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GB 2169473 A GB 2129255 A US 5117372 A
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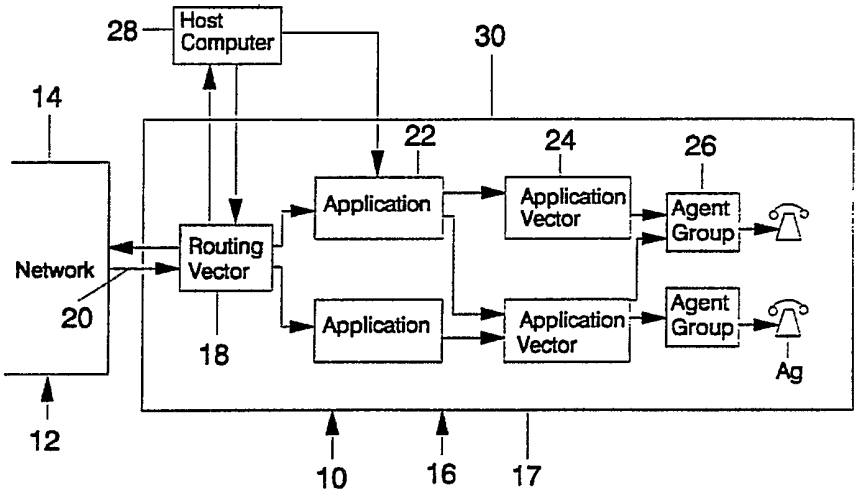
(54) Telephone switching system which is programmable at the user location

(57) A control device 10 for the network 14 of a telephone switching system 12, (such as an A.C.D. system), has a device 18 for routing calls received from the network 14, the operation of the routing means 18 being definable by the user at the location of the control device 10.

The means for defining the operation of the routing device 18 and switching means is a host computer 28.

A second embodiment (shown in Figure 2) discloses a control device comprising a trunk group for selecting the routing of incoming calls from the network at a plurality of locations of the trunk group.

Fig. 1



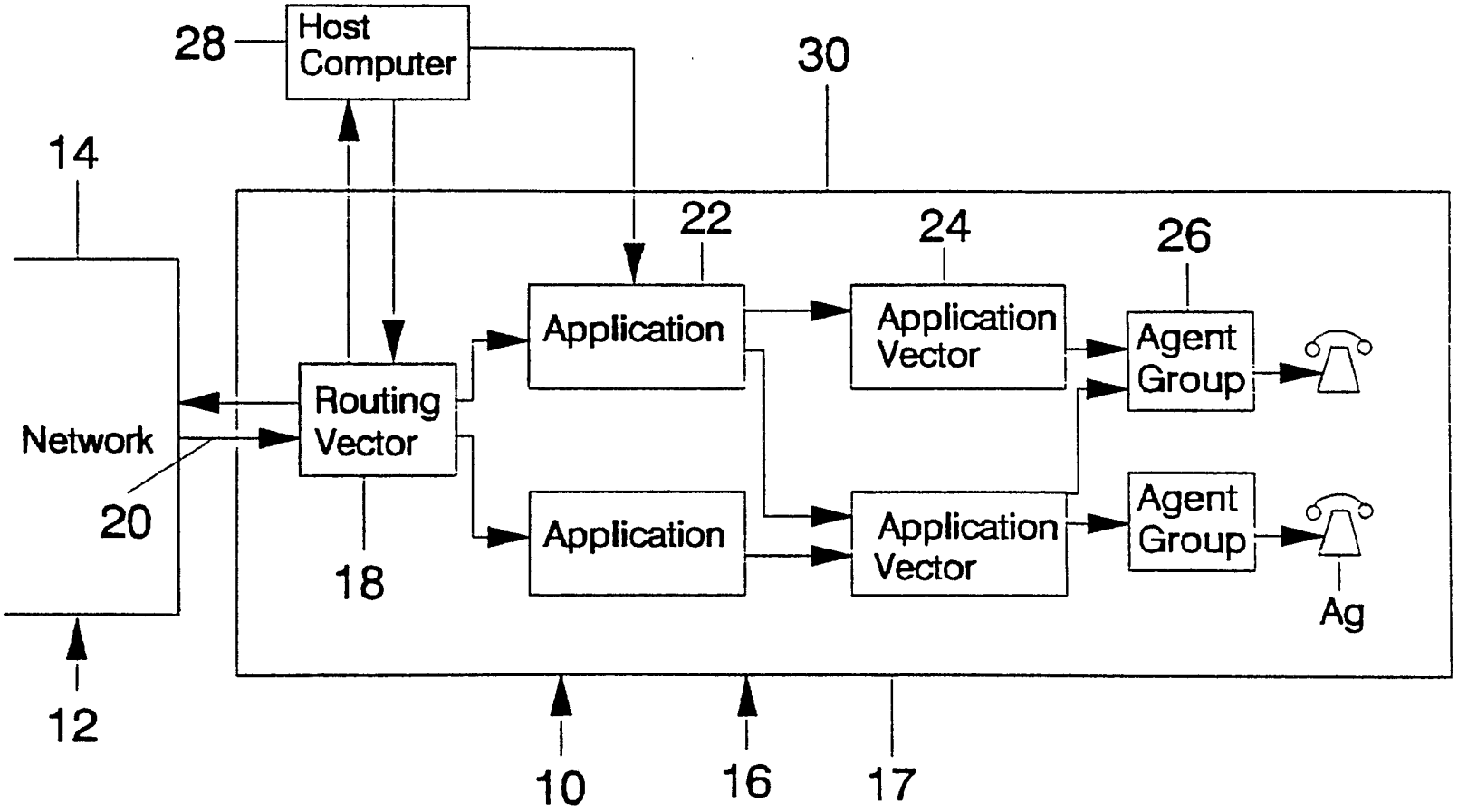
At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

This print takes account of replacement documents submitted after the date of filing to enable the application to comply with the formal requirements of the Patents Rules 1990.

This print incorporates corrections made under Section 117(1) of the Patents Act 1977.

GB 2 273 225 A

Fig. 1


28
Host Computer
30
14
22
24
26
Application
Application Vector
Agent Group
Routing Vector
Network
20
18
Application
Application Vector
Agent Group
Ag
12
10
16
17

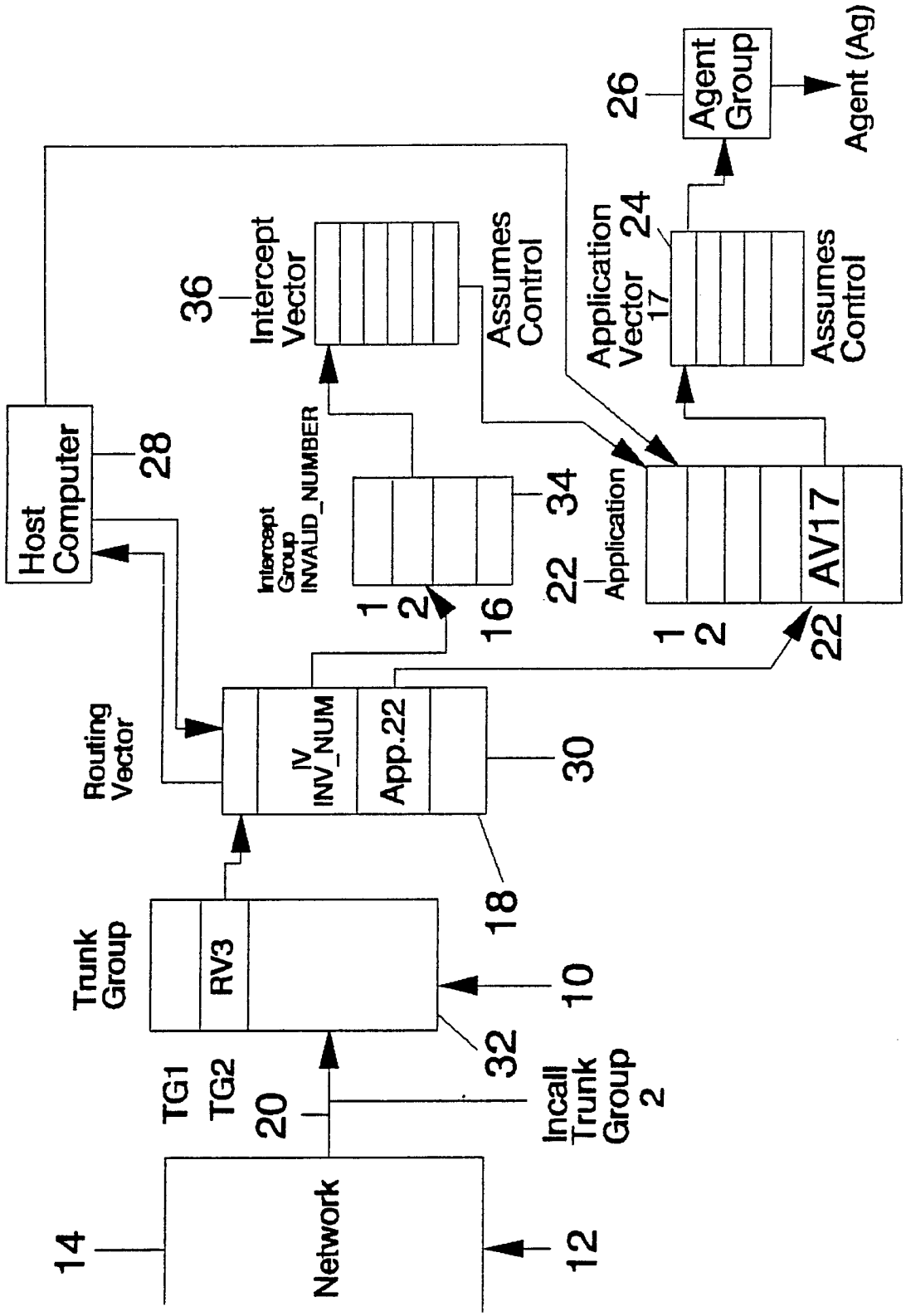

Network
14
12
TG1
TG2
20
Incall Trunk Group 2
32
Trunk Group
RV3
10
18
Routing Vector
IV INV_NUM
App.22
30
Host Computer
28
Intercept Group INVALID_NUMBER
1
2
16
34
36
Intercept Vector
Assumes Control
Application
22
1
2
22
AV17
Application Vector 17
24
Assumes Control
26
Agent Group
Agent (Ag)

Fig. 2

BACKGROUND OF THE INVENTION

The present invention relates to control devices for a telephone switching system.

In the past, telephone switching systems have been known which have a switch, such as an Automatic Call Distributor (ACD), for routing incoming telephone calls from a network of the system to agents for handling the calls. However, the operation of such switches has been conventionally established by the manufacturer of the system, and does not provide sufficient flexibility to permit the user to fully control the routing of the incoming telephone calls at the location of the user, such as a call center.

SUMMARY OF THE INVENTION

A principal feature of the present invention is the provision of a control device for the network of a telephone switching system.

The control device of the present invention comprises, means for routing calls received from the network, and means responsive to the routing means for switching calls received from the routing means in the telephone system.

A feature of the invention is that the operation of the routing means is definable by the user at the location of the control device.

Another feature of the invention is that the operation of the switching means is also definable by the user at the location of the control device.

Another feature of the present invention is that the control device comprises a suitable computer, and the user may program both the routing means and switching means in a simplified manner to control the routing of incoming telephone calls as desired by the user at the location of the control device.

Yet another feature of the invention is that the device may include a host computer which is under control of the user at the location of the control device.

Still another feature of the invention is that incoming calls from the network are under control by the user at the location of the control device.

Another feature of the invention is that the routing means has a plurality of locations for selecting the routing of the calls.

Yet another feature of the invention is that the routing means may direct incoming calls to an intercept group for disposition of the calls.

A further feature of the invention is that the intercept group has a plurality of locations which may be utilized to define different routing of the calls.

Another feature of the invention is that the intercept group directs calls to a plurality of different intercept vectors for disposition of the calls in the event of a fault condition.

A feature of the invention is that the control device has an application having a plurality of separate

locations, and that the routing means directs incoming calls to the location of the application.

Another feature of the invention is that the application directs the incoming calls to a plurality of application vectors for disposition of the calls.

Yet another feature of the invention is that the application vectors may direct the incoming calls to one or more agent groups for handling by one or more agents associated with the agent groups.

A further feature of the invention is that the intercept vectors may direct incoming calls to one or more of the locations of the application for disposition of the calls.

A feature of the invention is that the routing means may request information relating to an incoming call from the network.

Still another feature of the invention is that the routing means may inform the host computer that an incoming call has been received.

A feature of the invention is that the routing means may request the host computer for information.

Another feature of the invention is that the host computer may request the routing means for information from the network related to the incoming call.

A further feature of the invention is that the routing means may request the host computer to handle the routing of an incoming call.

Still another feature of the invention is that the host computer may route the incoming calls to one or more locations of the application.

A feature of the invention is that the user may define the working relationship between the routing means, switching means, and the host computer.

Yet another feature of the invention is that control of the device may be defined by the user by a high level programming language for the respective computers.

A further feature of the invention is that the routing of the calls is predicated upon information associated with the incoming call and the designation of the telephone number which has been called.

Thus, a feature of the invention is that the user may

custom define the control device in a simplified manner for a particular type of use.

Further features will become more fully apparent in the following description of the embodiments of the invention, and from the appended claims.

DESCRIPTION OF THE DRAWINGS

In the drawings:

Fig. 1 is a block diagram of a control device for the network of a telephone switching system; and

Fig. 2 is another block diagram of the control device of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to Fig. 1, there is shown a control device generally designated 10 for a telephone switching system generally designated 12. The telephone system 12 has a network 14 which is connected to a switching system 16, such as an Automatic Call Distributor (ACD) 17, included in the control device 10.

The control device 10 has a routing vector or script 18 to receive incoming calls from a trunk 20 connected to the network 14 of the telephone system. The routing vector 18 may route calls to an application 22 which in turn directs the calls to an application vector 24. For purposes of this application, a vector is considered to be one or more statements or instructions in the program for a computer or similar device. The application vector 24 routes the calls from the application 22 to one or more agent groups 26 for handling by one or more agents Ag associated with the agent groups 26.

As shown, the routing vector 18 is also connected to a host computer 28 which may process calls coming into the ACD. The host computer 28 may direct the incoming calls to the application 22, as will be seen below.

The ACD of the control device 10 may comprise a

suitable computer 30 or Central Processing Unit (CPU) having a random access memory (RAM) and Read Only Memory (ROM) for processing information related to the incoming telephone calls, and route the incoming telephone calls. As will be seen below, the routing vector 18, as well as the application 22 and application vector 24, may be controlled by the user at the location of the control device 10, by programming the computer 30 with high level statements in a high level language for the computer 30 to make control of the control device 10 relatively simple to define.

With reference to Fig. 2, an incoming call from the network 14 is presented to the control device 10 on a trunk group 2 of a trunk group 32 having a plurality of separate locations for processing the calls as defined by the user through suitable programming of the device 10. As shown, the trunk group 2 is programmed to direct the calls to Routing Vector 3 of the routing vector 18 having a plurality of possible locations. In this case, the call is presented to routing vector 3, as defined in the trunk group 32.

The routing vector 3 then executes a series of defined steps which is accomplished by previous programming of the computer 30. Such steps may include a jump to an intercept group 34 in the case of a fault

condition, with the intercept group 34 having a plurality of separate locations as defined by programming the computer 30. The intercept group 34 directs calls to an associated intercept vector 36 having a plurality of separate locations, with the intercept vector 36 being based upon the group and intercept class of the call. The intercept vector 36 then assumes control of the call. In the specific example shown, the routing vector 3 jumps to intercept group INVALID NUMBER. The INVALID NUMBER group and the calls assigned intercept class translate to intercept vector 1.

In another case, the routing vector 18 may direct the calls to the application 22 having a plurality of separate locations which are defined by the user through previous programming of the computer 30. As shown, the routing vector 18 transfers the calls to application 22 which in turn routes the call to an application vector 24 having a plurality of locations, after which the application vector 24 assumes control of the calls. In turn, the application vector 24 may direct the call to one or more of the agent groups 26 for handling of the call by one or more agents Ag associated with the agent groups 26. If desired, one or more locations of the intercept vector 36 may transfer the calls to one or more locations of the application 22 which ultimately directs the call to the application vector 24 and the agent groups 26.

In a preferred form, each trunk 20 is assigned to an intercept class, and may point to the same or different routing vectors 18. The intercept vector 36 utilized in the case of a failure may usually constitute an announcement or recorded tone, as defined by the user. Also, the application vector 24 may include an announcement, and ultimately directs the calls to the agent group 26.

As shown in Figs. 1 and 2, the routing vector 18 is connected to the host computer 28, and informs the host computer 28 of an incoming call. The routing vector 18 may request information concerning the call from the host computer 28, and the host computer 28 may request information concerning the call from the routing vector 18 which is obtained by the routing vector 18 from the network 14, which information is supplied by the routing vector 18 to the host computer 28. Also, the application vector 18 may request the host computer 28 to route a given call depending upon the nature of the call, as defined by the user, and the host computer 28 may direct the calls to the application 22 for ultimate disposition at the agent group 26.

The routing of calls is defined by information supplied by the network 14 which may be a Trunk Group

which is the number of the inbound trunk group on which the call was presented, an Internal Directory Number (DID) to which the call should be presented, a Dialed Number Identification Service (DNIS) which identifies the called number, or an Automatic Number Identification (ANI) which comprises an area code, an area code + exchange code, or an area code + exchange code + station address. Thus, the control device 10 routes the calls using this information associated with an incoming call for routing by the ACD or host computer 28.

In accordance with the present invention, the ACD provides an interaction with the network 14 of the telephone system 12 for improved handling of the incoming calls. When a valid call has been received by the routing vector 18, the routing vector 18 retrieves information concerning the call from the network 14 which is collected by the trunk 20. The routing vector 18 is responsible for any error handling during collection of digits from the network 14. Each trunk group 32 has a routing vector 18 and route class assigned to it.

The routing vector 18, the intercept group 34, the intercept vector 36, the application 22, and the application vector 22 essentially serve as different switches to direct calls in the ACD. Thus, in accordance with the present invention, the user may define the

interaction of these switches alone, or in combination with the host computer 28 in a simplified manner through use of the high level statements in programming the computer 30, as will be seen in the Examples below.

EXAMPLE I

The following is a simple example of a call being routed, as programmed by the following statements for the computer 30, of a call being routed based upon the ANI collected from the network 14. No check is being made here on whether the network information is collected successfully. In this case, if the network information retrieval fails or the ANI translation fails, the ROUTE TRANSLATION will make use of the default routing information established at the point the vector was accessed, i.e., the trunk group's routing information.

(1) RETRIEVE NETWORK
(2) INFORM HOST ON ARRIVAL
(3) TRANSLATE ANI
(4) ROUTE TRANSLATION

EXAMPLE II

The following is an example of a route on DNIS with the "ANI Required Indicator" being checked. The default routing information was established prior to the activation of the routing vector 18 and is that of the trunk group 32.

Upon entry, the trunk 20 is requested to RETRIEVE the network information. If a failure occurs while retrieving the network information, control is passed to the intercept vector 36 associated with the intercept group Invalid Procedure and the call's intercept class.

On a successful network data collection, the vector INFORMs the host computer 28 of the call's arrival and TRANSLATES the DNIS to its routing information. If the translation fails, the vector script ROUTEs the call based upon the initial translation of the trunk group information.

On a successful DNIS translation, the vector script checks if ANI is required for the DNIS number. If it is required, the script REQUESTs the ANI from the network 14. If the ANI request fails, the call is sent to the intercept vector 36 specified by the call intercept class and the intercept group 34 Invalid Number.

Upon either ANI not required or successful ANI retrieval, the call is routed based upon the DNIS route translation.

```
(1) RETRIEVE NETWORK INFORMATION
(2) IF RESULT EQ SUCCESS GO TO 4
(3) INTERCEPT INVALID_PROCEDURE
(4) INFORM HOST ON ARRIVAL
(5) TRANSLATE DNIS
(6) IF RESULT EQ SUCCESS GO TO 8
(7) ROUTE TRANSLATION
(8) IF ANI_IND EQ ANI_NOT_REQUIRED GOTO 12
(9) REQUEST NETWORK ANI_IND
(10) IF RESULT NE FAIL GOTO 12
(11) INTERCEPT INVALID_NUMBER
(12) ROUTE TRANSLATION
```

EXAMPLE III

In the following example, if the vector script 18 is unable to retrieve the network information and translate the ANI into routing information, the call is treated with intercept handling. If the call's ANI is collected and translated successfully, the vector script checks if the ANI is flagged as being a candidate for host (host computer 28) routing. If not, the script informs the host of the arrival and routes the call based upon the ANI translation.

If the ANI is flagged as preferring host routing, the host is provided with a call arrival indication and REQUEST for instruction. The vector waits 2 seconds for a host route.

If the host fails to respond or the message is unable to be transmitted to the host, the call is routed based upon the previous ANI translation.

If the host responds within the 2 seconds, the vector "translates" the host provided routing information and the subsequent ROUTE TRANSLATION makes use of the host provided routing information to route the call.

```
(1) RETRIEVE NETWORK INFORMATION
(2) IF RESULT EQ SUCCESS GOTO 4
(3) INTERCEPT INVALID_NUMBER
(4) TRANSLATE ANI
(5) IF RESULT EQ SUCCESS GOTO 7
(6) INTERCEPT INVALID_NUMBER
(7) IF HOST_ROUTE_PREFERRED EQ YES GOTO 10
(8) INFORM HOST ON ARRIVAL
(9) GO TO 11
(10) REQUEST HOST INSTRUCTION ON ARRIVAL 2 SECONDS
(11) ROUTE TRANSLATION
```

Thus, a program of simplified form may be programmed by the user through use of the statements by the user at the location of the control device 10.

The foregoing detailed description has been given for clearness of understanding only, and no unnecessary limitations should be understood therefrom, as modifications will be obvious to those skilled in the art.

What is claimed is:

1. A control device for the network of a telephone switching system, comprising:

means for routing calls received from the network being definable by the user at the location of use of the control device; and

means responsive to the routing means for switching calls received from the routing means in the telephone system.

2. The device of claim 1 wherein the routing means defines a plurality of separate locations to which the calls may be switched.

3. The device of claim 1 including a host computer, and means for selecting the path of routing either by the routing means and switching means or by the host computer.

4. The device of claim 1 wherein the routing means comprises a plurality of routing vectors.

5. The device of claim 1 including means for receiving calls from the network and directing the calls to separate locations of the routing means.

6. The device of claim 5 wherein the receiving and directing means comprises a trunk group for directing calls from the network to a plurality of locations in the routing means.

7. The device of claim 5 wherein the receiving and directing means has a plurality of independent locations for receiving and directing calls from the network to the routing means.

8. The device of claim 1 wherein the switching means includes at least a pair of switching devices to receive and process different classes of calls.

9. The device of claim 8 wherein one of the switching devices comprises an application having a plurality of independent locations to receive and direct calls received from the routing means.

10. The device of claim 9 including a plurality of application vector having a plurality of locations to receive and direct calls from the application.

11. The device of claim 10 including at least one agent group to handle incoming calls for at least one agent from the application vector.

12. The device of claim 8 wherein one of the switching devices comprises an intercept group having a plurality of separate locations to receive and direct calls from the routing means.

13. The device of claim 12 including a plurality of independent intercept vectors to receive and direct calls from the intercept group.

14. The device of claim 13 wherein the intercept vectors direct calls to a second switching device comprising an application having a plurality of separate locations to direct incoming calls.

15. The device of claim 1 wherein the routing means includes means for requesting and receiving information related to incoming calls from the network.

16. The device of claim 1 including a host computer, and in which the routing means includes means for notifying the host computer of an incoming call.

17. The device of claim 16 wherein the host computer requests the routing means to request information relating to the incoming calls from the network and supply the information to the host computer.

18. The device of claim 1 including a host computer, and in which the routing means requests the host computer to direct incoming calls.

19. The device of claim 18 wherein the host computer requests the routing means for information relating to the calls.

20. The device of claim 18 wherein the host computer directs the calls to a plurality of locations of the switching means.

21. The device of claim 1 wherein the switching means is definable by the user at the location of the control device.

22. The device of claim 1 including a host computer which provides the routing means with information for routing the incoming calls.

23. The device of claim 1 wherein the control device comprises a computer, and in which the routing means is programmable by the user to define the routing of incoming calls.

24. The device of claim 1 wherein the control device

comprises a computer, and in which the switching means is programmable by the user to define the switching of incoming calls.

25. The device of claim 1 wherein the routing of calls by the device is based upon a plurality of different sets of data associated with an incoming call.

26. A control device for the network of a telephone switching system, comprising:

a trunk group for selecting the routing of incoming calls from the network at a plurality of locations of the trunk group;

a routing vector for receiving calls at a plurality of locations from the trunk group, and routing the calls to a plurality of locations of an intercept group or a plurality of locations of an application;

means for directing calls from the intercept group to a plurality of locations of an intercept vector;

means for directing calls in the application to a plurality of locations in an application vector; and

means for directing calls from the application vector

to at least one agent group for handling by at least one agent associated with the agent group.

27. The device of claim 26 wherein the intercept vector assumes control of processing of the incoming call.

28. The device of claim 26 wherein the application vector assumes control of the processing of the incoming calls.

29. The device of claim 26 wherein the intercept vector has at least one location for directing incoming calls to the application.

30. The device of claim 26 including a host computer for handling incoming calls.

31. The device of claim 30 wherein the routing vector notifies the host computer of the incoming calls.

32. The device of claim 30 wherein the routing vector transfers control of switching of the incoming calls to the host computer.

33. The device of claim 32 wherein the host computer directs the incoming calls to the application.

34. The device of claim 30 wherein the routing vector supplies information from the network related to an incoming call to the host computer.

35. The device of claim 30 wherein the host computer supplies the routing vector with information related to an incoming call.

Patents Act 1977
Examiner's report to the Comptroller under Section 17 (The Search report)

Application number
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Relevant Technical Fields

(i) UK Cl (Ed.M) H4K (KFD, KFH)

(ii) Int Cl (Ed.5) H04M (3/42 3/46 3/50) H04Q 3/00 3/545)

Search Examiner
MR S J L REES

Date of completion of Search
31 JANUARY 1994

Databases (see below)
(i) UK Patent Office collections of GB, EP, WO and US patent specifications.

(ii) ONLINE DATABASES: WPI

Documents considered relevant following a search in respect of Claims :-
1-25

Categories of documents

X: Document indicating lack of novelty or of inventive step.

Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.

A: Document indicating technological background and/or state of the art.

P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

&: Member of the same patent family; corresponding document.

Category	Identity of document and relevant passages		Relevant to claim(s)
X	GB 2129255	(WESTERN) whole document especially lines 75-88 of page 1	1-6, 16-25
X	GB 2169473	(A T & T) whole document	1-6, 16-25
X	US 4951310	(HONDA) whole document especially lines 6-25 of column 4 and lines 60-62 of column 5	1-6, 10, 11 15-25
X	US 5117372	(A T & T) whole document especially lines 9-55 of column 3	1-6, 16-25

Databases: The UK Patent Office database comprises classified collections of GB, EP, WO and US patent specifications as outlined periodically in the Official Journal (Patents). The on-line databases considered for search are also listed periodically in the Official Journal (Patents).