior to the election by the dummy run, see FIG. 1. The matching code and count cards are again fed to the collator 20 so that they may appear on the corrected tape 22. Since the data arrives in random sequence and time is of the essence, it is necessary to process in the order which the data arrives and to sort, i.e., place in a predetermined order such as by candidate identification number, on another record utilizable for data processing equipment, such as in a memory, before official returns can be prepared. This step is indicated in FIG. 1 as being performed by processor 24. Tape 22 prepared at the output of input editor 21 may be reprocessed by the same computer to effect the processing function of processor 24. Where the same computer is used, the information on tape 22 may be stored internally in the computer rather than constituting a physically separate record.

In the process as described, the functions of collator **20** and input-editor **21** may be performed on a single computer where the information input is from the cards of FIGS. **9** and **10** (sheet **12**) and the output may be a magnetic tape, in the format indicated below.

Input "code" and "count" cards		Output magnetic tape record	
Column	Information	Column	Information
1-2*.....	Key-puncher.	1.....	Blank.
3-9.....	Voting machine return sheet or precinct ID.	2-8.....	Precinct ID.
10.....	Voting machine return sheet or precinct section. sheet or precinct	9.....	Precinct section.
11.....	Check character.	10.....	Check character.
12-14.....	Candidate code/count.	11-79.....	Cards cols. 12-80**.
15-18..... Etc. to—	Do.	80-150..... Etc. to—	Do.
78-80.....	Do.	932-1002.....	Do.

*Code cards differ from "count" cards by a plus (12 punch) in col. 1.
**Code cards now differ from "count" cards by plus (12 punch) in the units position of 1st data field.

In this operation all input code and count cards pertaining to a particular voting machine return sheet or precinct are grouped together, although within a particular voting machine return sheet or precinct, the cards may appear in random order. As all the input data cards from a particular return sheet or precinct are grouped together, the precinct number is recorded only at the beginning of the file on the output tape, see FIG. **11**, where all the information, i.e., candidate code identification number and vote, is recorded.

The program causes the first card to be read and places the printed return number in the output record area P of FIG. **11**. It will be noted from the table above that the information in the first two columns of the input data cards is not reproduced on the magnetic tape output record. For this reason it is desirable to have the mark which distinguishes a code card from a count card in the first column to be also present in the 11th column of the card for subsequent reference. When a second card is read, if it is a valid card, the voting machine return sheet or precinct number is matched against the records retained in memory. If there is a match of information in columns **3–9** of the new input card, the input card information is placed in the next available space in the memory. This continues until all the cards from the one voting machine return sheet or precinct are processed. At this point nothing has been done toward tabulating the results except to transfer the information from the various cards for one precinct into adjacent positions within the memory of the processor; no effort toward matching candidate code identification numbers with totals has yet been expended.

When a new card has a return sheet or precinct number that does not match the voting machine return sheet or precinct number of the record in memory, then the memory is checked for completeness of information before operating further. If all cards for this return sheet or precinct have been recorded, the information standing in memory is written out as a separate record on logical tape which may have an arrangement as shown in FIG. **11**. The memory area is thereafter cleared, and the precinct identification information (ID) of the new card is then placed in the memory and the cards from the next precinct accepted.

With present invention, it is possible to determine when complete information from a precinct is missing. Assuming the voting machine return sheet has between 92 and 115 candidates, for each return sheet there will be five code cards and five count cards. Thus the check digit *m* in column **10** will be a number between 1 and 5 for the respective card to identify what portion of the return sheet is coded on the respective card. Input-editor **21** thus may be programmed to require detection of the digits 1 to 5 in column **10** for cards having the identifying "code" mark and also for cards without this mark, and to provide a suitable signal identifying any missing cards.

Each card may be checked in input-editor **21** prior to entry of the information stored therein on the intermediate record or tape **22** as follows:

1. The voting machine return sheet or precinct number is checked and if blank, an error may be indicated.

2. If the section area check digit *m* (column **10**) and check-character (column **11**) duplicate an entry already standing in the memory, an error is indicated.

3. The data fields are scanned, and if any field contains less than three digits of punched information, the card is ignored. Any blank fields which appear after data fields must consist of three blanks. No data field may follow a blank field.

In each of the above tests, which may be performed in manners well known to those skilled in the art and hence detailed discussion of such checking means is not believed necessary here, unique signals may be produced to identify the reason for rejection a particular card to assist in correction procedures. A series of messages may be precoded, and upon detection of a certain error, the appropriate identifying message is typed out by means that are convention in computer programming.

In addition to the foregoing checks, each group of cards of a voting machine return sheet or precinct is checked as follows:

1. For each code card there must be a corresponding count card.

2. Only one card within a particular section identified by the check digit in column **10** may contain any blanks in the data field. This is called a terminating card, and each terminating count card must correspond to the terminating code card.

3. Within a section it is not permissible for any check digit (columns **10** and **11**) less than that corresponding to a terminating card to be missing.

If any of these conditions exist, the information contained in a group of cards pertaining to that particular return is not placed on the intermediate record tape **22** from input-editor **21**, but it will be placed on an error record **26** and analyzed to determine the reason for rejection. Thus, no information known to be erroneous is ever placed on the intermediate tape record **22**. As error information appears on tape **26**, steps may be taken to determine the error and make the necessary corrections while data from other precincts are being processed. The format of the error record **26** may be comparable to that of the tape shown in FIG. **11**.

An error list program is desirable to assist in locating and correcting errors which have resulted in the recording of data on the error record of the input program. It may cause print out of the count cards present and the code cards present. Thus, it will be possible for the operator by visually comparing these numbers with those on the cards what the nature of the error is.

Summarizing, on the intermediate record tape **22** from input-editor **21** there is captured error-free data for precinct identification including candidate identification and vote data in random order. It is an important step in the preferred process of the present invention since it solves the difficult problem of capturing the vote data in a large election which may have ballot variation including candidate rotation in a manner that is fraudproof and error free and that can be carried out with a reasonable amount of operating personnel on available equipment.

Assuming all precinct code and count cards present, the magnetic tape shown in FIG. **11** (sheet **11**) will be produced with the pattern of the data containing a blank space to indicate a separation between adjacent precincts, the precinct identifying information being in area P, and separate areas **1–10** for the information on each of the five count cards and five code cards as shown in the table above. Note that the check digit from columns **10** and **11** of the cards is carried on the record of FIG. **11** so that with the precinct data P, each item of data is identifiable. However, the cards for each precinct may be recorded in random sequence and the order of the data on tape **22** at the output of processor **20** is the same as the order in which it was applied.

Where incorrect or incomplete data from a precinct is detected, the information in the memory may be read out on error tape **26** and not be supplied to tape **22**. Thus, processing can continue while the nature of the error is determined, and a corrected deck of count cards provided. Thereafter the corrected cards for the precinct may be again applied to the input of processor **20**.

The process of reading cards continues until the logical tape **22** is filled to capacity or until the last card has been read. At this point an end-of-file mark is written onto the logical tape and the input-editor **21** is stopped. Cards may be read at the rate of 800 cards per minute and the magnetic tape output processed at the rate of 150,000 characters per second.

The function of the process program at block **24** is to organize all the counts within a particular printed voting machine return sheet or precinct by candidate code number. Thus, the input consists of the intermediate magnetic tape record **22** and the processed data output is placed on a second record which may be another magnetic tape **28** or its equivalent. In this secondary record **28**, the data fields may have a pattern identical to that shown in FIG. **11**, but the information for each precinct is arranged in the following order:

1–7	Voting machine return sheet or precinct ID
8–10	Count for code number **001**
11–13	Count for code number **002**
14–16	Count for code number **003**
etc. to 3005–3007	

To accomplish this organization of the information, the processor **24** reads two records on the input tape **22** from the same precinct and by matching the check characters *mm* from columns **10** and **11** of the cards, code card data are matched to count card data. When a match is found, the data from the two matching cards are moved together into a special work area in the computer memory. There the counts are associated with codes by position, pulled out and filed in an address corresponding to the code number. Thus, when record **28** (magnetic tape) is produced, it contains all the counts from a particular voting machine return sheet or precinct in the format of the above table. When the information for each precinct is stored in this manner, each candidate's counts may be found simply by referring to the appropriate area of the record. Therefore, it is no longer essential to retain the candidate code identification number. The only randomness remaining is the order of the precincts.

For both the first and second processing steps indicated at blocks **20** and **24**, an IBM **1401** is suited ideally to the input-output functions of the system. Such machines are widely available and have substantial speed for card and tape reading, printing (errors) and producing a magnetic tape output.

IBM keypunchers and verifiers are, therefore recommended as the preferred equipment to be used because they complement the 1401. Paper tape equipment may also be used in an analogous manner, but use of tape is considered to be somewhat less desirable because paper tape readers for the 1401 are significantly slower than 1401 card readers and somewhat less likely to be available on a rental basis in many areas. On the other hand, keypunch equipment is very widely used so that services of both experienced operators and equipment can normally be readily acquired on election night for the few hours necessary following the closing of the polls.

DESCRIPTION OF SPECIFIC EMBODIMENT

In the specific embodiment for which a programming arrangement has been devised, 12 programs have been prepared for implementation on an IBM 1401 computer. FIGS. **12**, **13** and **14** represent chronologically the flow of work. FIG. **12** indicates those procedures which are to be accomplished prior to election day. FIGS. **13** and **14** show those operations which are performed election night as input data becomes available, providing successive, updated Unofficial Returns. FIG. **14** shows the processing required to obtain the detailed Official Returns, which may be completed subsequent to the night of the election. The function and limitations of each individual program will be described below together with a pictorial logic flow diagram representative of that program's function. Thereafter, the individual input/output records, both card and magnetic tape will be described in detail together with corresponding references to the respective program work area. Finally, the operating instructions for every IBM 1401 program, will be given. Supplementary to this, a flow chart relating all the programs is provided. With this information, a computer programmer or operator will be able to understand the program here described, and also prepare a program suitable for other types and brands of digital computers.

FIGS. **15** and **16** illustrate the Unofficial and Official Reports produced by this system. In the Unofficial Report candidates are listed by office, and it will be noted that this yields an up-to-the-minute status of the processed returns showing the total votes and machines reported for each candidate. Thus, several Unofficial reports can be processed immediately following the election as machine returns are received. Contrasting this, the Official Report is run only once, and this report reveals in detail the number of votes each candidate received by the machines which carried his name and the office for which he was a candidate along with his final grand total of votes.

FIG. **17** shows the format used in the Unofficial and Official Returns for endorsed candidates. While this format is illustrated separately, it should be appreciated that endorsed candidate vote totals will be listed in any order desired (under header card control).

In order to be able to use the maximum number of IBM 1401 computers available, the entire system has been designed and implemented for operation on a modest computer configuration. For example: all input and output programs require only a 4K memory and all process programs require only an 8K memory. The maximum number of tape drives for any one program is three. The optional features available for IBM 1401's such as "Hi-Lo-Equal" compare, Multiplication/Division, and Indexing are not utilized in the illustrated program.

The format and arrangement of the Header Cards largely determines the final output reports. This is particularly the case for the Unofficial Report. It is, for example, the Unofficial Headers which determine the Endorsed Candidates and their accumulations. Furthermore, the Header Cards control the amount of information included on a page of the report.

Provision for automatic handling of multireel input operations has not been made for any one pass through the system. Therefore, it is strongly recommended that the programs be run with the Tape Mode Switch set for the highest available density, 800 or 556 characters per inch.

The Unofficial portion of the system must be run once for each input data batch to update the Edited Unofficial Returns File and provide intermediate processed returns status reports. Multireel input to the Official Returns portion can be avoided by merging processed input data to one reel by using Sort II on the IBM 1401. Control cards for this purpose are shown in a later section of this description. A geographic area encompassing up to a maximum of 3,000 to 4,000 voting machines or precincts will result in only one reel of data.

It is possible, though, to increase the capacity of input to the system. Two major factors necessary for such an increase are: (a) a computer with a larger storage capacity, and (b) program modification plus the possible addition of programs to the system.

With respect to the present system, any one input data card permits a maximum of 23 candidate codes/counts. In addition, a maximum of 56 cards for any one machine is allowable (i.e., 14 code and count cards per section with four sections per machine). Each tape record is approximately equal to a section per return, with a maximum here of approximately 7,000-plus records per one input tape, which maximum may be easily increased to 8,000 or 9,000.

If any maximum limits are anticipated, it then becomes necessary to sort all card input on card columns **3–11** inclusive (the Return ID, section and Check Character).

The system operates with the following configurations:

A. The Ward-Precinct-Machine numbers are, for the most part, treated as a single number. (WWPPPMM, where WW is the two-digit Ward, PPP is the three-digit Precinct, and MM is the two-digit Machine number.)

B. For control purposes there is a section number which may vary within a given Ward-Precinct-Machine (W–P–M–) number from 1 through 4. Within these section numbers there is a Check Character which may vary from 1 through 7.

C. Every candidate is assigned arbitrarily a unique code number. For any endorsed candidate several unique codes are assigned one for each party under which he appears and one for his combined votes. These codes are initially set up as three-digit numbers (000 to 999).

D. All election "counts" or votes shall be reported for keypunching as three-digit numbers (005, 104, etc).

E. Since "count" cards are to be matched with prepunched "-code" cards before being introduced into the system, the "-counts" for any particular W–P–M number plus section number plus Check Character must match with its corresponding Code Card. For example:

	W–P–M No.	Section	Check character	Candidate code/vote, totals	
Code card	0100101	2	1	002	003
Count card	0100101	2	1	150	201

where 150 and 201 are the number of votes for candidates 002 and 003, respectively.

F. Although a candidate is originally assigned a unique three-digit number, the final reports reflect a five-digit number. This is provided in order to distinguish the "common" candidate code from the "noncommon." A "noncommon" candidate is one whose name does not appear on all ballots over the entire election. Consequently, the first two digits of the extended five-digit code represent the restricted geographic area in which the "noncommon" candidate appears. The double zero prefix applies to all "common" candidates.

Hence, care must be taken when assigning candidate codes if "noncommon" candidates are to be included. It is essential that those "noncommon" candidates be assigned numbers beyond some designated maximum number for "common" candidates (e.g., numbers 001–250 to be assigned the "common" candidates, and 251–300 to be assigned the "noncommon" candidates with 300 being the highest code assigned). The Summarize Program for the Unofficial Reports and the Official Edit Program for the Official Reports require control cards (see FIG. **30**) which indicate the "breaking point" between the "common" and "noncommon" codes.

PROGRAM DESCRIPTIONS

Program title	Program Number	Flow diagram drawing figure	Program run sheet drawing figure
Setup unofficial headers	00.1	18 (sheet 21)	36 (Sheet 44).
Setup offical headers	00.2	19 (Sheet 22)	37 (Sheet 45).
List cards	00.5	20 (Sheet 23)	38 (Sheet 46.)
Input editor	01.0	21 (Sheet 24)	39 (Sheet 47).
Error list	01.5	22 (Sheets 25–27)	40 (Sheet 48).
Process	02.0	23 (Sheet 28)	41 (Sheet 49).
Summarize	03.0	24 (Sheet 29)	42 (Sheet 50).
Edit unofficial returns	04.0	25 (Sheet 30)	43 (Sheet 51).
Print unofficial returns	05.0	26 (Sheet 31)	44 (Sheer 52).
Endorse candidate accumulation	05.5	27 (Sheet 32)	45 (Sheet 53).
Edit official returns	06.0	28 (Sheets 33 and 34)	46 (Sheet 54).
Print official returns	07.0	29 (Sheet 35)	47 (Sheet 55).

PROGRAM NO. 00.1 – SETUP UNOFFICIAL HEADERS

1. Machine Requirements

IBM 1401–4K, 1402 Card Reader, 1403 Printer, one 729 or 7330 Tape Drive utilized as illustrated in FIGS. **18** and **36**.

2. Input

Unofficial header cards — including candidates.

3. Output

"Unofficial Headers" tape.

4. Description Of Process

The program reads in two cards in succession. The first card is stored in the high-order portion of the area to be written; the second card, in the low-order portion of the same area. The complete card is not stored in either case. This "Merge" area which is written on logical tape **1** is analogous to a line of print — the area or record size is 141 positions, slightly more than the allowable 132 print positions, due to the need for control information.

a. Card **1** utilizes card columns **1–72**.

b. Card **2** utilizes card columns **1–69**.

5. Special Checks

None.

PROGRAM NO. 00.2 – SETUP OFFICIAL HEADERS

1. Machine Requirements

IBM 1401–4K, 1402 Card Reader, 1403 Printer, one 729 or 7330 Tape Drive utilized as illustrated in FIG. **19** and **37**.

2. Input

Official header cards — including candidates.

3. Output

"Official Headers" Tape.

4. Description of Process

The program reads in two cards in succession. The first card is stored in the high-order portion of the output record area; the second card, in the low-order portion of the same area. This "Merge" area which is written on Logical Tape **1** is 137 positions—slightly larger than the total number of print positions in a line (viz 132). This is due to the fact that certain control information is present in the first few positions of the high order.

a. Card **1** utilizes card columns **1–65**.

b. Card **2** utilizes card columns **1–72**.

5. Special Checks

None.

PROGRAM NO. 00.5 – LIST CARDS

1. Machine Requirements

IBM 1401–4K, 1402 Card Reader, 1403 Printer utilized as illustrated in FIGS. **20** and **38**.

2. Input

Input data cards.

3. Output

Listing of those data cards.

4. Description of Process

Each card is read into memory. The print area is then set up with edit word and each unit of data is moved to the print area and printed. The data on each card is essentially:

a. Return ID - Ward/Precinct/Machine Number

b. Section ID - A single digit with values between 1 to 4.

c. Check Character - A single digit with values between 1 to 7.

d. Codes or votes, depending on the card - A series of 23 three-digit numbers.

5. Special Checks

None.

PROGRAM NO. 01.0 – INPUT EDITOR

1. Machine Requirements

IBM 1401–4K, 1402 Card Reader, 1403 Printer, two 729 or 7330 Tape Drives utilized as illustrated in FIGS. **21** and **39**.

2. Input

Input data cards - "Code Cards" and "Count Cards."

3. Output

Edited usable data on Logical Tape **1**; error data on Logical Tape **2**.

4. Description of Process

This program is designed to accept data cards in the format indicated and combines them into output records in the format indicated.

Input data (cards)		Output records (tape)	
Column	Information	Column	Information
1-2*.....	Keypuncher.	1.....	Blank.
3-9.....	Return ID.	2-8.....	Return ID.
10**.....	Section (1-4).	9-79.....	Card cols. 10-80 ***.
11**.....	Check character (1-7).	80-150.....	Do.
12-14.....	Candidate code/count.	Etc. to—	
15-17.....	Do.	932-1, 002....	Do.
Etc. to—			
78-80.....	Do.		

* Code cards differ from count cards by A plus (12) punch in col. 1.
** For every Section (digits 1, 2, 3, or 4) there exists a check character (digits 1, 2, 3, 4, 5, 6, or 7).
*** Code cards now differ by plus (12 punch) units. Position of 1st data field.

The Return ID consists of a seven-character number which is broken down as follows: XXYYYZZ; where XX equals the Ward or District number; YYY is the Precinct number; and, ZZ is the Machine number. The section number for any Return ID can vary from digits 1 through 4. Within each section number the check character can vary from digits 1 through 7. Hence, for any code card there can be only one unique identification number; that is, the combination of Return ID, Section and Check Character is a uniquely combined number. The only other card containing this identical number is the code's card match — a count card.

It is assumed that all input cards pertaining to a particular return (i.e., Ward-Precinct) will be grouped together although within a particular return, cards may appear in random order. Within the computer space is reserved for two output records, i.e., a high-order record and a low-order record. Each of these records could contain as many as 14 code and count cards. Thus a maximum of four records will be allowable for any particular return. The program reads the first card and places the printed return number (i.e., Ward-Precinct-Machine Number) in both record areas. After appropriate checking of the cards the data is placed in the low record if the section number is either 1 or 2, and in the high record if the section number is either 3 or 4. It will be noted that the first two columns of the card are not longer retained, so it is necessary to move the zone from the first column to the 14th column of the card for subsequent reference to distinguish a code card from a count card. When another card is read, if it appears to be a valid card, then the return number is matched against the records retained in memory. If there is a match, the input card information is placed in the next available space in either the high or the low record. If either of these record areas becomes full, the information is written on Logical Tape **1** and the memory record blanked out. If the new card return number does not match the return number of the record in memory, then both record areas are checked for information and if such is present, these are written as separate records on Logical Tape **1**, the two memory areas cleared, and the ID of the new card placed in the record areas. The process of reading cards continues until approximately 7,000 records have been written on Logical Tape **1**, or until the last card has been read. At this point an end-of-file mark is written onto Logical Tape **1** and the machine is stopped. The 7,000 record limit is designed to prevent overfilling a tape.

5. Special Checks

a. The printed return number is checked and if blank, the card is ignored and a message printed on line.

b. If the section area and check-character duplicate an entry already processed the card is ignored and a message appears on line.

c. The data fields are scanned and if any field contains less than three digits of punched information, the card is rejected. In addition any blank fields which appear after data fields must consist of three blanks. No data field may follow a blank field. Any of these conditions constitutes a scan error and the card is ignored and a message printed on line.

In addition to these checks each group of cards is checked as follows:

a. For each code card there must be a corresponding count card.

b. Only one card within a particular section number may contain any blanks. Obviously, these blanks must be on the last card of a section check character series. This is called a terminating card. Each terminating code card must correspond to a terminating count card.

c. It is permissible for a section number to be missing. However, within a section it is not permissible for any checkcharacter less than that corresponding to a terminating card to be missing.

If any of these conditions exist, the information pertaining to that particular return is deleted from Logical Tape **1** and written on Logical Tape **2**. Thus, no information known to be erroneous is retained on Logical Tape **1**. If any error information has been written on Logical Tape **2** at the program termination an end-of-file mark is written onto Logical Tape **2**. Format of records on Logical Tape **2** is comparable to those on Logical Tape **1**. At the end-of-job a record count is printed which states the number of good records as well as the number of error records.

PROGRAM NO. 01.5 – ERROR LIST

1. Machine Requirements

IBM 1401–4K, 1402 Card Reader, 1403 Printer, one 729 or 7330 Tape Drive utilized as illustrated in FIGS. **22A**, B, and C, and in FIG. **40**.

2. Input

"Error" Tape from Input Editor Program.

3. Output

Listing of erroneous input (card) data.

4. Description of Process

The error list program is designed simply to assist in locating and correcting errors which have resulted in records on Logical Tape **2** of the input program. It prints out four series of "-count cards present" and "code cards present." These correspond to return section numbers 1, 2, 3, and 4, respectively. For terminating cards the appropriate section characters number is zoned so that it appears as an alphabetical character A through G. Thus, it will be possible for the operator to scan these numbers and determine if any are missing or if the terminating cards do not match. Additionally, under certain conditions as determined from Logical Tape **2** of the input program. At the end-of-job a message so starting is printed.

5. Special Checks

None.

PROGRAM NO. 02.0 – PROCESS

1. Machine Requirements

IBM 1401–8K, 1402 Card Reader, 1403 Printer, two 729 or 7330 Tape Drives utilized as illustrated in FIGS. **23** and **41**.

2. Input

"Edited Input Data" Tape produced from Input Editor Program.

3. Output

"Processed Data" Tape, possible printed message.

4. Description of Process

The function of the process program is to organize all the counts within a particular printed return number by candidate code number. Thus, the output is as follows:

OUTPUT (TAPE)

	Column	Information
	1-7	Return ID
td 8-10		Count for code number **000**
	11-13	Count for code number **001**
	14-16	Count for code number **002**
	etc. to	
	3005-3007	Count for code number **999**

To accomplish this organization of the information the process program reads two records from the input tape. It then matches the return number section check-characters codes to determine if the information to be searched is contained in one record or two. If it happens to be in one record, then the second record is simply retained in memory, while the first record is completely matched, code cards against count cards. When a match is found, the two matching records are moved into a special work area. There the counts are associated with codes by position on the card, pulled out and "filed" in an address corresponding to the code number. Thus, a record is produced which contains all the counts from a particular return in the format shown above. When the information is placed in this manner, each can;idate's counts may be found simply by referring to the appropriate area in the record. Therefore, it is no longer necessary to retain the candidate codes.

In the process of placing the count in its appropriate location, the location is first interrogated to determine if prior information was stored. This would result from duplicate code information in a particular candidate's return. If such a duplicate is found, the second count entry is simply ignored and a message concerning the duplicate code number is printed on line.

It is noted that for a limited memory processor (as described) a problem could arise if for any printed return two records of the low(or high) sequence became separated. No problems arise of the number of cards in combined sections 1–2 (or 3–4) of the printed sections do not exceed 14 since only one record results. Otherwise, the present program requires:

a. That all input be arranged so that high-low entries are not intermixed, or

b. That the input to the process program be partially sorted.

In a large-memory machine, no problem will occur since the entire printed return will be in memory and readily operated upon.

5. Special Checks

None.

PROGRAM NO. 03.0 – SUMMARIZE

1. Machine Requirements

IBM 1401–8K, 1402 Card Reader, 1403 Printer, two 729 or 7330 **Tape Drives utilized as illustrated in FIGS. 24 and 42.**

2. Input

"Processed Data" Tapes from Process Program.

3. Output

"Summarized Data" Tape.

4. Description of Process

The Summarizing Program merely totals all the information from the various printed returns. Only 250 candidates have their votes totaled at each pass of the data tape. This is primarily due to the memory limitations —250 six-digit fields are required to accumulate the votes, and a similarly grouped field is required to accumulate the number of machines. After 250 such totalings are taken, each field is written on the output tape; the total votes in one record followed by the total machines in the second record. The input tape is then rewound and processing is started on the next group. The output is in the following format:

Record	Column	Information
1	1–5	00000
	6–11	Vote totals for Code 00000
	12–17	Vote totals for Code 00001
	etc. to	
	1499–1505	Vote totals for Code 00249
2	1–5	0000
	6–11	Machine totals for Code 00000
	etc. to	
	1499–1505	Machine totals for Code 00249
etc. to		
	7–8	– Which have information for Codes 00750–00999
	9–10	– Which have information for Codes XX000 Where XX (the Ward Number) denotes a noncommon candidate code, etc.

PROGRAM NO. 04.0 – EDIT UNOFFICIAL RETURNS

1. Machine Requirements

IBM 1401–8K, 1402 Card Reader, 1403 Printer, three 729 or 7330 Tape Drives utilized as shown in FIGS. **25 and 43.**

2. Input

"Summarized Data" Tape, and "Unofficial Headers" Tape.

3. Output

"Edited Unofficial Returns" Tape.

4. Description of Process

This program accepts as input the information from the summarizing program and the unofficial headers which are placed on tape by the header program. Logically, the output is another header tape, that is to say, the input header is comparable to an output header, but with additional information included in the totals. Each record is logically a printline preceded by control information, i.e.,

Column	Information
1–5	Currently blank
6–9	Control information
10	Carriage control character*
11–141	Print line in internal computer Form

*Normal 1401 Control

VARIATIONS OF UNOFFICIAL PRINT LINES

Type	Column	Information
Header	9	H
	11–141	Directly Printable Line
Votes (cont.)	1–5	Endorsed Candidate's combined code
	9*	Blank
	13–32	Office
	38–42	Candidate Code
	46–65	Candidate Name
	73–78	Precinct previously reported
	82–87	Votes previously reported
	95–100	Precincts this report
	104–109	Votes this report
	117–122	Precincts (total)
	126–131	Votes (total)

*Blank spaces between columns 11–141 are not shown.

For a "Votes" card a check is made on columns **1–5.** If they are blank, processing continues. However, if they are not blank, the program treats this number

(XXYYY–XX = 00 for common candidate
= Ward number for noncommon candidate
–YYY = C0de)

as the code which represents the combined totals for an endorsed candidate. It then proceeds to add the vote of the candidate represented by that "Votes" card into the area as designated by the code in columns **1–5.**

The records from the header tape are read line by line and if a blank is not found in column **9,** the record is passed to the output tape. If "summarized" tape is searched for the information corresponding to this code and the entries inserted in columns **95–100** and **104–109** (precincts and votes for "this report"). The totals in columns **117–122** and **126–131** are moved to columns **73–78** and **82–87** respectively. Then the

record is passed to the output tape. The process of reading from the "header" tape, searching for the necessary information, etc., continues until an end-of-file written on the output tape.

If a particular candidate code form the header tape is not found on the "summarize" tape, the information for "this report" is considered blank and updating procedures continue normally.

5. Special Checks

None.

PROGRAM NO. 05.0 – PRINT UNOFFICIAL RETURNS

1. Machine Requirements

IBM 1401–4K, 1402 Card Reader, 1403 Printer, one 729 or 7330 Tape Drive utilized as shown in FIGS. **26** and **44**.

2. Input

"Edited Unofficial Returns."

3. Output

Unofficial Returns Report.

4. Description of Process

The output from the Unofficial Edit Program is substantially a line in a report. It is necessary, however, to suppress signs, leading zeros, etc., and truncate the first 10 characters in the record. The control information is a customary 1401 carriage control character. Other control information is designed for interrogation so that the line will be appropriately edited depending upon whether it is alphabetic, numeric or mixed or otherwise. To date only the character "*h*" is used which indicated the line is to be printed without alteration.

5. Special Checks

None.

PROGRAM NO. 05.5 – ENDORSED CANDIDATE ACCUMULATION

1. Machine Requirements

IBM 1401–8K, 1402 Card Reader, 1403 Printer, two 729 or 7330 Tape Drives utilized as shown in FIGS. **27** and **45**.

2. Input

"Processed Data" Tape.

3. Output

"Endorsed Candidates for Official Returns" Tape.

4. Description of Process

All the control cards containing "endorsement" are read into memory — however, only a maximum of 25 cards may be read on any one pass. If more than 25 cards are to be read in, a message is printed. The remaining cards are not read at this time, and processing commences. A record is read from the input Logical Tape **2** and the data area based on the key code of the input card is located. The subsequent codes from the card are used to determine the other locations in the record. The data in these "other" locations is then added to the data (or no-data) as determined by the key code. When all the data is added for any one stored card, the information on the next stored card is used to similarly process the record — until all 25 cards have been utilized. At this point the processed data is written out, the next tape record is read and processing begins again. (Processed data is written on Logical Tape **4**).

At the end of the file on Logical Tape **2**, Tape **2** is rewound, as is Tape **4**. A test is made to determine if more cards are in the hopper. If there are, all altered locations and instructions are initialized and the next group of cards is read in. Processing then continues, but this time with the output Logical Tape **4** now on the input Logical Tape **2**, and a new scratch tape on Logical Tape **4**.

The input and output tape formats are identical except the output has certain candidates endorsed.

Card Column	Format
1–5	00XXX where XXX equals the combined endorsed candidate code.
6–8	A 3-digit candidate code—of one party.
9–11	A 3-digit candidate code—of next party
etc.	
33–35	A 3-digit candidate code—of next party.

PROGRAM NO. 06.0 – EDIT OFFICIAL RETURNS

1. Machine Requirements

IBM 1401–8K, 1402 Card Reader, 1403 Printer, three 729 or 7330 Tape Drives utilized as shown in FIGS. **28A** and **B** and in FIG. **46**.

2. Input

"Endorsed Candidates" Tape, or "Processed Data" Tape, "Official Headers" Tape.

3. Output

"Edited Official Returns" Tape.

4. Description of Process

This program operates much like the unofficial edit program except that its headers are in a different format and it prints all details available on the process data tape (or endorsed candidate tape if there are endorsements) if called for by an appropriate candidate code. Each page of the report requires a pass of the processed data tape. The record format for the output is as follows:

Column	Information
1–4	Control
5	Carriage Control
6–137	Information to be printed

OFFICIAL PRINT LINE VARIATIONS

Line Type	Code Column	Code Information
Header	5	H
	6–137	Printable line image
Code	5	C
	23–27	Candidate code
	35–39	Candidate code
	47–51	Candidate Code
	59–63	Candidate Code
	71–75	Candidate code
	83–87	Candidate Code
	95–99	Candidate Code
	107–111	Candidate Code
	119–123	Candidate Code
	131–135	Candidate Code
Total	5	T
	6–15	Total
	18–27	Total votes for candidate where code appears in columns 23–27
	30–39	Next Candidate Totals, etc.
	etc.	

PROGRAM NO. 07.0 – PRINT OFFICIAL RETURNS

1. Machine Requirements

IBM 1401–4K, 1402 Card Reader, 1403 Printer, 729 or 7330 (one) Tape Drive utilized as shown in FIGS. **29** and **47**.

2. Input

"Edited Official Returns" Tape.

3. Output

"Official Returns Report."

4. Description of Process

This program performs the same functions for the official report as the "Print Unofficial" program performs in the latter case.

The official edit program reads the headers and passes them on to the output tape. When a "code" line is encountered, information from the processed tape is inserted in the next line (or lines) in the order of the processed data tape. The latter is read, return by return and each return generates a line. Totals are taken on the same pass. When all returns have been processed, the totals are written out and the process of reading

Essentially represented by a blank card when used as input to "Setup unofficial headers"

73–78	1–5	Number of machines	Previous totals.	6 N	269
79–81	6–8	Blank		3	272
82–87	9–14	Number of votes		6 N	278
88–94	15–69	Blank		7	285
95–100		Number of machines	Totals this report.	6 N	291
101–103		Blank		3	294
104–109		Number of votes		6 N	300
110–116		Blank		7	307
117–122		Number of machines	Totals to date.	6 N	313
123–125		Blank		3	316
126–131		Number of votes		6 N	322
132–141		Blank		10	332

Page titles * unofficial headers

1–8		Blank	8	
9		"H" (for first card of heading)	1 A	
10		Carriage control	1 A–N	
13–72	13–72	First half of page title (Card 1)	60 A–N	263
73–141	1–69	Second half of page title (Card 2)	69 A–N	332

* Cards to be punched for "setup header" program.

NOTE.—Print positions total 188 (× ½)=59 mid-point. Hence, with respect to the Page Title (card)—column 72 may be considered the mid-point.

from the header tape resumed. Thus, each page of the report requires a pass of the data tape. This would be a large price to pay in a large election and could be reduced by programming to process several pages per pass. On a large memory machine no real problem arises since 40 to 50 returns (i.e., the number appearing on a page) may be retained in memory. Thus, all pages pertaining to these returns can be written in a single pass of information.

5. Special Checks

None.

FORMAT SPECIFICATIONS

Input Data

	Column	Data	Character
Code Card:	1	+	1A
	2	Blank	—
	3—4	Ward number	2N
	5–7	Precinct number	3N
	8–9	Machine number	2N
	10	Section number	1N
	11	Check character	3N
	12–14	Candidate code	3N
	15–17	Candidate code	3N
	etc.	Candidate code	3N
	78–80	Candidate code	3N
Count Card:	1–2	Blank	—
	3–4	Ward number	2N
	5–7	Precinct number	3N
	8–9	Machine number	2N
	10	Section number	1N
	11	Check Character	1N
	12–14	Candidate votes	3N
	15–17	Candidate votes	3N
	etc.	Candidate votes	3N
	78–80	Candidate votes	3N

OFFICIAL HEADERS—COMPLETE RECORD FORMAT

Card No. 1 (odd-numbered)

Column	Card column	Data	Characters	Print position
1	1	Control information	1 N	
2–3		Blank		
4	4	"H" for first card of head-title / "C" for first card of code-header	1 A	
5	5	Carriage control	1 A–N	
6–15	6–15	Left-most column heading	10 A–N	210

UNOFFICIAL HEADERS—COMPLETE RECORD FORMAT

Column titles * unofficial headers

Column	Card Column	Data	Characters	Print position
1–5	1–5	Code 1 (endorsed candidate combined code)	5 N	
6–8	6–8	Blank	3	
9	9	do	1	
10	10	Carriage control	1 A–N	
11–12	11–12	Blank	2	203
13–32	13–32	Office	20 A	223
33–37	33–37	Blank	5	228
38–42	38–42	Code 2 (candidate code)	5 N	233
43–45	43–45	Blank	3	236
46–65	46–65	Candidate name	20 A	256
66–72	66–72	Blank	7	263

16–17	16–17	Blank	2	212
18–27	18–27	First column heading	10 A–N	222
28–29	28–29	Blank	2	224
30–39	30–29	Second column heading	10 A–N	234
40–41	40–41	Blank	2	236
42–51	42–51	Third column heading	10 A–N	246
52–53	52–53	Blank	2	248
54–63	54–63	Fourth column heading	10 A–N	258
64–65	64–65	Blank	2	260

CARD No. 2 (even-numbered)

66–75	1–10	Fifth column heading	10 A–N	270
76–77	11–12	Blank	2	272
78–87	13–22	Sixth column heading	10 A–N	282
88–89	23–24	Boank	2	284
90–99	25–34	Seventh column heading	10 A–N	294
100–101	35–36	Blank	2	296
102–111	37–46	Eighth column heading	10 A–N	306
112–113	47–48	Blank	2	308
114–123	49–58	Ninth column heading	10 A–N	318
124–125	59–60	Blank	2	320
126–135	61–70	Tenth column heading	10 A–N	330
136–137	71–72	Blank	2	332

AVM Input Editor Program — Output tapes 1 and 2 Program Designation

Column	Description	
1–8	Return ID -Ward-Prec.-Mach. No. Section No.	CTLL/CTLH
9	Check Character	
10–12	Candidate Votes	
13–15	Candidate Votes	
etc.		
to 994	Candidate Votes	

Process Data Program — Output Tape 2 Program Designation

Column	Description	
1–7	Ward-Prec.-Machine No.	WOR
1–3	Votes for Candidate 000	WORK
4–6	Votes for Candidate 001	
7–9	Votes for Candidate 002	
etc.		
to 3000	Votes for Candidate 999	

Summarized Data Program — Output Tape 2 Program Designation

Column	Description	
1–5	Total votes for Candidate 000	VOTES/PREC
6–11	Total Votes for Candidate 001	
12–17	Total Votes for	
etc.	Candidate 002	
	Total Votes for Candidate 249	
to 1500		

*reuse locations for candidates 250–499, 500-749, 750–999.

Setup Unofficial Headers Program — Output Tape 1 Program Designation

Column	Description	
1–141	Combined card 1 and 2 image	AREA

Setup Official Headers Program — Output Tape 1 Program Designation

Column	Description	
1–137	Combined card 1 and 2 image	AREA

Unofficial Edit Program — Output Tape 4 Program designation

Column	Description	
1–5	Endorsed Candidate Code	IMAGE
6–9	Header Flag	
10	Carriage Control	
13–32	Office	
38–42	Candidate Code	
46–65	Candidate Name	
73–78	Machines Previously Reported	
82–87	Votes Previously Reported	
95–100	Machines in this Report	
104–109	Votes this Report	
117–122	Machines (Total)	
126–131	Votes (Total)	

Endorsed Candidate Accumulation Program — Output Tape 4

*Same configuration as "Process Data" Tape

Edit Official Returns Program — Output Tape 4 Program Designation

Column	Description	
1–4	Control	IMAGE
5	Carriage Control	
6–17	Header Data	
18–29	Header Data	
30–41	Header Data	
etc.		
to 137		
1–4	Control ("T" in Col. 4)	TOTALS
5	Carriage Control	
6–17	"Totals" in cols. 6–10	
18–29	Total Votes per Candidate	
30–41	Total Votes per Candidate	
etc.		
to 137	Total Votes per Candidate	
1–7	Ward-Precinct-Machine No.	WORK
8–10	Total Machine Votes Candidate 000	
11–13	Total Machine Votes Candidate 001	
14–16	Total Machine Votes	
etc.	Candidate 002	
to 3000	Total Machine Votes Candidate 999	
1–4	Blank	
5	Blank	
6–7	Blank	
8–17	Ward-Precinct/Ward No.	
18–29	Precinct/Ward Total Votes per Cand.	
30–41	Precinct/Ward Total Votes per Cand.	
etc.		
to 137	Precinct/Ward Total Votes per Cand.	

OPERATING INSTRUCTIONS.—OPERATING TIME ESTIMATES

Program title	Pass No.	Estimated time
Setup unofficial headers, see Figure 36	00.1	600 cds/minute.
Setup official headers, see Figure 37	00.2	Do.
List cards, see Figure 38	00.5	500 cds/minute.
Input editor, see Figure 39	01.0	400 cds/minute.
Error list, see Figure 40	01.5	1 min./err. record.

Process, see Figure 41	02.0	1 min./225 good input cds.
Summarize, see Figure 42	03.0	1 min./75 good input cds.
Edit unofficial returns, see Figure 43	04.0	1 min./300 good input cds.
Print unofficial returns, see Figure 44	05.0	1 min./200 good input cds.
Endorsed candidate accumulation, see Figure 45	05.5	4 min./25 endorsed candidates.
Edit official returns, see Figure 46	06.0	1 min./150 good input cds.
Print official returns, see Figure 47	07.0	1 min./200 good input cds.

The invention may be embodied in other specific forms without departing from the spirit of essential characteristics thereof. The present embodiments are therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What is claimed and desired to be secured by Letters Patent is:

1. A method of processing voting data from a plurality of ballot formats in elections of the type wherein less than all the vote choices in the election appear on any one ballot format comprising the steps of:

a. assigning to the vote choices on different ones of said ballot formats an identifying indicia to be common to all vote choices of like significance in the election and capable of being distinguished from the identifying indicia of all vote choices of different significance;

b. placing appropriate ones of the vote choices on various different ballot formats presented to the voters at the precint voting locations;

c. prior to an election, preparing a first machine acceptable record containing the identifying indicia correlated with the physical location of the vote choice for each of said different ballot formats;

d. after an election, preparing a second machine acceptable record containing the vote cast for the vote choice correlated with the physical location of the vote choice on each of said different ballot formats;

e. combining said first and second records in a first data processing machine at a central processing station for each of said ballot formats to associate said identifying indicia and the corresponding vote on a further record acceptable for machine data processing; and

f. utilizing said further record in a second data processing machine in a processing step to produce totals for each distinct vote choice.

2. The method as defined in claim 1 comprising the further step of printing total votes processed to date during the processing operation wherein the vote cast for each choice is correlated with the identifying indicia for each choice to produce an unofficial return sheet.

3. The method as defined in claim 1 comprising the further step of printing the total vote cast after said further record has been completed to produce an official return showing the total vote for each choice together with the identifying indicia for each choice.

4. The method as defined in claim 1 wherein the first and second records for a plurality of voting locations are combined at a central station.

5. The method as defined in claim 4 wherein said second record is prepared from a voting machine printed return sheet.

6. The method as defined in claim 4 wherein said second record is prepared by data processing equipment counting individual ballots to produce a precinct summary.

7. The method as defined in claim 1 wherein the further record produced from the combining of the first and second records contains said identifying indicia and vote cast for each ballot format in a form free of error that results from checking to detect both omission of vote totals from any precinct and duplicate entry of vote totals from any precinct.

8. The method as defined in claim 7 wherein said further record contains all the information from one precinct in a unitary block of high-density information free of noninformation containing areas for carrying vote total information concerning vote choices absent from the ballot format from that precinct, the information for various precincts is entered in a random sequence, and thereafter said further record is processed in said second data processing machine to produce a summary printed return sheet.

9. The method as defined in claim 1 wherein said first record is a "code" card prepared prior to the election, said second record is a "count" card prepared after the election, and said further record is a magnetic tape having the identifying indicia and the associated vote in error-free form from a ballot format located geographically together in a unitary block of high-density information free of areas for carrying vote total information concerning vote choices absent from that ballot format.

10. The method as defined in claim 9 further comprising entering said unitary blocks of high-density information on said further record only after checking to determine all needed information for the ballot format involved is present.

11. The method as defined in claim 1 further comprising the steps of producing at the precinct a physical record containing the votes cast at that precinct; transporting said physical record to a central data processing center; and utilizing said physical record to produce a machine acceptable record which constitutes said second record as specified in step (d) of claim 1 randomly in substantially the order said physical records are received at the central processing center.

12. The method as defined in claim 11 wherein the first record as specified in step (c) of claim 1 comprises a deck of "code" cards for each precinct physical record with each card bearing precinct identification data; the second record as specified in step (d) of claim 1 constitutes a deck of "count" cards with each card bearing precinct identification data: and the further record specified in step (e) of claim 1 contains that vote total from each "count" card of a precinct and the identifying indicia from the corresponding "code" card of said precinct in a unitary block of high-density information free of areas for carrying vote total information concerning vote choices absent from the ballot format of that precinct; and the method further comprises entering the blocks of information on said further record only after checking to determine all information for the precinct is present.

* * * * *

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,648,022 Dated March 7, 1972

Inventor(s) Arnold G. Cook

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

On Title Page the Assignee should be "AVM Corporation, Jamestown, N.Y.".

Column 5, line 37, change "along" to --alone--.

Column 5, line 71, change "selection" to --election--.

Column 7, line 48, omit "the" (first occurence).

Column 8, line 8, insert --is shown-- between "Fig. 5" and "to".

, line 21, change "lie" to --like--.

Column 9, line 11, change "at" to --and--.

, line 65, change "checke;" to --checked--.

Column 13, in chart, second column, delete "sheet or precinct" (second occurence).

, in chart, fourth column, "Cards" should be --card--.

, line 65, insert --the-- before "present".

Column 14, line 17, insert --of--after "rejection".

, line 20, change "convention" to --conventional--.

, line 49, insert comma (,) between "operator" and "by".

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* U.S. GOVERNMENT PRINTING OFFICE : 1969 O—366-334

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,648,022 Dated March 7, 1972

Inventor(s) Arnold G. Cook

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 14, line 50, insert --, to determine-- after "cards".

Column 17, line 27, delete comma (,) after "vote".

, line 65, change "(Sheer" to --(Sheet--.

Column 19, line 46, change "not" to --no--.

Column 20, line 50, change ".At" to --at--.

, line 50, change "starting" to --stating--.

, line 73, (in diagram), delete "td";"8-10" should be under "Column".

Column 21, line 28, change "of" (first occurence) to --if--.

Column 24, line 34, delete "Code Code".

, line 71, after "processed" insert --data--.

Column 26, line 18, change "188" to --118--.

Column 27, line 14, change "Boank" to --Blank--.

Column 30, claim 12, line 6, change ":" (colon) to --;-- (semicolon).

Signed and sealed this 9th day of January 1973.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents

FORM PO-1050 (10-69)

USCOMM-DC 60376-P69
* U.S. GOVERNMENT PRINTING OFFICE : 1969 O—366-334