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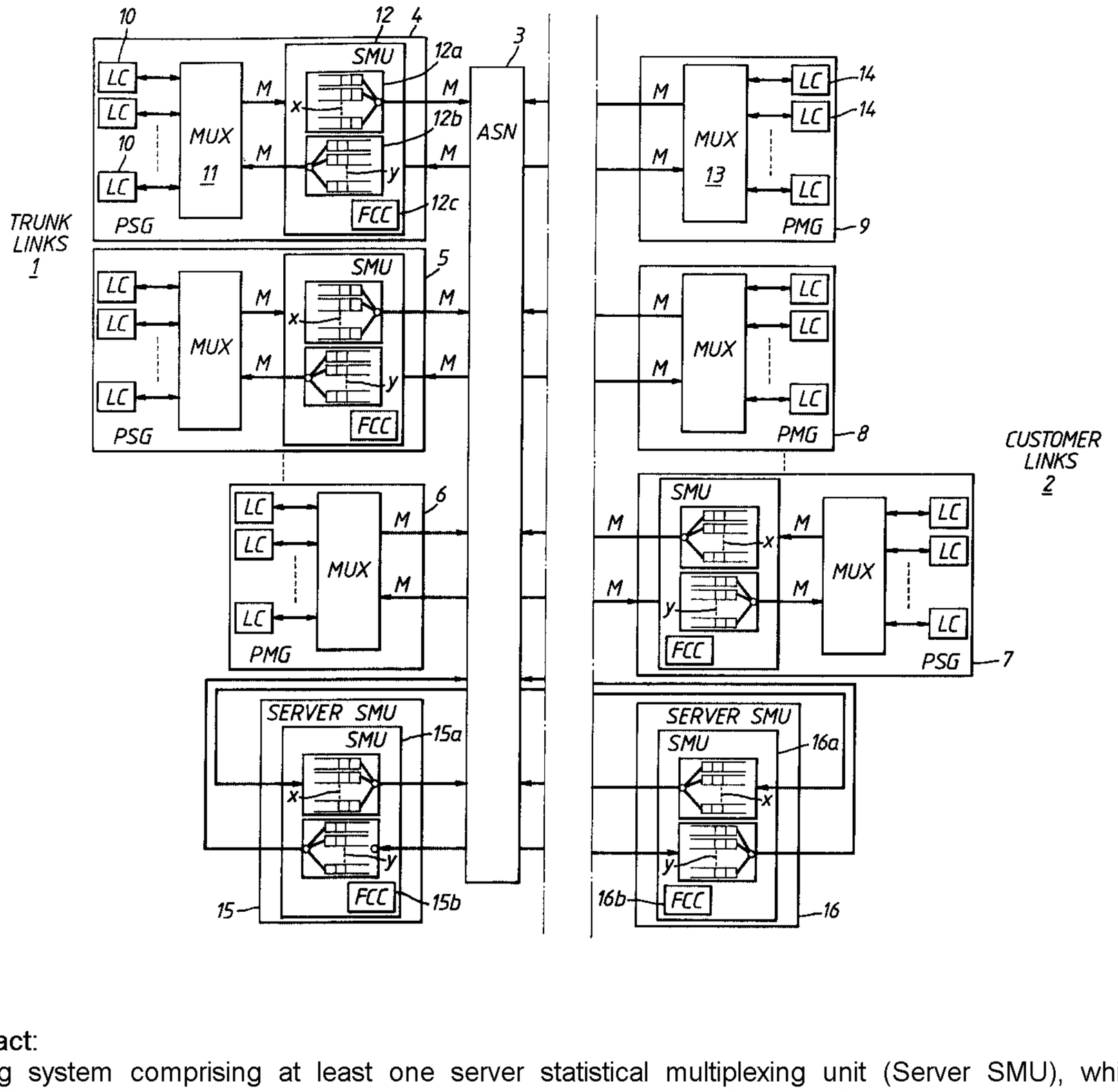

(57) Abrégé/Abstract:
An ATM switching system comprising at least one server statistical multiplexing unit (Server SMU), which facilitates the transmission of ATM cells between input and output ports which do have buffers and flow control, and input and output ports which do not have buffers and flow control.

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ABSTRACT

IMPROVEMENTS IN OR RELATING TO ATM SWITCHING SYSTEMS

An ATM switching system comprising at least one server statistical multiplexing unit (Server SMU), which facilitates the transmission of ATM cells between input and output ports which do have buffers and flow control, and input and output ports which do not have buffers and flow control.

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IMPROVEMENTS IN OR RELATING TO ATM SWITCHING SYSTEMS

This invention relates to asynchronous transfer mode (ATM) switching systems.

Considering firstly some technical background, ATM networks and switches are required to support a mixture of traffic including bursty traffic. By its nature bursty traffic requires a high bit rate for part of the time and little or no bit rate for the rest of the time. In order to efficiently use the bit rate available in the network, it is necessary to allocate to a connection a lower bit rate than its peak bit rate such that the total peak bit rate of all connections is greater than the bit rate of the network links.

ATM cells destined for a particular output port will enter a switch from many different input ports. The total instantaneous ATM cell flow rate of these may be greater than the output port rate of an ATM switching network (ASN) can sustain, thus a temporary overload of the output port may occur. The probability of this overload may be reduced to an operationally acceptable level by reducing the output port average load, but this results in a low utilisation of the network which is not usually acceptable. In an alternative approach, as described in our co-pending patent application GB 9405700.7, large flow controlled buffers can be included in the ATM switch which serve to buffer the overload of cells causing them to be delayed so that they can be transmitted at the link rate.

The invention as just before referred to, and which forms the subject of our co-pending patent application GB 9405700.7, is concerned with a system wherein buffers are placed at the input and output of a core ATM switch and flow control is used to manage the cells flowing between these buffers. Attention is also directed to our other co-pending patent applications GB 9212447.8, GB 9322744.5, GB 9309468.8 and GB 9405704.9 which provide useful background information.

Although, a system as described in our co-pending application GB 9405700.7, which involves the use of buffers and flow control to serve all parts of the switch, is operationally satisfactory and can be justified when large amounts of bursty traffic are present, when the amount of bursty data traffic is small, the cost of using flow controlled buffers at each input and output may be unacceptably large. It is therefore an object of the present invention to provide a system which is cost effective in situation where the amount of bursty data traffic is relatively small.

According to the present invention, there is provided an ATM switching system comprising: a plurality of input ports; a plurality of output ports; and a plurality of multiplexing units for facilitating the transmission of ATM cells between the input ports and the output ports; wherein at least one of said multiplexing units comprises a server statistical multiplexing unit having at least one flow controller for controlling the flow between those input ports and those output ports having buffers and flow control and those input ports and those output ports which do not have buffers and flow control.

The ATM switching system may be used to provide communication between a plurality of links, wherein at least one of the links includes a statistical multiplexing unit which embodies buffering and flow control, the switching system being operatively associated with server SMU, which facilitates the transmission of ATM cells between links which do have buffers and flow control, and links which do not have buffers and flow control.

In one embodiment of the invention, the plurality of links comprises a plurality of trunk links and a plurality of customer links, wherein at least one of the trunk links includes the statistical multiplexing unit which embodies buffering and flow control, the server statistical multiplexing unit facilitating the transmission of ATM cells between trunk links which do have buffers and flow control operatively associated therewith and customer links which do not have buffers and flow control operatively associated therewith.

One embodiment of the invention will now be described by way of example only with reference to the accompanying drawings, in which:

FIGURE 1 is a generally schematic block diagram of an ATM switching network system;

FIGURE 2 is a schematic flow diagram showing the route of ATM cell traffic from trunk links to customer links in one direction; and wherein,

FIGURE 3 is a schematic flow diagram showing the route of ATM traffic from customer links to trunk links in the opposite direction.

Referring now to Figure 1, a system is shown for the transmission of ATM cells between trunk links 1 and customer links 2, via an ATM switching network 3. In the present example, the trunk links 1, include two peripheral switch groups (PSG's) 4 and 5 which include buffering and flow control apparatus, and one peripheral multiplexing group (PMG) 6 which includes no such buffering and flow control apparatus. The customer links 2 on the other hand, comprise one PSG 7 which has buffering and flow control apparatus and two PMG's 8 and 9 which have no such buffering and flow control apparatus. As can be seen from Figure 1, the PSG's 4, 5 and 7 are similar and include line cards 10, a multiplexer 11 and a statistical multiplexing unit 12 having buffering apparatus 12a and 12b and flow control apparatus 12c.

The PMG's 6, 8 and 9 on the other hand merely comprise a multiplexer 13 and line cards 14 with no unit corresponding to the statistical multiplexing unit 12a which includes buffering and flow control apparatus.

In order to facilitate communication between the PSG's 4, 5 and 7 which have buffering and flow control, and the PMG's 6, 8 and 9 which do not have buffering and flow control, server statistical multiplexing units (server SMU's) 15 and 16 are provided, including statistical multiplexing units 15a and 16a respectively and flow controllers 15b and 16b respectively. In operation of the system, when communication is required

between a PSG having buffering and flow control and a PMG having no buffering and flow control, ATM cells are routed via one or other of the server SMU's 15 or 16.

The route taken by ATM cell traffic from trunk links 1 to customer links 2, via a server SMU is shown in Figure 2, wherein parts corresponding to Figure 1 bear where appropriate the same alphabetic or numerical designations. From Figure 2, it can be seen that ATM cells from the line cards 10 are transmitted via the SMU 4 and ASN 3 to the server 15 and then back through the ASN 3 to the MUX 13 and the line cards 14.

Referring now to Figure 3, traffic in the opposite direction from customer links 2 to trunk links 1 is shown. It can be seen from Figure 2 and Figure 3 that for transmission from the trunk links 1 to the customer links 2, flow control obtains between the units 3, 4 and 15 whereas for transmission in the opposite direction from the customer links 2 to the trunk links 1, flow control obtains between the units 15, 3 and 12, peak bit rate reservation obtaining over other parts of the transmission path in each case.

An important advantage of the present invention lies in the ability of the system to allow flow controlled statistical gain to maximise the utilisation of the trunk links 1, while not having to use SMU's within all PSG's. The reason that the MUX or LC components cannot have flow control added without the large buffers, is that as shown in Figure 3, for example, a point (a) between the ASN 3 and the SMU 12, may instantaneously receive more bandwidth than it can handle. The server SMU's however,

can be used to accept this overload bandwidth and re-route the traffic afterwards to correct the output.

Various modifications may be made to the arrangement shown without departing from the scope of the invention and for example, any number of trunk or customer links may be provided, which are placed in mutual communication across an ATM switching network, and for some applications, trunk links may be coupled to other trunk links or customer links may be interconnected using a system in accordance with the present invention.

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CLAIMS:

1. An ATM switching system comprising:

a plurality of input ports;

a plurality of output ports; and

a plurality of multiplexing units for facilitating the transmission of ATM cells between the input ports and the output ports;

wherein at least one of said multiplexing units comprises a server statistical multiplexing unit having at least one flow controller for controlling the flow between those input ports and those output ports having buffers and flow control and those input ports and those output ports which do not have buffers and flow control.

2. An ATM switching system as claimed in Claim 1, which is used to provide communication between a plurality of links, at least one of the links including a statistical multiplexing unit which embodies buffering and flow control, said switching system being operatively associated with the server statistical multiplexing unit which facilitates the transmission of ATM cells between links which do have buffers and flow control and links which do not have buffers and flow control.

3. An ATM switching system as claimed in Claim 2, wherein the plurality of links comprises a plurality of trunk links and a plurality of customer links, wherein at least one of the trunk links includes the statistical multiplexing unit which embodies buffering and flow control, the server statistical multiplexing unit facilitating the

transmission of ATM cells between trunk links which do have buffers and flow control operatively associated therewith and customer links which do not have buffers and flow control operatively associated therewith.

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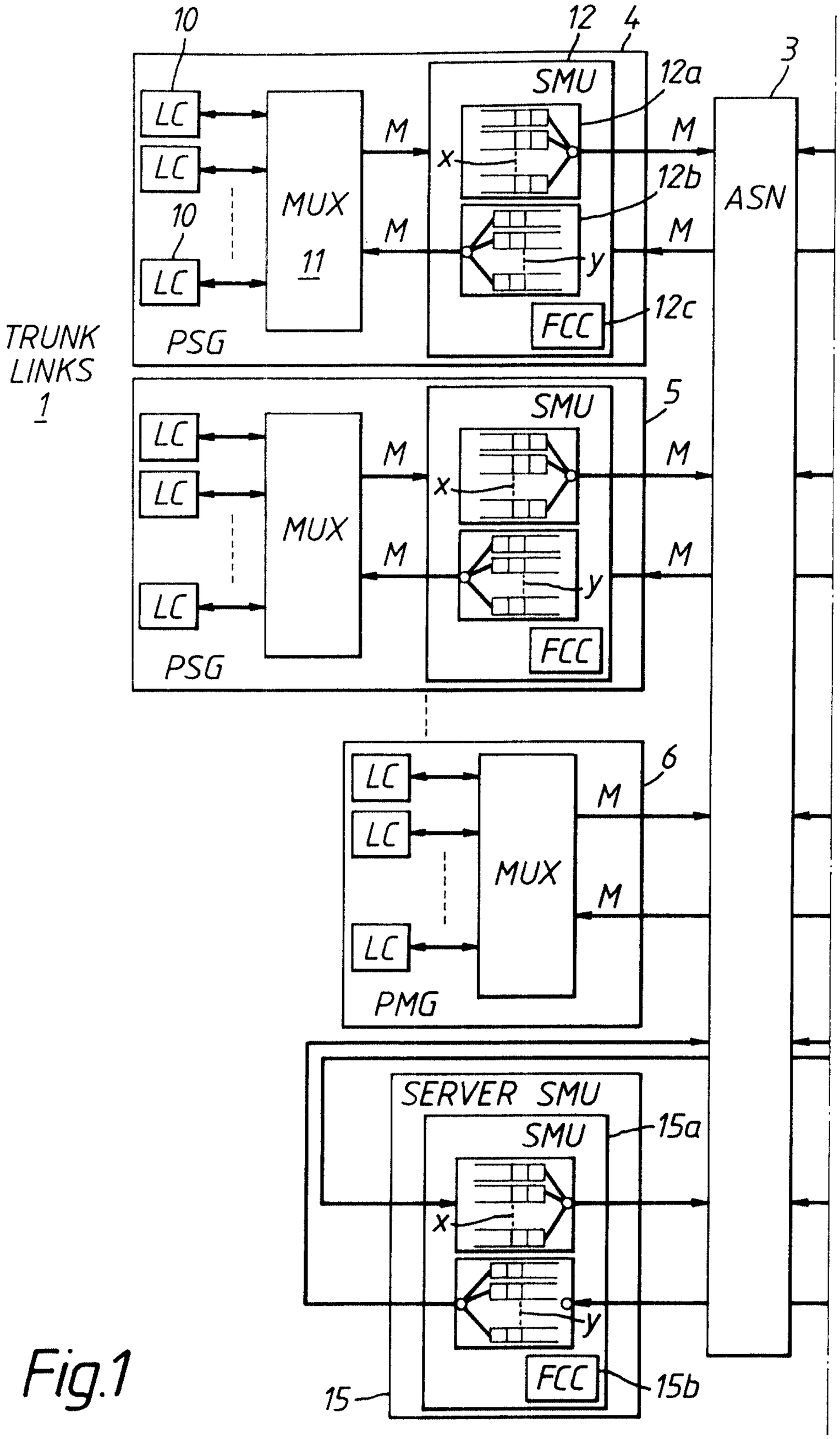

Fig.1

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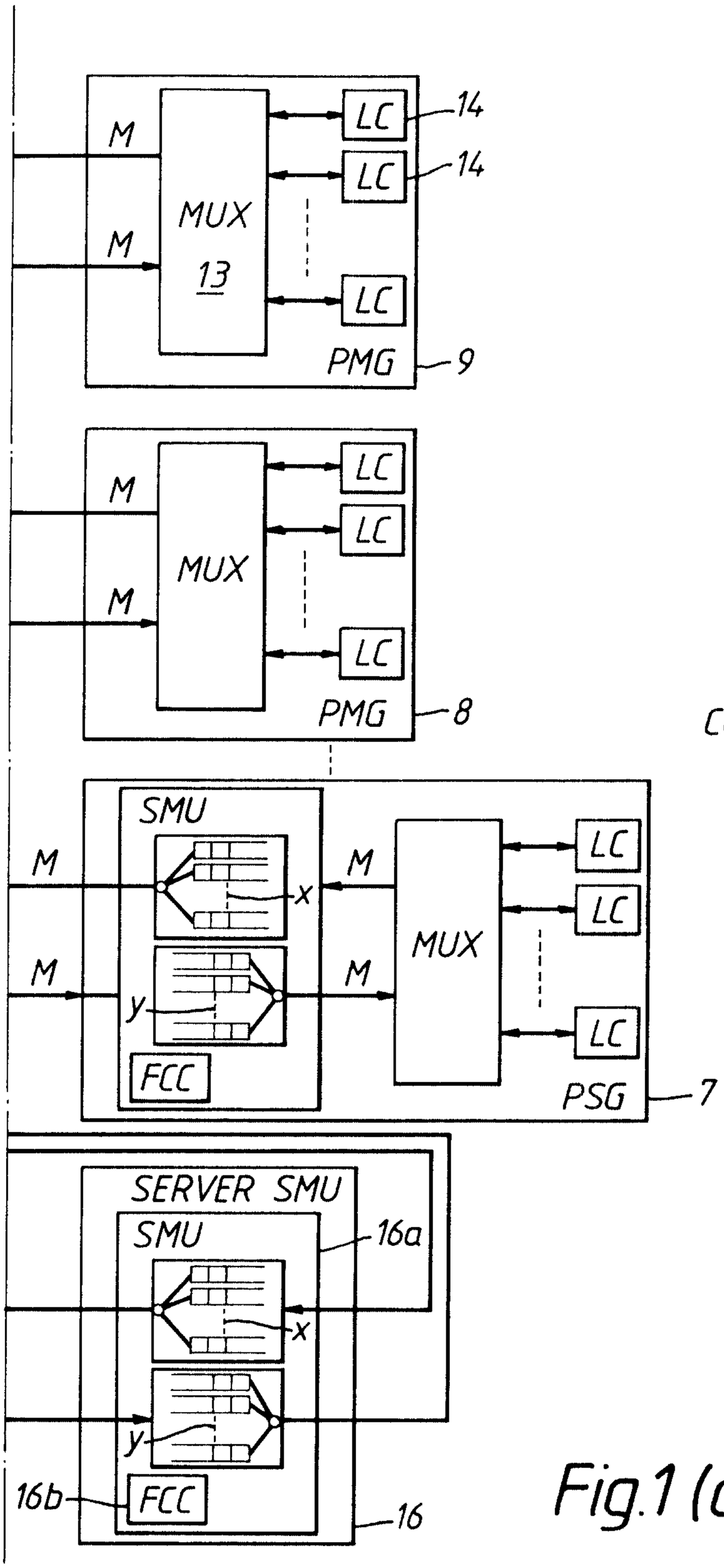

Fig.1 (cont.)

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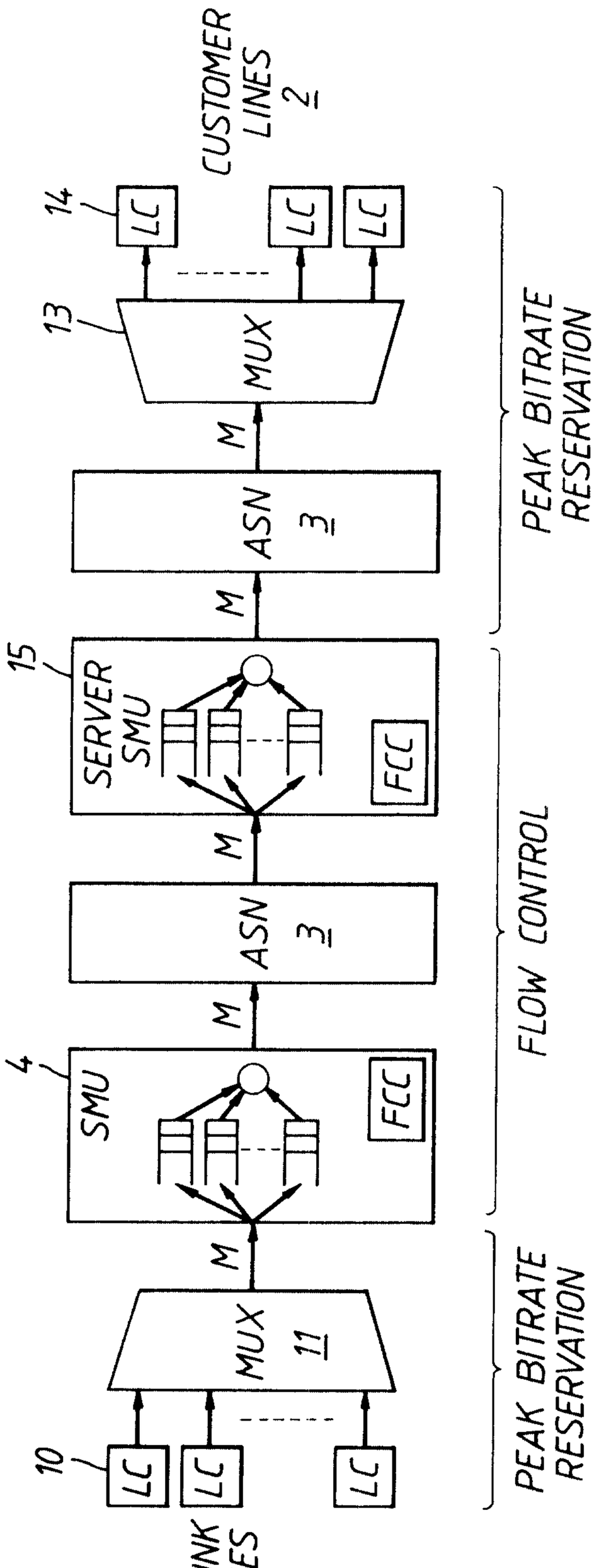

Fig.2

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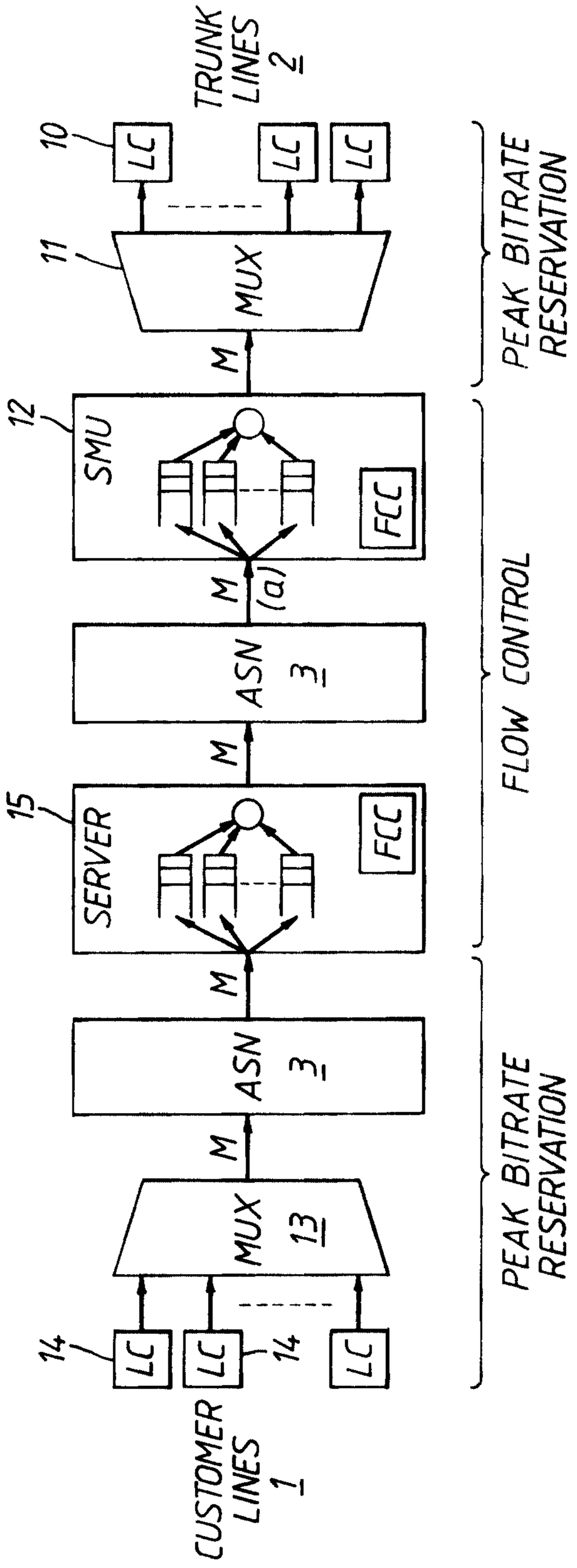

Fig.3

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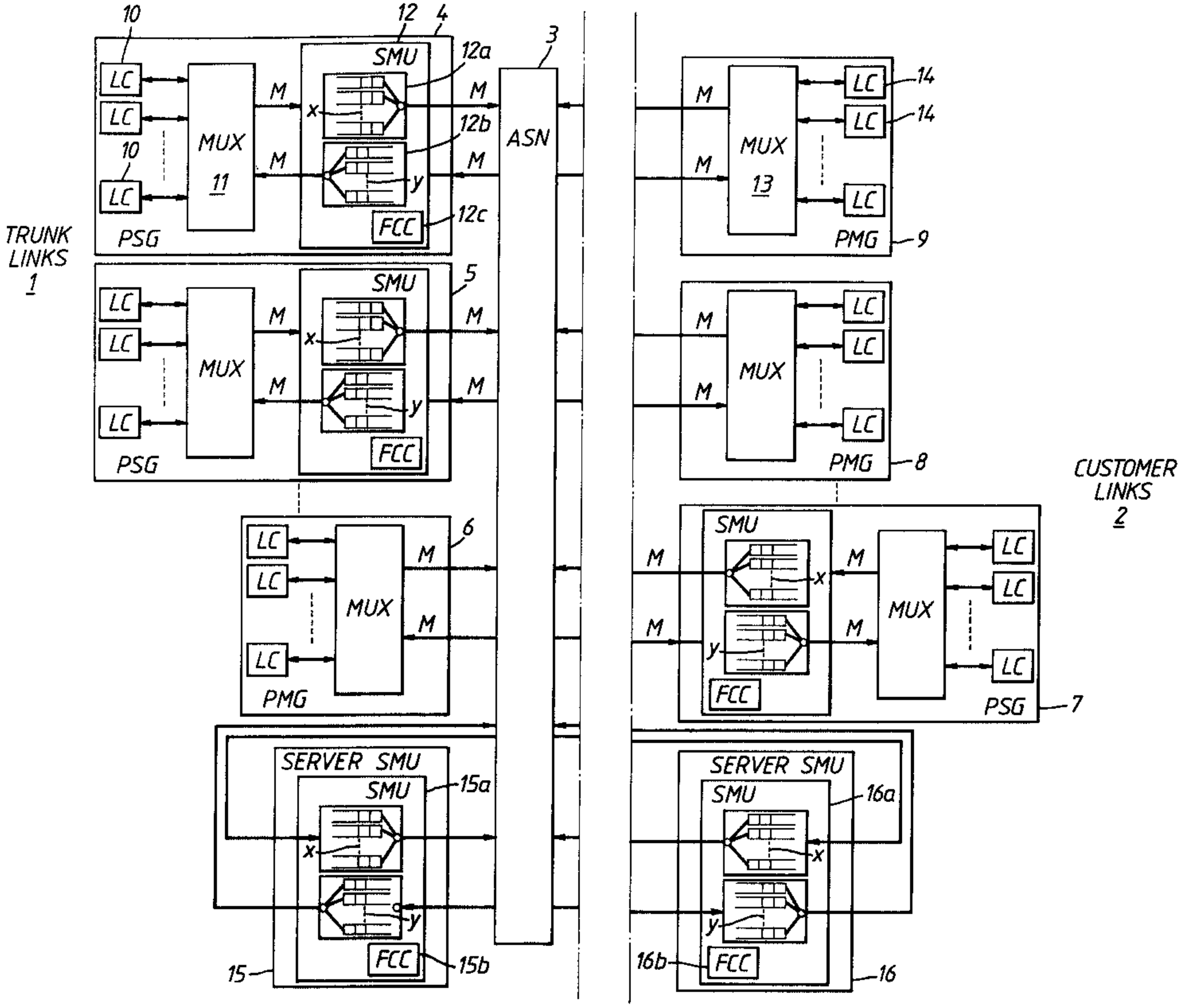
TRUNK LINKS 1
10
12
4
SMU
12a
3
LC
MUX 11
M
x
12b
ASN
y
12c
FCC
PSG
5
6
PMG
MUX 13
14
9
8
CUSTOMER LINKS 2
7
PSG
SERVER SMU
15a
15
15b
16a
16
16b