Office de la Propriété Intellectuelle du Canada
Un organisme d'Industrie Canada

Canadian Intellectual Property Office
An agency of Industry Canada

CA 2233467 C 2004/06/22

(11)(21) 2 233 467

(12) BREVET CANADIEN
CANADIAN PATENT

(13) C

(86) Date de dépôt PCT/PCT Filing Date: 1996/09/17
(87) Date publication PCT/PCT Publication Date: 1997/04/03
(45) Date de délivrance/Issue Date: 2004/06/22
(85) Entrée phase nationale/National Entry: 1998/03/27
(86) N° demande PCT/PCT Application No.: DE 1996/001758
(87) N° publication PCT/PCT Publication No.: 1997/012487
(30) Priorité/Priority: 1995/09/29 (195 36 522.4) DE

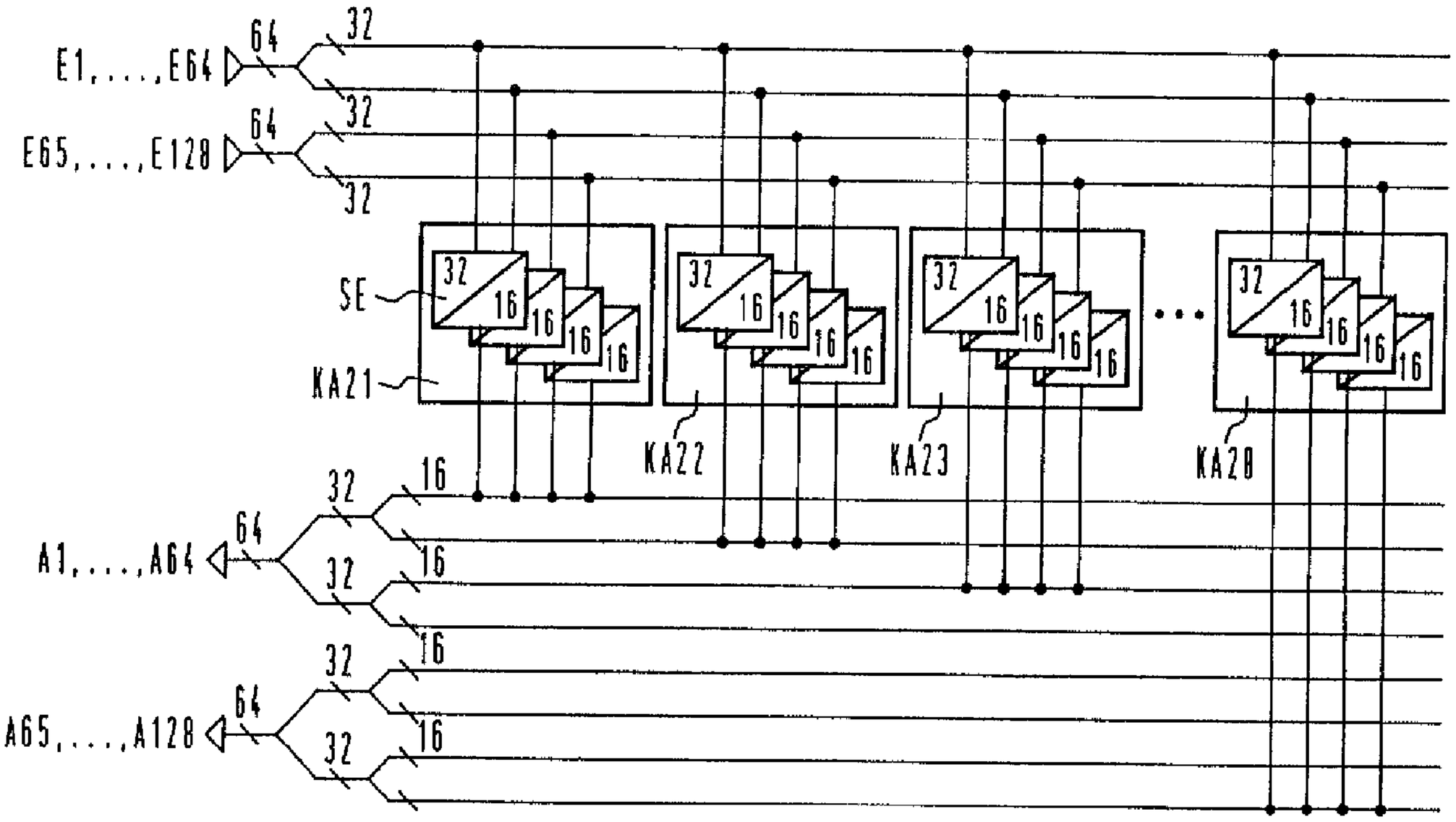
(51) Cl.Int.^{6}/Int.Cl.^{6} H04Q 3/00

(72) Inventeur/Inventor:
MARIGGIS, ATHANASE, DE

(73) Propriétaire/Owner:
SIEMENS AKTIENGESELLSCHAFT, DE

(74) Agent: FETHERSTONHAUGH & CO.

(54) Titre : INTERFACE POUR DISPOSITIFS DE TELECOMMUNICATIONS
(54) Title: SWITCHING NETWORK FOR COMMUNICATION DEVICES



(57) Abrégé/Abstract:
The switching network serves for the freely selectable connecting of input lines (E1,...,E128) combined into a plurality of input-line groups to at least one output-line group (A1,...,A16), on the one hand each of the input-line groups being connected to a separate switching element (SE) of at least one arrangement of switching elements (for example KA21) having a funnel structure. On the other hand, the respective arrangement of switching elements has a number of outputs corresponding to the number of output lines belonging to the respective output-line group. Each of these outputs is in connection with one of the output lines belonging to the respective output-line group. In this case, it is provided that the respective arrangement of switching elements (KA21) is formed only by the switching elements (SE) connected to the input-line groups. The switching elements in each case have outputs which are individually assigned to the output lines belonging to the respective output-line group. In this case, only one of the mutually corresponding outputs of these switching elements can be connected, according to choice, to the relevant output line of the respect output-line group by switching means.

95 P 2020

Abstract

Switching network for communication devices

The switching network serves for the freely selectable connecting of input lines (E1,...,E128) combined into a plurality of input-line groups to at least one output-line group (A1,...,A16), on the one hand each of the input-line groups being connected to a separate switching element (SE) of at least one arrangement of switching elements (for example KA21) having a funnel structure. On the other hand, the respective arrangement of switching elements has a number of outputs corresponding to the number of output lines belonging to the respective output-line group. Each of these outputs is in connection with one of the output lines belonging to the respective output-line group. In this case, it is provided that the respective arrangement of switching elements (KA21) is formed only by the switching elements (SE) connected to the input-line groups. The switching elements in each case have outputs which are individually assigned to the output lines belonging to the respective output-line group. In this case, only one of the mutually corresponding outputs of these switching elements can be connected, according to choice, to the relevant output line of the respect output-line group by switching means.

FIG 2

20365-3823

Description

Switching network for communication devices

The invention relates to a switching network for communication devices for the freely selectable connecting of input lines combined into a plurality of input-line groups to at least one output-line group according to the precharacterizing clause of Patent Claim 1. Such a switching network is already known from "IEEE JOURNAL ON SELECTED AREAS IN COMMUNICATIONS", Vol. 9, No. 8, October 1991, pages 1299 to 1307. In the case of this switching network, the respective arrangement of switching elements is in a multi-stage form of funnel structure, in order to connect an even number of input lines in a freely selectable way to a number of output lines corresponding to half the number of input lines. Consequently, due to the number of individual switching elements for realizing the funnel structure of the respective arrangement of switching elements, relatively complex circuitry is required, which is sometimes undesired.

It is thus the object of the present invention to show a way in which a switching network according to the precharacterizing clause of Patent Claim 1 can be formed to make it possible to reduce the complexity of the circuitry for realizing the respective arrangement of switching elements.

In accordance with the present invention, there is provided a switching network for communication devices for the freely selectable connecting of input lines (E1,...,E128) combined into a plurality of input-line groups to at least one output-line group (A1,...,A16), on the one hand each of the input-line groups being connected to a separate

switching element (SE) of at least one arrangement of switching elements (for example KA21) having a funnel structure and on the other hand the respective arrangement of switching elements having a number of outputs corresponding to the number of output lines belonging to the respective output-line group and each of these outputs being in connection with one of the output lines belonging to the respective output-line group, characterized in that the respective arrangement of switching elements (KA21) is formed only by the switching elements (SE) connected to the input-line groups, and in that each of the switching elements has outputs which are individually assigned to the output lines belonging to the respective output-line group, and in that only one of the mutually corresponding outputs of these switching elements can be selectively connected to the relevant output-line of the respective output-line group by switching means.

The invention thereby brings with it, for example, the following advantages over the prior art:

- lower number of switching elements and consequently a cost reduction for the respective arrangement of switching elements,

- lower power loss because of the reduction in the number of switching elements,

- saving in subassembly surface area for realizing the switching network
- and lower signal delay time because of the reduced number of switching elements to be passed through within the respective arrangement of switching elements.

Advantageous refinements of the switching network according to the present invention emerge from Patent Claims 2 to 5.

The present invention is described in more detail below on the basis of exemplary embodiments represented in the drawings, in which:

FIG 1 shows a switching network according to the prior art cited above,

FIG 2 shows in schematic form a switching network in which the present invention is used,

FIG 3 shows a first exemplary embodiment of the arrangements of switching elements represented in FIG 2,

FIG 4 shows a second exemplary embodiment of the arrangements of switching elements represented in FIG 2, and

FIG 5 shows an exemplary embodiment of arrangements of switching elements according to FIG 2 distributed between two subassemblies.

In FIG 1, a switching network corresponding to the prior art cited above is represented for the case in which 128 input lines can be connected freely selectably to 128 output lines. The input lines are denoted by E1 to E128, the output lines on the other hand are denoted by A1 to A128. The input lines and output lines are in this case subdivided into input-line groups and output-line groups with in each case a fixed number of input lines and output lines, respectively. An input-line group is formed here by 32 input lines, an output-line group on the other hand is formed by 16 output lines.

Altogether, in the assumed example, four input-line groups and 8 output-line groups are formed. Each of the 8 output-line groups is in this case assigned a

separate arrangement of switching elements. The arrangements of switching elements, which are denoted by KA11 to KA18, are connected on the input side in parallel to the four input-line groups.

The arrangements of switching elements, having the same structure in each case, are respectively of a multi-stage funnel form, using switching elements with 32 inputs and 16 outputs. The switching elements are denoted by SE. A first stage has four switching elements, which are in each case connected to one of the input-line groups. This is adjoined by a second stage, which is composed of two switching elements. To their inputs there are led the outputs of the switching elements of the first stage. On the output side, the switching elements of the second stage are finally in connection with a switching element forming a third stage. This switching element is connected by its 16 outputs to one of the output-line groups.

The switching network represented in FIG 1 and realized in accordance with the prior art thus has in the assumed example 7 switching elements per arrangement of switching elements, ie. a total of 56 switching elements.

In FIG 2 there is represented a switching network according to the present invention which can be used, for example, in communication devices operating on the basis of an asynchronous transfer mode (ATM), such as for example ATM switching devices or ATM "cross connects", in order to be able to relay information cells fixed for this transfer mode. Apart from the realization of the individual arrangements of switching elements, this switching network corresponds to the switching network reproduced in FIG 1. The arrangements of switching elements are denoted in FIG 2 by KA21 to KA28. These arrangements of switching elements are in each case of only a single-stage form, four switching elements SE with in each case 32 inputs and 16 outputs being provided in this single stage. Here too, to each of these switching elements there is connected one of the input-line groups. The outputs of the switching elements are individually

assigned to the 16 outputs of an output-line group. However, in this case only one of the mutually corresponding four outputs of the switching elements which are assigned to one and the same output line can be connected, according to choice, to the relevant output line by switching means.

In the case of the switching network represented in FIG 2, there are thus required in the assumed example, in contrast to the switching network reproduced in FIG 1, now only four switching elements per arrangement of switching elements and consequently a total of 32 switching elements.

In FIG 3 there is indicated a first exemplary embodiment of how the individual arrangements of switching elements represented in FIG 2 are realized. In the case of this exemplary embodiment it is assumed that 64 input lines can be connected freely selectably to 16 output lines. For this purpose, two switching elements SE with in each case 32 input lines and 16 output lines are provided. In this case, the previously mentioned switching means are of such a form that the mutually corresponding two outputs of the switching elements which are assigned to one and the same output line are connected to each other by the said switching means in the manner of a "wired-or" operation. Each of these two outputs can be controlled, according to choice, to assume an active or high-impedence state, with the result that at a given point in time only one of the two outputs is ever connected to the relevant output line. Controlling takes place in this case via a control bus CB connected to the two switching elements. Via this control bus the outputs of the switching elements are also controlled in such a way that they operate bit-synchronously. The switching over of the outputs of the switching elements connected to each other by the switching means may in this case take place, for example, after the transmission of an information cell or when a so-called void cell occurs, if void cells are inserted at periodically recurring intervals in the cell stream to be relayed to the respective

output line. Irrespective of the specific type of switching over, its sequence, and consequently the sequence for the emission of an information cell by the respective switching element, can be fixed by the respective switching element with the aid of control signals transmitted via the control bus CB. For example, these control signals may be sent commands which are cyclically emitted to the switching elements.

In FIG 4 there is indicated a further exemplary embodiment of how the individual arrangements of switching elements represented in FIG 2 are realized. This corresponds substantially to the exemplary embodiment described before with reference to FIG 3. There is a difference only in the design of the switching means for switching the mutually corresponding outputs of the switching elements SE to a relevant output line. While in the case of the first exemplary embodiment a "wired-or" operation is performed, here it is provided that the switching elements are respectively followed by a multiplexing device MUX. The two multiplexing devices MUX have in the assumed example eight separate pairs of inputs, which are each individually assigned an output connected to one of the output lines. The multiplexing devices thus have in each case an 8X2:1 structure. Connected to a pair of inputs are in this case the two mutually corresponding outputs of the switching elements SE assigned to one and the same output line, the multiplexing devices being controllable via the control bus CB in such a way that, of a pair of inputs, at every point in time there is only ever one input connected to the associated output line. The sequence of the switching over may in this case take place as in the case of the first exemplary embodiment by control signals transmitted via the control bus. The exemplary embodiment represented in FIG 4 may, moreover, in the assumed example also be modified in such a way that, instead of multiplexing devices individually assigned to the switching elements, only one such multiplexing device is used, which in the example has 16 pairs of inputs, to which in each case there is individually

assigned an output. This multiplexing device thus has a 16X2:1 structure.

Finally, represented in FIG 5 is the case in which, with an arrangement of switching elements, 128 input lines can be connected freely selectably to 16 output lines. Of the four switching elements SE required for this purpose, in this case let two be accommodated on a subassembly A, the remaining two switching elements on the other hand be accommodated on a subassembly B. The outputs of the two switching elements present on one subassembly are in this case provided with switching means according to one of the exemplary embodiments explained above. Since differences in the delay during the transmission of information cells may occur because of this separate accommodation of the switching elements and consequently because of different line lengths, the outputs of the two subassemblies (16 per subassembly) are connected to a phase-matching device PH, which is connected on the output side to the 16 output lines. The said differences in delay are compensated in this case by this phase-matching device. In the event that the switching means are in the form of multiplexing devices, according to the second exemplary embodiment, the phase matching may also be carried out by these multiplexing devices.

Finally, it should also be pointed out that the arrangements of switching elements explained above with reference to Figures 2 to 5 only represent expedient designs. For example, the switching elements respectively included in the arrangements of switching elements may also be modifed with regard to the number of inputs and outputs. Moreover, the internal structure of the individual switching elements may, for example, be based on a structure such as that specified in the document cited at the beginning. In this case, all that is necessary is to connect to the outputs of the respective switching element switching means corresponding to one of the exemplary embodiments explained above.

In addition, it should also be further pointed

out that the switching network explained above can be used not only in ATM communication devices but also generally in communication devices which are designed for a transmission principle other than the asynchronous transfer mode mentioned.

20365-3823

CLAIMS:

1. Switching network for communication devices for the freely selectable connecting of input lines (E1,...,E128) combined into a plurality of input-line groups to at least one output-line group (A1,...,A16), on the one hand each of the input-line groups being connected to a separate switching element (SE) of at least one arrangement of switching elements (for example KA21) having a funnel structure and on the other hand the respective arrangement of switching elements having a number of outputs corresponding to the number of output lines belonging to the respective output-line group and each of these outputs being in connection with one of the output lines belonging to the respective output-line group, characterized in that the respective arrangement of switching elements (KA21) is formed only by the switching elements (SE) connected to the input-line groups, and in that each of the switching elements has outputs which are individually assigned to the output lines belonging to the respective output-line group, and in that only one of the mutually corresponding outputs of these switching elements can be selectively connected to the relevant output-line of the respective output-line group by switching means.

2. Switching network according to Claim 1, characterized in that the switching means are of such a form that the mutually corresponding outputs of the switching elements are connected to each other by the said switching means in the manner of a "wired-or" operation and each of these outputs can be controlled, to assume an active or high-impedance state.

3. Switching network according to Claim 1, characterized in that the switching means are in the form of

a multiplexing device (MUX) to which on the imput side the mutually corresponding outputs of the switching elements are led and by which one of these outputs can be selectively connected to the relevant output-line.

4. Switching network according to one of Claims 1 to 3, characterized in that the switching means are further of such a form that differences in signal delay at the mutually corresponding outputs of the switching elements are compensated by the said switching means.

5. Switching network according to one of Claims 1 to 4, characterized in that a plurality of output-line groups are provided, in that each of the output-line groups is assigned a separate arrangement of switching elements and in that the input-line groups are led in parallel to mutually corresponding switching elements of the arrangement of switching elements relevant for the said groups.

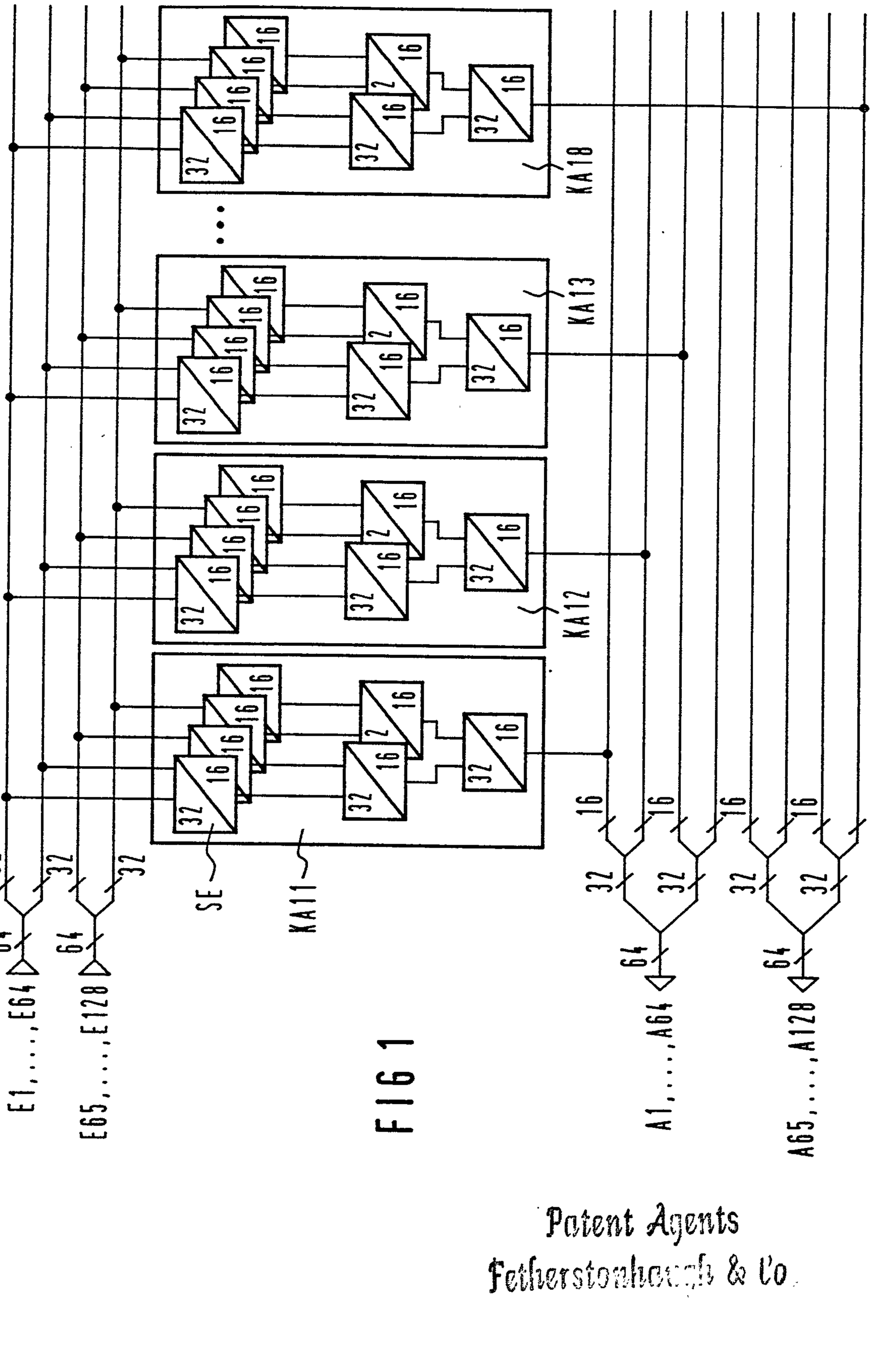


FIG 1

Patent Agents
Fetherstonhaugh & Co.

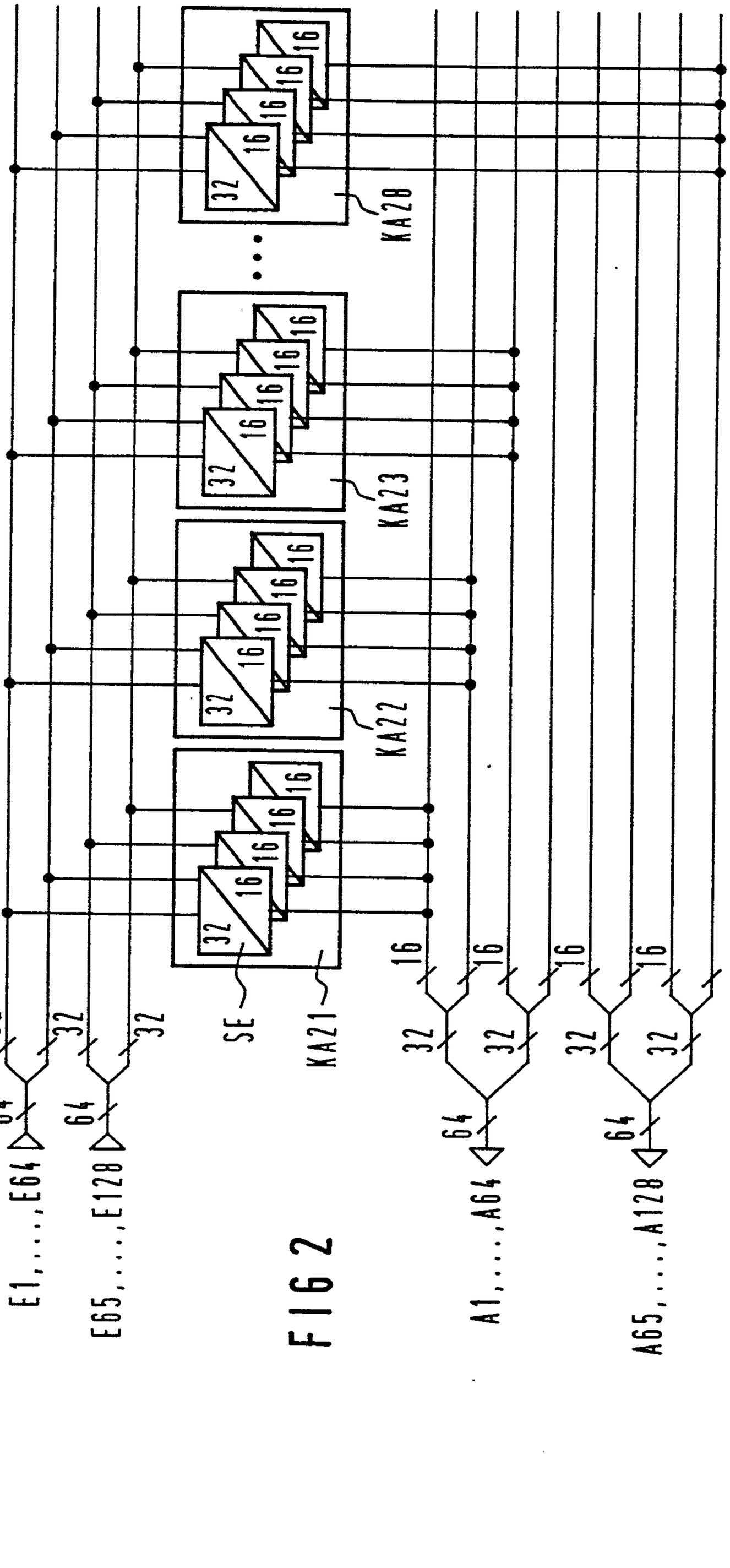

16
16
16
32
KA28
KA23
KA22
KA21
SE
32
64
E1,....,E64
E65,....,E128
A1,....,A64
A65,....,A128

FIG 2

FIG 3

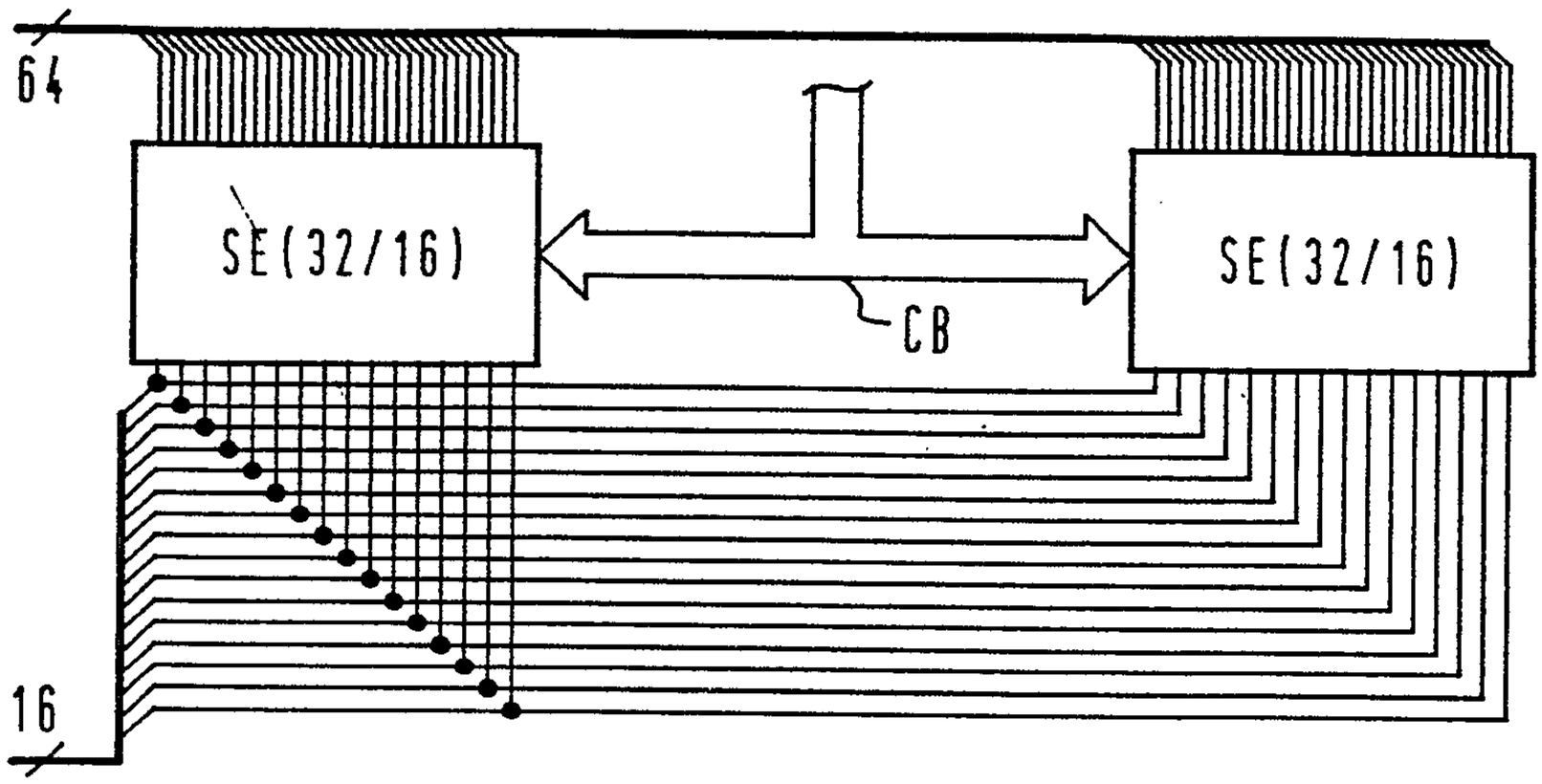


FIG 4

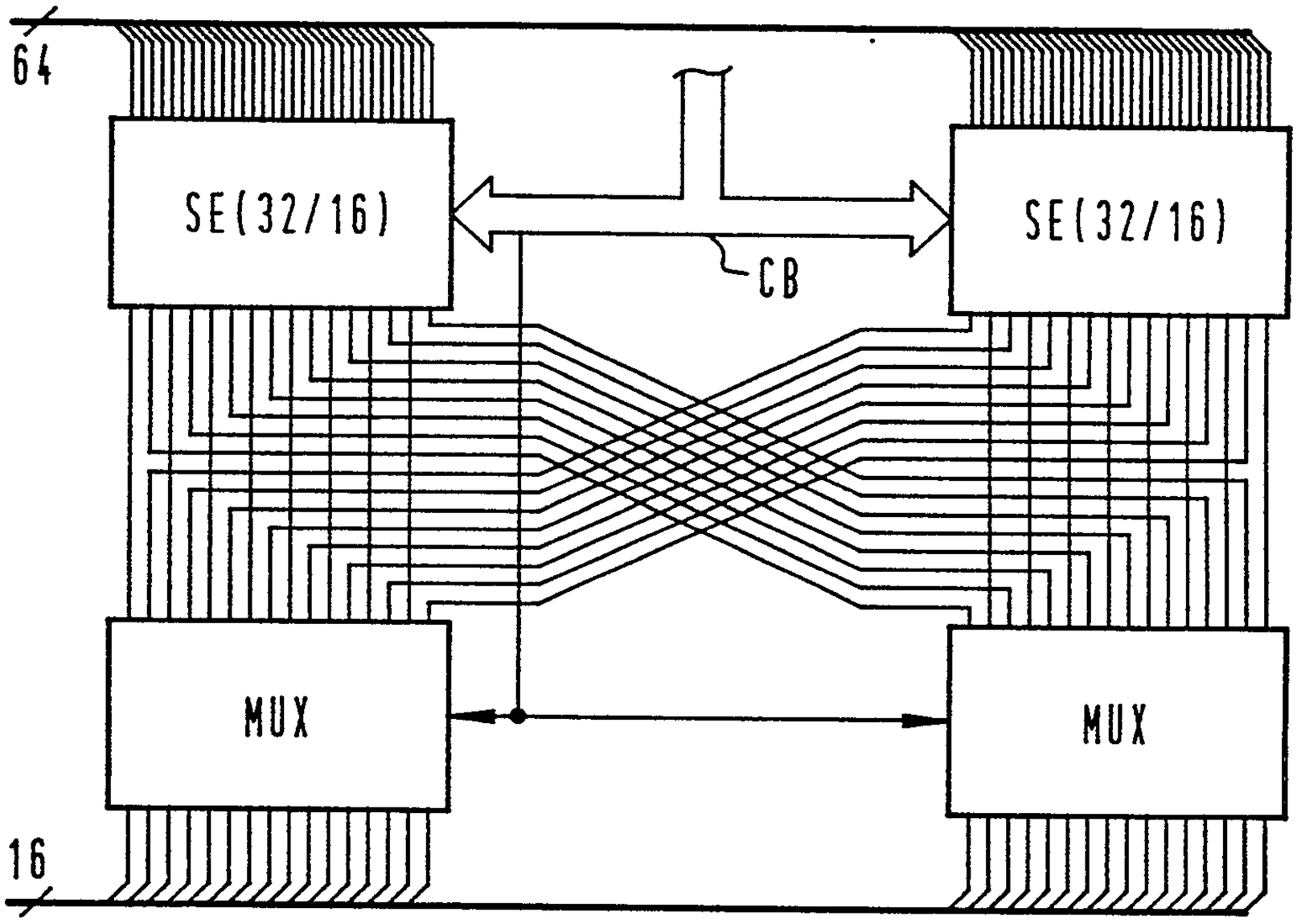
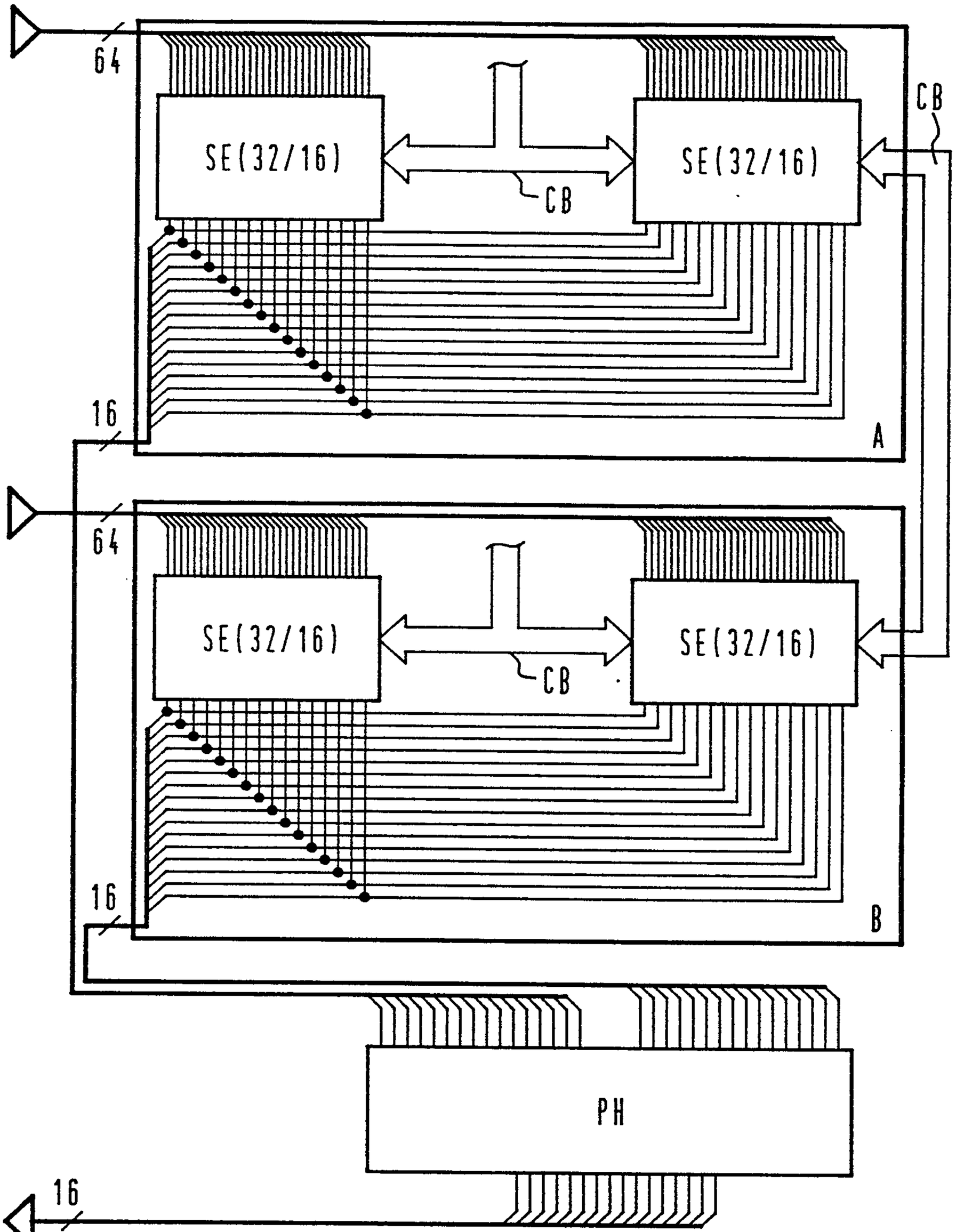
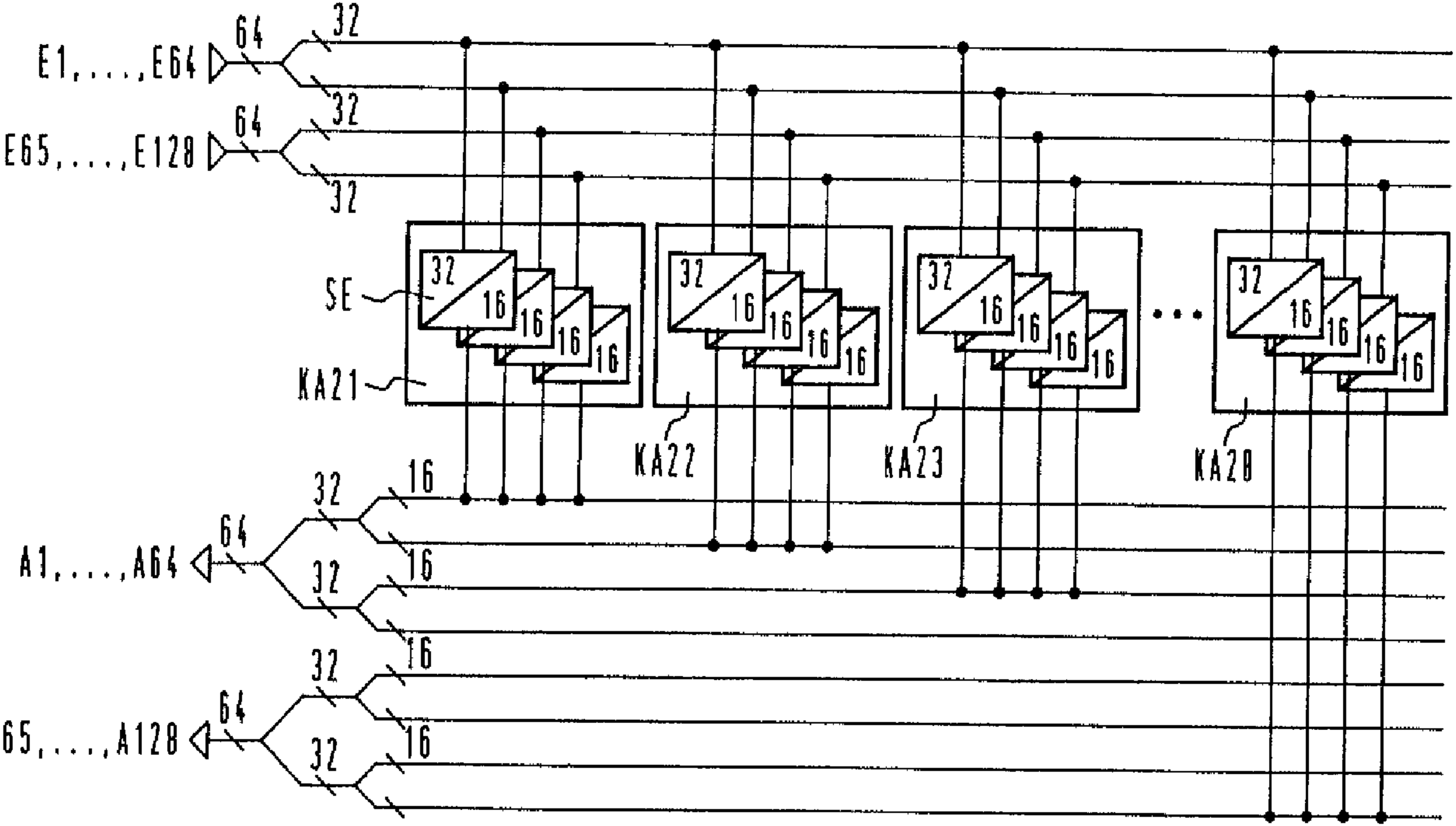


FIG 5



Patent Agents
Fetherstonhaugh & Co.


E1,...,E64
64
32
32
E65,...,E128
64
32
32
SE
KA21
32
16
16
16
16
KA22
KA23
KA28
A1,...,A64
64
32
16
32
16
A65,...,A128
64
32
16
32
16