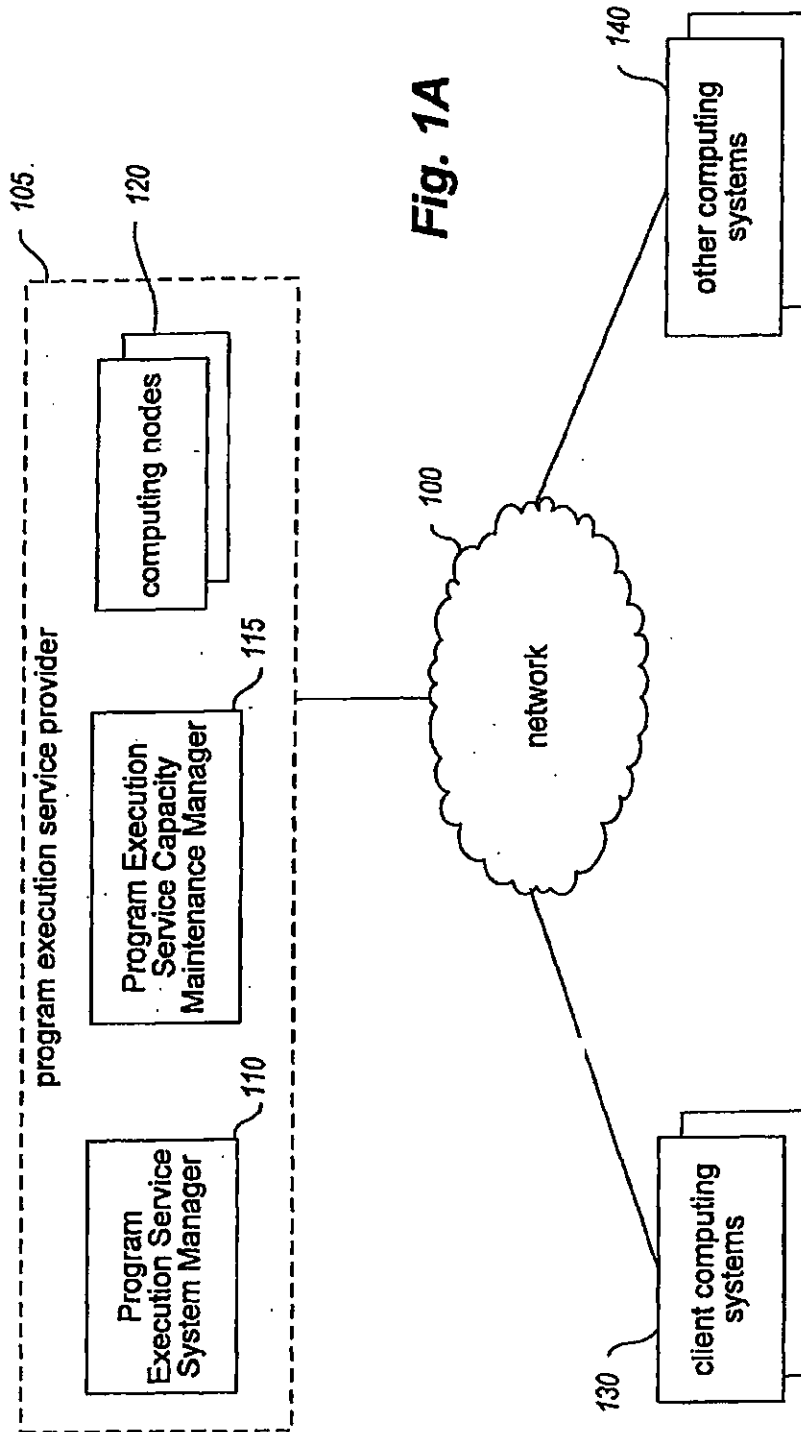
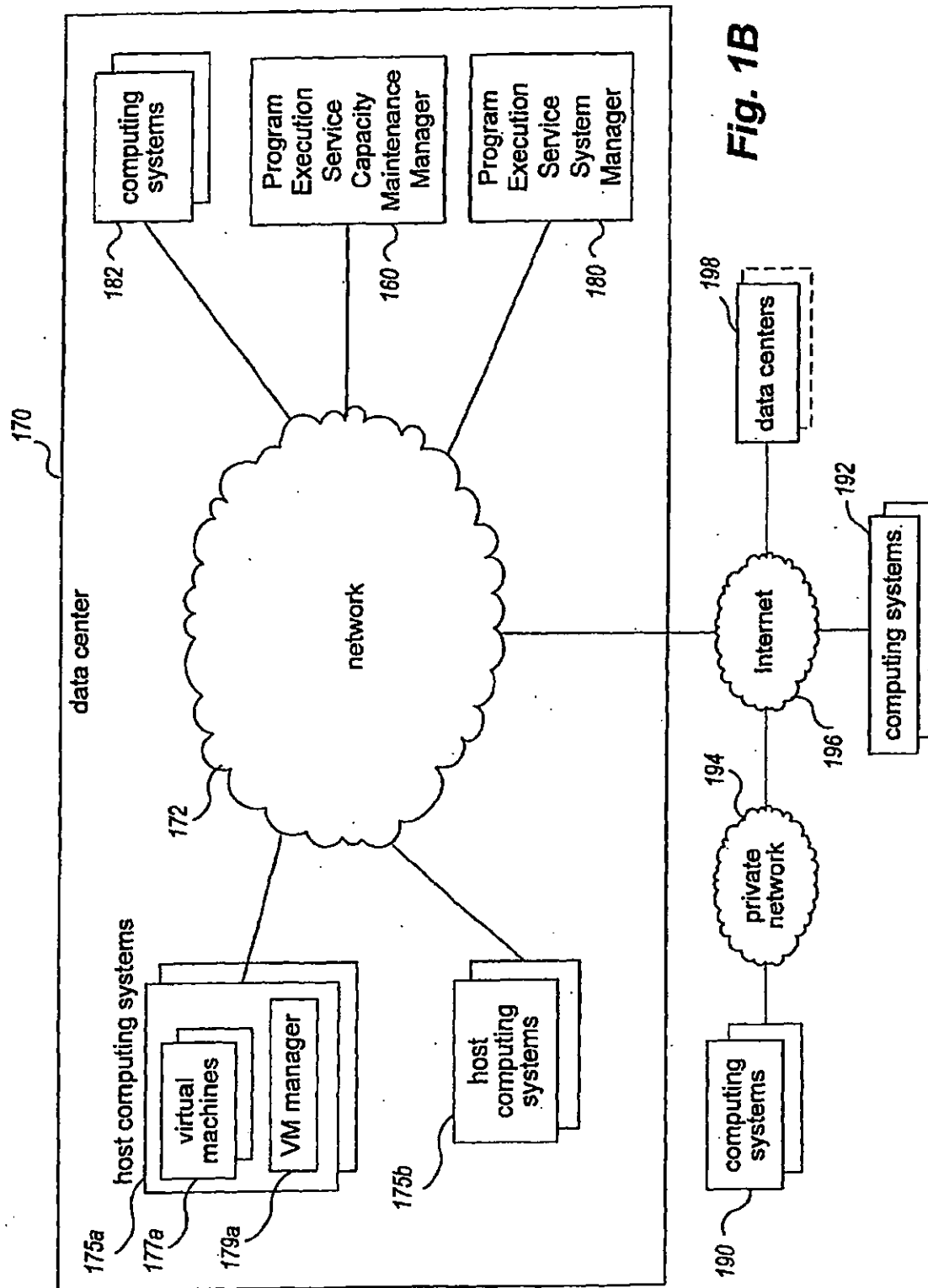








EXAMPLE TRIGGERS

Trigger TR-1 – if aggregate CPU utilization $\geq 80\%$, then increase desired computing node quantity by 4
 Trigger TR-2 – if aggregate CPU utilization $\geq 90\%$, then increase desired computing node quantity by 6
 Trigger TR-3 – if aggregate CPU utilization $< 20\%$, then decrease desired computing node quantity by 2

Trigger TR-N – if aggregate bandwidth utilization $\geq 75\%$, then increase desired computing node quantity by 2

Example Computing Node Group Changes Database

Change ID	280a	280b	280c	280d	280e	280f	280g	280h	280i
Change ID	Group ID	Change Type	Change Result	Change Details	Start Time	End Time	Time Period	Change-Event Nexus ID	
283a	C01	Group1	computing node quantity	add nodes	T01	T02	H1	N1	
283b	C02	Group1	computing node quantity	add nodes	T01	T03	H1	N1	
283c	C10a	Group1	computing node quantity	add node	T01	-	H1	N1	
283d	C10b	Group1	computing node quantity	terminate uninitialized node	T04	T04	H1	N2	
283e	C03	Group1	computing node quantity	add node	T04	T05	H1	N3	
283f	C04	Group1	computing node quantity	terminate unavailable node	T07	T07	H1	N4	
283g	C05	Group1	computing node quantity	add node	T07	T09	H1	N5	
283h	C06	Group1	computing node quantity	terminate unavailable node	T20	T20	H2	N6	
283i	C07	Group1	computing node quantity	add nodes	T21	T22	H3	N7	
283j	C08	Group1	computing node quantity	terminate unavailable node	T28	T28	H3	N8	
283k	C09	Group1	computing node quantity	remove node	T31	T32	H4	N9	
283l	:								

Fig. 2B

Example Computing Node Group Events Database

Event ID	290a	290b	290c	290d	290e	290f	290g	290h	290i
Event ID	Group ID	Event Type	Event Source	Time	Time Period	Change-Event Nexus ID			
293a	E01	Group1	group initialization	user instruction	T01	H1	N1		
293b	E02a	Group1	failed node initialization detected	system initiated	T04	H1	N2		
293c	E02b	Group1	uninitialized node terminated	system initiated	T04	H1	N3		
293d	E03a	Group1	unavailable node detected	system initiated	T07	H1	N4		
293e	E03b	Group1	unavailable node terminated	system initiated	T07	H1	N5		
293f	E05	Group1	increase desired quantity by 4	trigger TR-1	T16	H2	N7		
293g	E06	Group1	increase desired quantity by 2	trigger TR-N	T18	H2	N7		
293h	E04	Group1	increase desired quantity by 3	user instruction	T19	H2	N7		
293i	E09a	Group1	unavailable node detected	system initiated	T20	H2	N6		
293j	E09b	Group1	unavailable node terminated	system initiated	T20	H2	N7		
293k	E08	Group1	decrease desired quantity by 2	trigger TR-3	T27	H3	N9		
293l	E10a	Group1	unavailable node detected	system initiated	T28	H3	N8		
293m	E10b	Group1	unavailable node terminated	system initiated	T28	H3	N9		
293n	:								

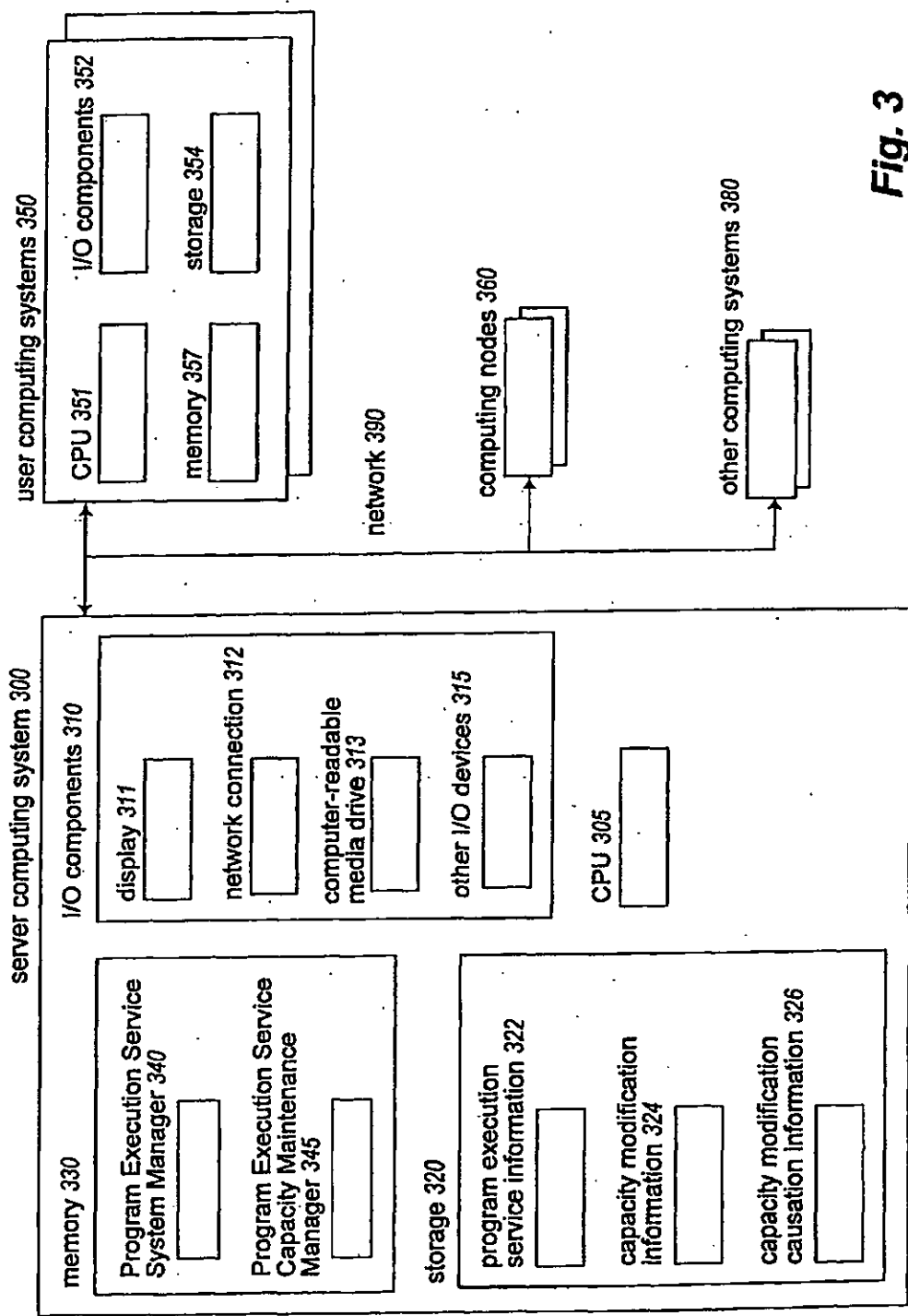


Fig. 3

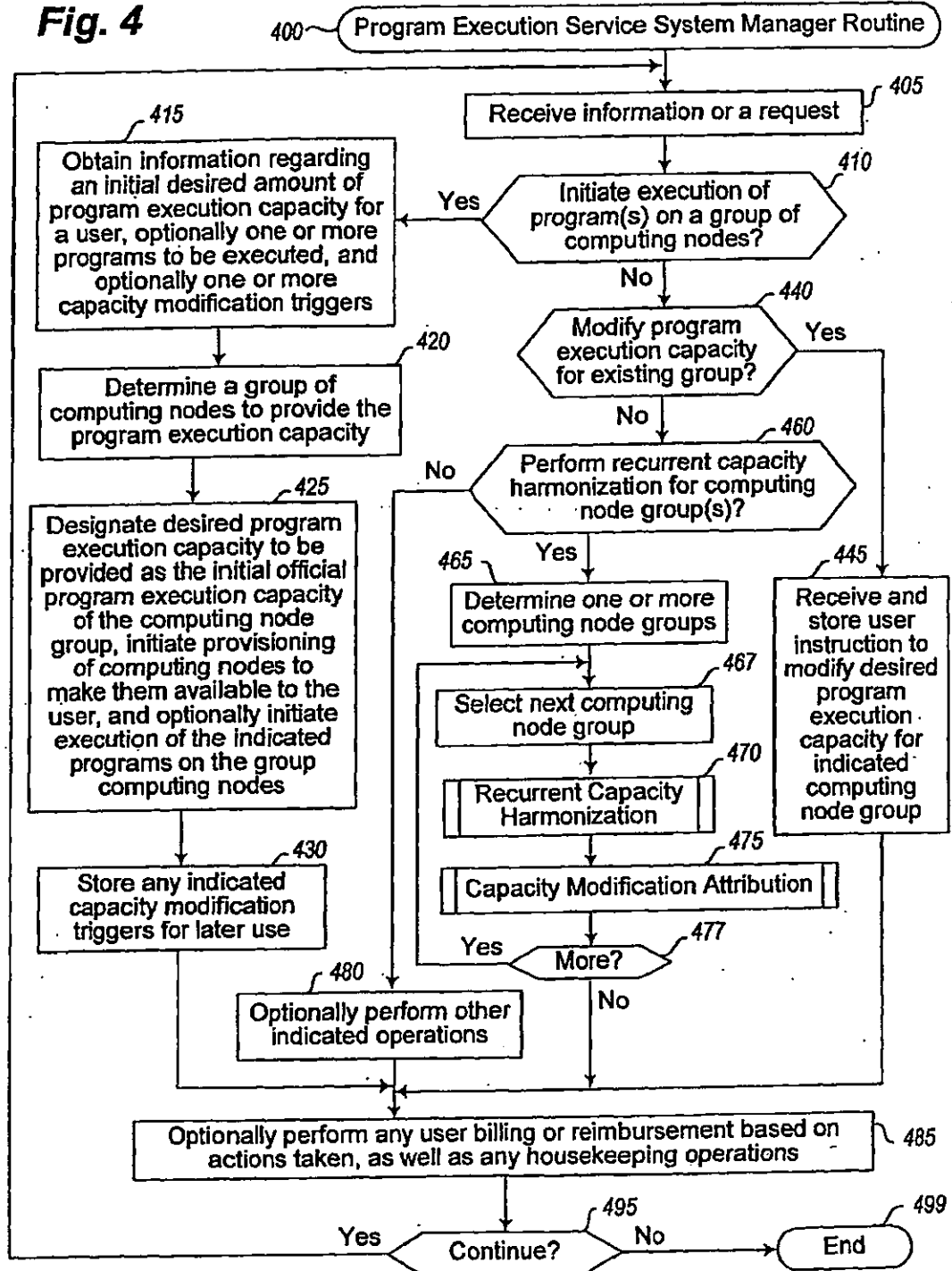
Fig. 4

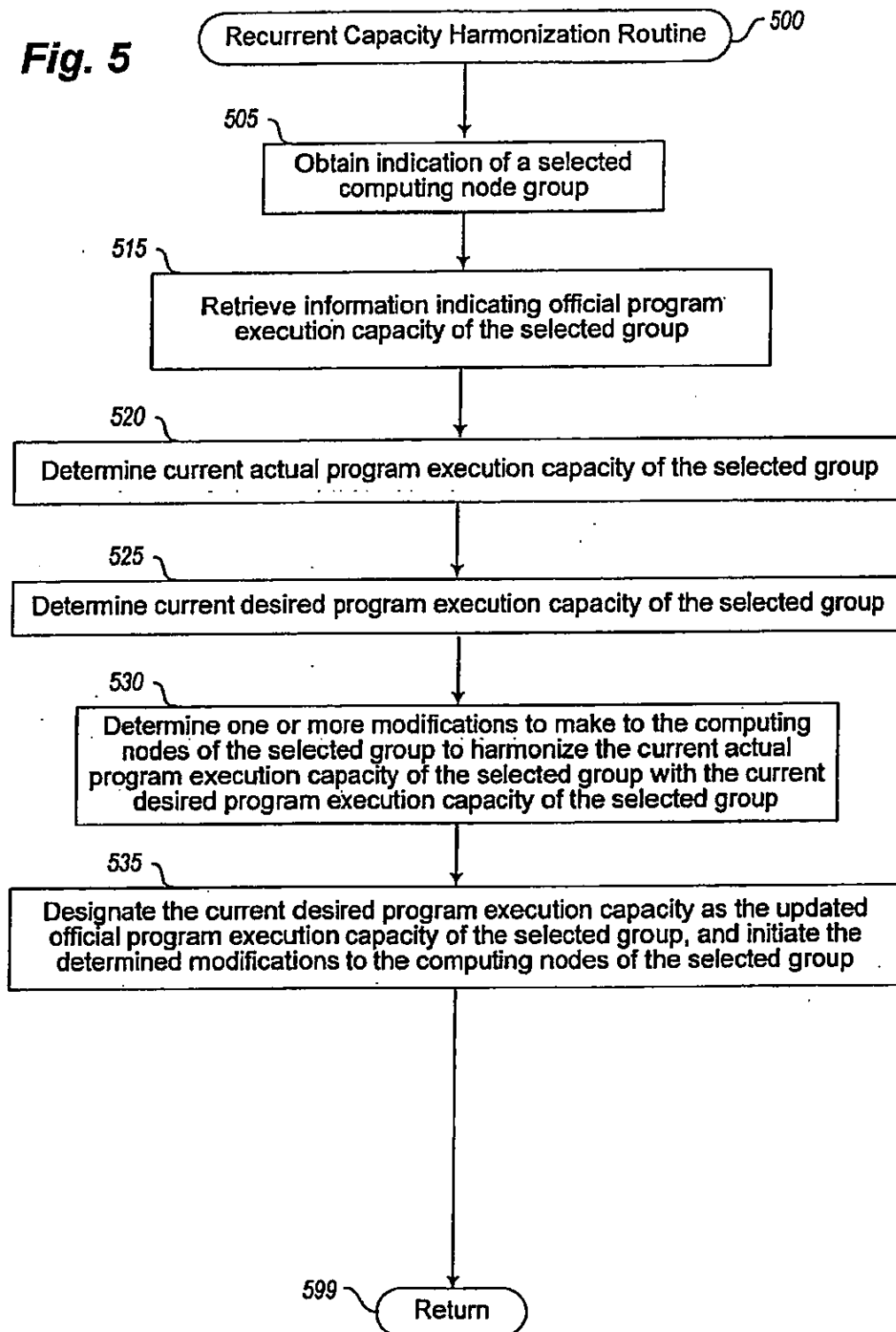
Fig. 5

Fig. 6

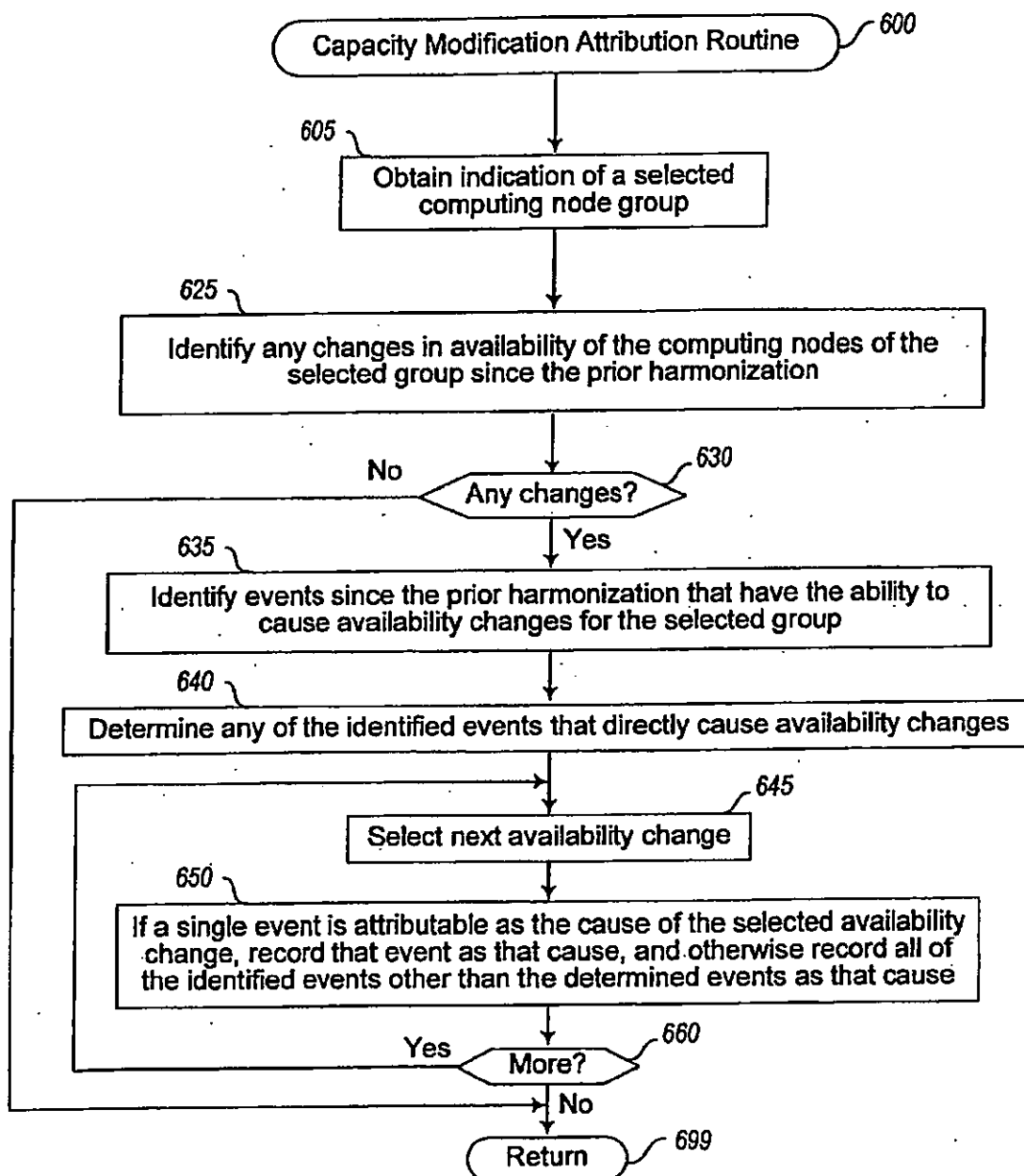


Fig. 7

