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(71) Applicants:
- **Dunks, Anthony Phillip**
  Sebastopol, Victoria 3350 (AU)
- **Coad, Trevor James**
  Ballarat, Victoria 3350 (AU)

(72) Inventor: **Dunks, Anthony Phillip**
Sebastopol Victoria 3350 (AU)

(74) Representative: **Zeitler & Dickel**
Patentanwälte
European Patent Attorneys
Herrnstrasse 15
80539 München (DE)

(54) Lifting device

(57) A lifting device (1) for loads of various weights and dimensions, the lifting device having an upwardly and downwardly movable load-bearing means (2), connected to a framework means (3), which is in turn connected to a base means (4), which framework comprises:

a. a first scissor means (5) and a second scissor means (6), each scissor means comprising an upper scissor element (7,15) pivotally connected or indirectly at an upper point to the loadbearing means and a lower scissor element pivotally connected directly or indirectly;

b. upper (11, 19) and lower (12,20) stabilizer means pivotally connected at each of the upper and lower pivot points defined under sub-paragraph a. respectively to the load-bearing means and the base means respectively, wherein the stabilizer means is adapted to transfer rotational force in a controlled manner from one scissor means to the other scissor means; and

c. upper (13) and lower (14) bracing means pivotally connected to the upper and lower stabilizer means respectively;

wherein as the load-bearing means is raised from or lowered to a lower rest position to or from an operative position, the framework expands or contracts by rotation of the integers defined above about their respective pivot points.

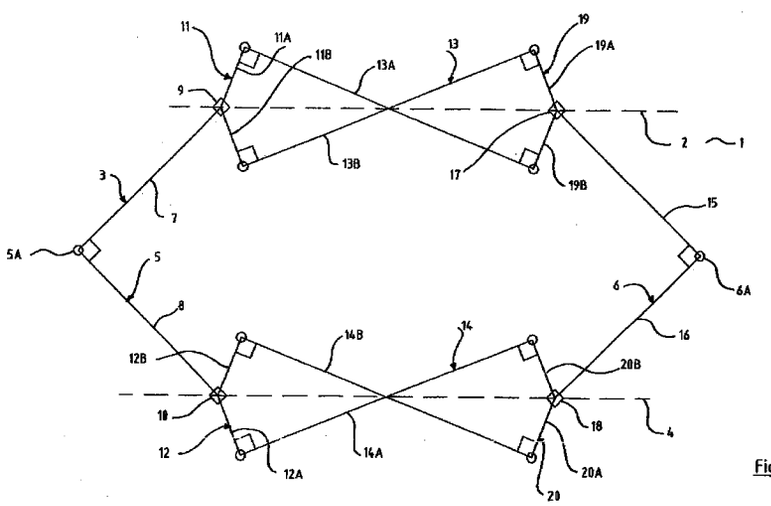

Fig 1

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Description

FIELD OF THE INVENTION: This invention relates to a lifting device having improved stability in comparison with known lifting devices.

BACKGROUND TO THE INVENTION: A number of devices are known for lifting loads in which the lifting action is accomplished using, for example, hydraulic rams or a "lazy tong" - type action. Thus, hydraulic rams may he positioned to provide directly a vertical lift. Whereas such hydraulic ram devices have high lifting capacity, they are expensive, and, whereas lazy tong devices have the merit of simplicity, they suffer from a lack of stability and strength.

The present invention adopts an alternative approach to the devices just mentioned, the device according to the invention offering improved stability.

In this specification, the references to "lifting" and "upwardly and downwardly moveable" are to be construed as including cases where the device is used for sideways thrust. Thus the terms "lifting" and "upwardly and downwardly moveable" are used for the sake of economical definition and description.

BRIEF SUMMARY OF THE INVENTION: This invention provides:

A lilting device for loads of various weights and dimensions, the lifting device having an upwardly and downwardly movable load hearing means, connected to a framework means, which is in turn connected to a base means, which framework comprises:

a. a first scissor means and a second scissor means, each scissor means comprising an upper scissor element pivotally connected directly or indirectly at an upper point to the loadbearing means and a lower scissor element pivotally connected directly or indirectly at a lower pivot point to the base means, the scissor elements being pivotally connected to each other at an intermate point;

b. upper and lower stabilizer means pivotally connected at each of the upper and lower pivot points defined under sub-paragraph a, respectively to the load-bearing means and the base means respectively, wherein the stabilizer means is adapted to transfer rotational force in a controlled manner from one scissor means to the other scissor means; and

c. upper and lower bracing means connected to the upper and lower stabilizer means respectively,

wherein as the load-hearing means is raised from or lowered to a lower rest position to or from an operative position, the framework expands or contracts by rotation of the intergers defined above their respective pivot points.

BRIEF DESCRIPTION OF THE DRAWINGS: The accompanying drawings illustrate in diagrammatic form several embodiments of the lifting device according to the invention.

Figures 1 and 1A are side views of one embodiment of the device in its half-raised (or half-lowered) state;

Figure 2 is a side view of the device of Figure 1 in its completely raised state, Figure 2A showing the device in its nearly completely raised state;

Figure 3 is a side view of the device of Figure 1 in its completely lowered or collapsed state, Figure 3A showing the device in its nearly completely lowered state;

Figure 4 is a side view of a second embodiment of the device showing scissor means of differing lengths;

Figure 5 is a side view of a third embodiment of the device showing stabilizer means of differing sizes;

Figures 6 - 10 illustrate various configurations of the device of Figure 1, some attached in "stacks", showing the possible positioning of a means to supply thrust such as a screw-threaded means or a hydraulic ram.

Figures 11 to 13 illustrate various configurations of a fourth embodiment of the device showing the use of a combination stabilizer means/bracing means;

Figure 14 illustrates a combination stabilizer means/bracing means which is supplied with gripping teeth; and

Figure 15 illustrates a combination stabilizer means/bracing means which is derived from the embodiments of Figures 11 to 13 and Figure 14 respectively.

DETAILED DESCRIPTION OF THE INVENTION: The general aim of the invention is to provide a lifting device which can be raised to the greatest extent possible. Conversely, the aim is also to provide a lifting device which can be lowered or collapsed to the greatest extent possible. Hence the dimensions and angular configuration of the elements may be selected to achieve these desiderata. However, if complete extension or collapse' is not important or subordinate to other desiderata, the respective dimensions and angular configurations may be so chosen.

In the most used embodiment each scissor element is of substantially the same length as corresponding scissor elements.

In another embodiment the scissor elements of a scissor means are of different length from the scissor elements of another scissor means, providing in use an upwards and sideways thrust.

Preferably the scissor elements are offset with respect to each other. This enables the upper and lower scissor elements, and their associated stabilizer means and bracing means, to be collapsed completely.

Each stabilizer means according to the invention may take various forms. For example, it may take the form of a disc which pivots around its respective upper or lower pivot point. In a preferred embodiment, each stabilizer means comprises a set of stabilizer arms. The respective lengths of the stabilizer arms may be selected to achieve the result desired, but they are desirably of the same length.

The respective angular configurations of the stabilizer arms with respect to each other and each associated scissor element may also be selected to achieve the result desired, but they are desirably such that right-angles are formed between the respective stabilizer arm and the bracing means at the half-raised state.

Each bracing means preferably comprises two crossed bracing elements, or struts. In a preferred embodiment, these bracing elements extend from the end of one set of stabilizer arms to the ends of another set of stabilizer arms connected to the load-bearing means or the base means, that is, upper stabilising arm to lower stabilising arm and lower stabilising arm to upper stabilising arm. For preference, the members of each set of bracing elements are equal in length. One member of the lower set of two crossed bracing elements may be left out but in such a case, the remaining bracing element may need to be strengthened.

The stabilizer arms at the opposing ends of a particular bracing element are preferably substantially of the same length. However, the stabilizer arms comprising a set may be of differing lengths.

In an alternative embodiment, the stabilizer means may comprise a single stabilizer arm only. In such a case the bracing means may comprise a single bracing element preferably strengthened as compared with the use of crossed bracing elements.

In yet an alternative embodiment, a or each stabilizer means may be integral with a or each scissor means, for example, the or both pivot point(s) for the respective bracing element(s) being located on a relatively wide scissor element.

In a further developed embodiment, each stabilizer means has a drumlike form and the bracing element or elements take the form of a continuous strip which wraps partially or completely around the drumlike means and wherein a scissor element is connected fixedly to the circumference of each drumlike means.

In a variation of the further developed embodiment, the continuous strip has a toothed form on its inner surface which meshes with a corresponding toothed form as the outer surface of the drumlike means.

It is convenient to insert a means to apply thrust such as a first screw-threaded means or a first hydraulic ram between the intermediate pivot points which are located between the scissor elements to raise or lower the lifting device according to the invention. Alternatively the first screw-threaded means or first hydraulic ram may be applied to or under one or each intermediate pivot point to raise or lower the lifting device. These are examples only and other possibilities are described later in the specification.

The lifting device according to the invention may be provided with a side-thrust means, for example, a second screw-threaded means or a second hydraulic ram, to tilt the lifting device to enable convenient transfer of a load to the load-bearing means. Thus the device according to the invention may be used to lift and transport large pieces of furniture, such as pianos of various types and sizes and billiard tables. For example, by making use of the side-thrust means, the load-bearing means such as a flat platform, may be tilted from the horizontal to allow loading of the piece of furniture. The load-bearing means may then be tilted back to the horizontal and the piece of furniture lifted.

It would be possible to stack lifting devices according to the invention one on top of the other to provide a longer lift. It is also possible to gang lifting devices according to the invention one beside the other, if it is desired to lift a large load, whether heavy or extensive in dimensions.

Turning now to the accompanying drawings, integer 1 indicates the lifting device as a whole. A dotted line indicated by numeral 2 indicates a horizontal plane through a load-bearing means (not shown) such as a platform. A framework 3 joins the load-bearing means to base means 4.

Scissor means 5 and 6 are located on opposing sides of framework 3. Scissor means 5 comprises an upper scissor element 7 pivotally joined, at intermediate pivot point 5A, to lower scissor element 8. Scissor means 6 correspondingly comprises an upper scissor element 15 pivotally joined, at an intermediate pivot point 6A, to lower scissor element 16. Scissor means 5 is joined fixedly, at upper pivot point 9 and lower pivot point 10, to upper and lower stabilizer means 11 and 12 respectively. Scissor means 6 is correspondingly joined fixedly, at upper pivot point 17 and lower pivot point 18, to upper and lower stabilizer means 19 and 20 respectively.

Upper stabilizer means 11 comprises two stabilizer arms 11A and 11B and lower stabilizer means 12 comprises two stabilizer arms 12A and 12B respectively. Similar comments may be made about upper stabilizer means 19 and lower stabilizer means 20. In this embodiment, all stabilizer arms are of the same length. Upper stabilizer means 11 pivots with respect to load-bearing means 2 at pivot point 9 and lower stabilizer means 12 pivots with respect to base means 4 at pivot point 10. Corresponding remarks may be made about stabilizer means 19 and pivot point 17 and stabilizer means 20 and pivot point 18.

An upper bracing means 13 comprises two bracing elements 13A and 13B pivotally joined to upper stabilizer arms 11A and 11B and opposing upper stabilizer arms 19A and 19B. The bracing elements are shown as

crossing. Similarly, a lower bracing means 14 comprises two bracing elements 14A and 14B, again pivotally joined to stabilizer arms 12A and 12B and opposing lower stabilizer arms 20A and 20B. Again, the bracing elements are shown as crossing.

As may be seen from Figure 1, the internal angle(s) between stabilizer arms 11A and 11B and corresponding bracing elements 13A and 13B are/is preferably, but not necessarily, a right angle at the half-raised position. The same comment applies to the other three stabilizer arm/bracing element combinations, that is, 12A and 12B; 19A and 19B; and 20A and 20B. Furthermore, the internal angle between the scissor elements 7 and 8 is also a right angle; the same comment applying to the opposing scissors means 6 and scissor elements 15 and 16.

Referring to Figure 1A, the device is shown as being lowered slightly from its position in Figure 1. A circle symbol is shown at pivot points such as 5A and a square symbol is shown at those paints such as 9 where the stabilizer arms are feed with respect to the respective scissor element but pivoted with respect to the load-bearing means 2 (or the base means 4).

Turning now to Figure 2, the scissor elements 7 and 8 have each been rotated around the intermediate pivot point 5A so that hey are substantially in line and scissor means 5 is vertical in orientation. Analogous remarks may be made about scissor means 6. As may be seen from this figure, stabilizer arms 11A and 11B have been rotated counter-clockwise and stabilizer arms 12A and 12B have been rotated clockwise Analogous remarks may be made about the opposing sets of stabilizer arms 19A, 19B and 20A, 20B.

With regard to Figure 2A, the device is shown in its nearly completely raised state, the circle and square symbols having meanings as before.

Referring specifically to Figure 3, like numerals refer to like integers illustrated in Figures 1 and 2. The heavy black lines refer to the collapsed position of the lower scissor elements, stabilizer arms and bracing elements and the light lines to the analogous position of the upper elements. In the case shown ,the upper stabilizer arms and bracing elements protrude through the collapsed device. It is a matter of choice to select dimensions and angular configurations so that the upper and lower elements are for all intents and purposes superimposed.

Figure 3A illustrates the device in its nearly completely lowered state, the circle and square symbols having meanings as before.

Figure 4 illustrates the use of scissor means of differing lengths. Thus numeral 30 refers to the device as a whole and numerals 31 and 32 refer to stabilizer means, bracing means and load-bearing means (or base means) assemblies respectively. Numeral 33 refers to the longer scissor means, comprising two scissor elements 34 and 35 respectively pivoting around point 36. Correspondingly, numeral 37 refers to a shorter scissor means, comprising scissor elements 38 and 39 pivoting around point 40. In use, raising or expansion of the device would tend to move a load across and up the page, that is, provide a thrust in two directions.

Turning to Figure 5, this illustrates a device where the stabilizer means are of differing sizes. Thus numeral 50 refers to the device as a whole and numerals 51 and 52 to corresponding scissor means. One the of the stabilizer means assembly is indicated by numeral 53 and the associated load-bearing means is indicated by numeral 54. A shatter stabilizer means 55, located at one end of stabilizer means assembly 53, comprises two short stabilizer arms 56 and 57. A longer stabilizer means 58 comprises two stabilizer arms 59 ad 60. The other stabilizer means assembly is indicated by numeral 61. Once again this embodiment may be used to provide thrust in two directions.

Referring to Figure 6, and version A in particular, a device according to the invention is indicated generally by 80. Numerals 81 and 82 refer to load-bearing means and base means respectively. Numeral 83 indicates a means to supply thrust such as a screw-threaded means of a hydraulic ram and is located between a thrust support 84 and a pivot point 85 in scissor means 86. Thus the thrust supply means may be used to act upon the various pivot points in the device or stacked or gaged devices.

With reference to Figure 7, numeral 100 indicates an upper device according to the invention stacked upon a lower device according to the invention indicated by numeral 101. The stacked devices are located on base means 102. A thrust supply means 103 acts between base means 102 and a pivot point in lower device 101; compare Figure 6. Upper and lower devices 100 and 101 are joined by collapsible tetragonal means 104. Considering one side of tetragonal means 104, upper arm 105 is joined to lower arm 106 at pivot point 107. Considering the other side of the tetragonal means, upper arm 108 is integral with a scissor element 109 of upper device 100. Similarly lower arm 110 is integral with scissor element 111 of lower device 101. Upper arm 108 and lower arm 110 pivot around point 112.

Figures 8 to 10 illustrate six different modes of use of a thrust supply means, with the devices according to Figure 1 attached in stacks.

Turning now to Figure 11, integer 201 indicates the lifting device as a whole. Dotted line 202 indicates a load-beating means such as a platform. A framework 203 connects the load-bearing means to base means 204.

Scissor means 205 and 206 are located on opposing sides of framework 203. Scissor means 205 comprises an upper scissor element 207 pivotally joined, at intermediate pivot point 205A, to lower scissor element 208. Scissor means 206 correspondingly comprises an upper scissor element 215 pivotally joined, at an intermediate pivot point 206A, to lower scissor element 216. Scissor means 205 is joined, at upper point 207A and

lower point 208A, to upper and lower drumlike stabilizer means 211 and 212 respectively. These stabilizer means rotate about pivot points 209 and 210 respectively. Continuous strip bracing means 213 and 214 extend around and in contact with drumlike stabilizer means 211 and 212 respectively. Scissor means 206 is correspondingly joined, at upper point 215A and lower point 216A, to upper and lower drumlike stabilizer means 219 and 220 respectively. These stabilizer means rotate about pivot points 217 and 218 respectively.

Figures 12 and 13 illustrate different configuration for scissor means as compared with the similar embodiment of Figure 11.

Turning to Figure 14, integer 301 indicates the lifting device as a whole. Dotted fine 302 indicates a load-bearing means such as a platform. A framework 303 joins the load-bearing means to base means 304.

Scissor means 305 and 306 are located on opposing sides of framework 303. Scissor means 305 comprises an upper scissor element pivotally Joined, at intermediate pivot point 305A, to lower scissor element 308. Scissor means 306 correspondingly comprises an upper scissor element 315 pivotally joined, at an intermediate 306A, to lower scissor element 316. Scissor means 305 is joined, at upper point 307A and lower point 308A, to upper and lower drumlike stabilizer means 311 and 312 respectively. These stabilizer means rotate about pivot points 309 and 310 respectively.

A toothed continuous strip bracing means 313 extends around and in contact with drumlike stabilizer means 311 and 319, each of which has a corresponding outer toothed surface. These drumlike stabilizer means rotate about pivot points 309 and 317

A partial toothed continuous strip bracing means 314 extends around and in contact with drumlike stabilizer means 312 and 320, each of which has a corresponding partial outer toothed surface. These drumlike stabilizer means rotate about pivot points 310 and 318 respectively.

Figure 15 illustrates an embodiment 401 which may be considered as an amalgam of the embodiment of Figures 11 and 14. Thus the upper strip bracing means 402 is continuous whereas the lower strip bracing means 403 extends partially only around the corresponding lower drumlike stabilizer means.

Claims

1. A lifting device for loads of various weights and dimensions, the lifting device having an upwardly and downwardly movable load bearing means, connected to a framework means, which is in turn connected to a base means, which framework comprises:

a. a first scissor means and a second scissor means, each scissor means comprising an upper scissor element pivotally connected directly or indirectly at an upper point to the loadbearing means and a lower scissor element pivotally connected directly or indirectly at a lower pivot point to the base means, the scissor elements being pivotally connected to each other at an intermediate point;

b. upper and lower stabiliser means pivotally connected at each of the upper and lower pivot points defined under subparagraph a, respectively to the load-bearing means and the base means respectively, wherein the stabilizer means is adapted to transfer rotational force in a controlled manner from one scissor means to the other scissor means; and

c. upper and lower bracing means connected to the upper and lower stabilizer means respectively,

wherein as the load-bearing means is raised from or lowered to a lower rest position to or from an operative position, the framework expands or contracts by rotation of the integers defined above their respective pivot points.

2. A lifting device is claimed in claim 1, wherein the upper and lower scissor elements are pivotally connected directly at the upper and lower pivot points respectively and the upper and lower bracing means are pivotally connected to the upper and lower stabilizer means respectively.

3. A lifting device as claimed in claim 2, wherein each scissor element 15 of substantially the same length as corresponding scissor elements.

4. A lifting device as claimed in claim 2 wherein the scissor elements of a scissor means are of different length from the scissor elements of another scissor means, providing in use an upwards and sideways thrust.

5. A lifting device as claimed in any one of claims 2 to 4, wherein the scissor elements are offset with respect to each other.

6. A lifting device as claimed in any one of claims 2 to 5, wherein the stabilizer means comprises a set of stabilizer arms.

7. A lifting device as claimed in claim 6, wherein each stabilizer arm in a set is of the same length as corresponding stabilizer arms in a set.

8. A lifting device as claimed in claim 6 or claim 7, wherein the respective angular configurations of the stabilizer arms with respect to each other and

each associated scissor element may be selected to achieve the formation of right angles between the respective stabilizer arm and the bracing means at the half-raised state.

9. A lifting device as claimed in any one of claims 2 to 8, wherein each bracing means comprises two crossed bracing elements.

10. A lifting device as claimed in claim 9, wherein the bracing elements extend from the ends of one set of stabilizer arms to the ends of another set of stabilizer arms connected to the load-bearing means or the brace means, that is, upper stabilizing arm to lower stabilizing arm and lower stabilizing arm to upper stabilizing arm.

11. A lifting device as claimed in claim 9 or claim 10, wherein the members of each set of bracing elements are dual in length.

12. A lifting device as claimed in any one of claims 9 to 11, wherein the stabilizer arms at the opposing ends of a particular bracing element are substantially of the same length.

13. A lifting device as claimed in any one of claims 2 to 5, wherein the stabilizer means comprises a single stabilizer arm.

14. A lifting device as claimed in claim 13, wherein each bracing means comprises a single bracing element.

15. A lifting device as claimed in any one of claims 2 to 5, wherein a or each stabilizer means is integral with a or each scissor means.

16. A lifting device as claimed in claim 15, wherein the or both pivot point(s) for the respective bracing elements is/are located on a relatively wide scissor element.

17. A lifting device as claimed in any one of claims 2 to 16, wherein a first screw-threaded means or a first hydraulic ram is applied to or under a pivot point to raise or lower the lifting device.

18. A lifting device as claimed in any one of claims 2 to 16, wherein a first screw-threaded means or a first hydraulic ram is inserted between pivot points to raise or lower the lilting device.

19. A lifting device as claimed in claim 13 or claim 14, wherein a second screw-threaded means or a second hydraulic ram is provided, adapted to tilt the lifting device to enable convenient transfer of a load to the load-bearing means.

20. A lifting device as claimed in claim 2, substantially as described with reference to the accompanying drawings Figures 1 to 10.

21. A lifting device is claimed in claim 1, wherein the upper and lower scissor elements are pivotally connected indirectly at the upper and lower pivot points respectively and the upper and lower bracing means engage the upper and lower stabilizer means in belt-like fashion.

22. A lifting device as claimed in claim 21, wherein each scissor element is of substantially the same length as corresponding scissor elements.

23. A lifting device as claimed in claim 21 wherein the scissor elements of a scissor means are of different length from the scissor elements of another scissor means, providing in use an upwards and sideways thrust.

25. A lifting device as claimed in any one of claims 21 to 24, wherein each stabilizer means comprises a drumlike means to the pivot point of which is fixedly connected an upper or lower scissor element scissor.

26. A lifting device as claimed in claim 25, wherein each bracing means comprises a belt means adapted to engage a corresponding drumlike means.

27. A lifting device as claimed in claim 26, wherein the belt means is provided with teeth adapted to engage corresponding teeth on the drumlike means.

28. A lilting device as claimed in any one of claims 21 to 27, wherein a or each stabilizer means is integral with a or each scissor means.

29. A lifting device as claimed in any one of claims 21 to 28, wherein a first screw-threaded means or a first hydraulic ram is applied to or under a pivot point to raise or lower the lifting device.

30. A lifting device as claimed in any one of claims 21 to 28, wherein a first screw-threaded means or a first hydraulic ram is inserted between pivot points to raise or lower the lifting device.

31. A lifting device as claimed in claim 29 or claim 30, wherein a second screw-threaded means or a second hydraulic ram is provided adapted to tilt the lifting device to enable convenient transfer of a load to the load-bearing means.

32. A lifting device as claimed in claim 21, substantially as described with reference to the accompa-

nying drawings Figures 11 to 15.

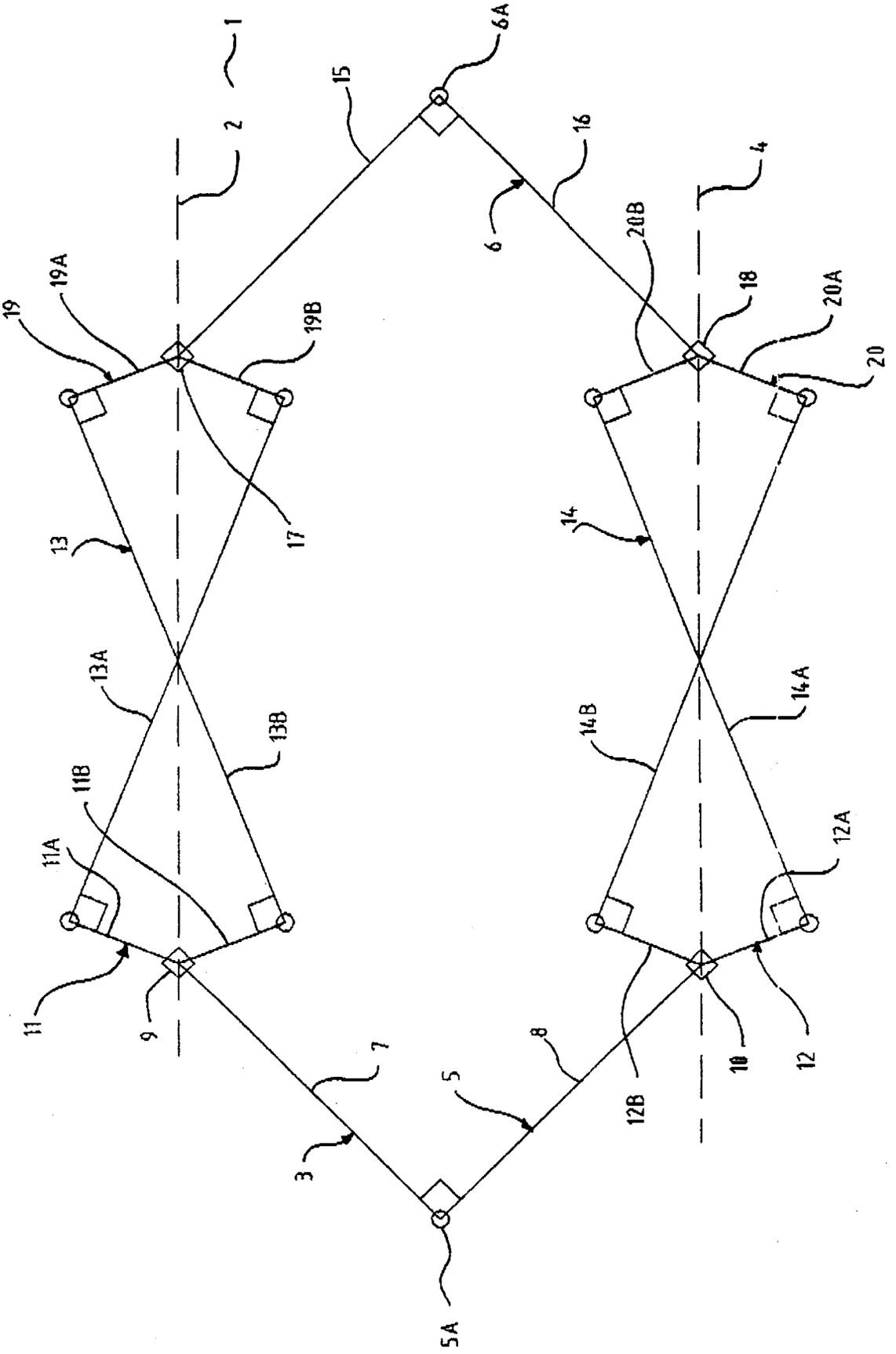
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Fig 1

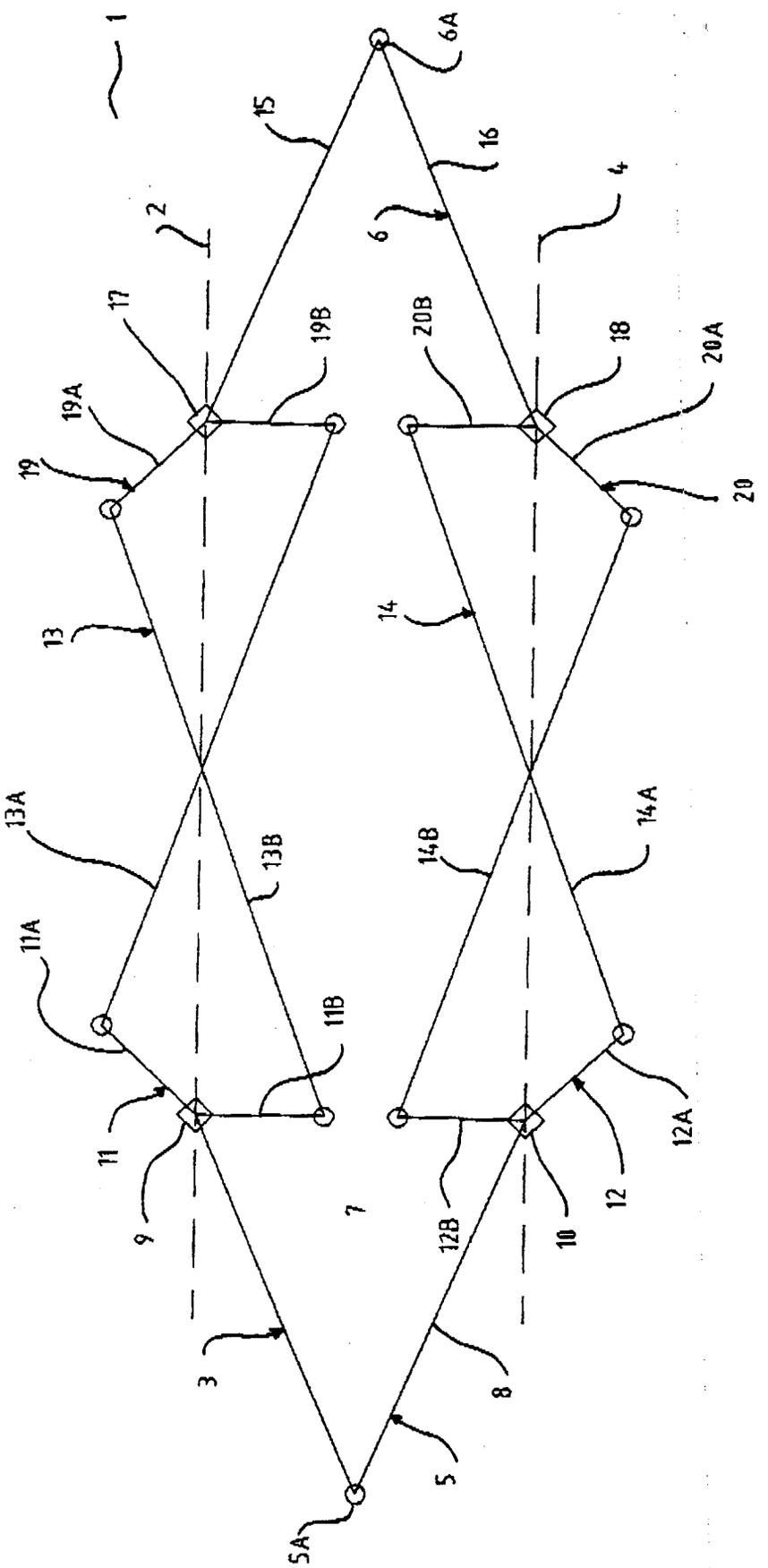
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Fig 1A

Fig 2

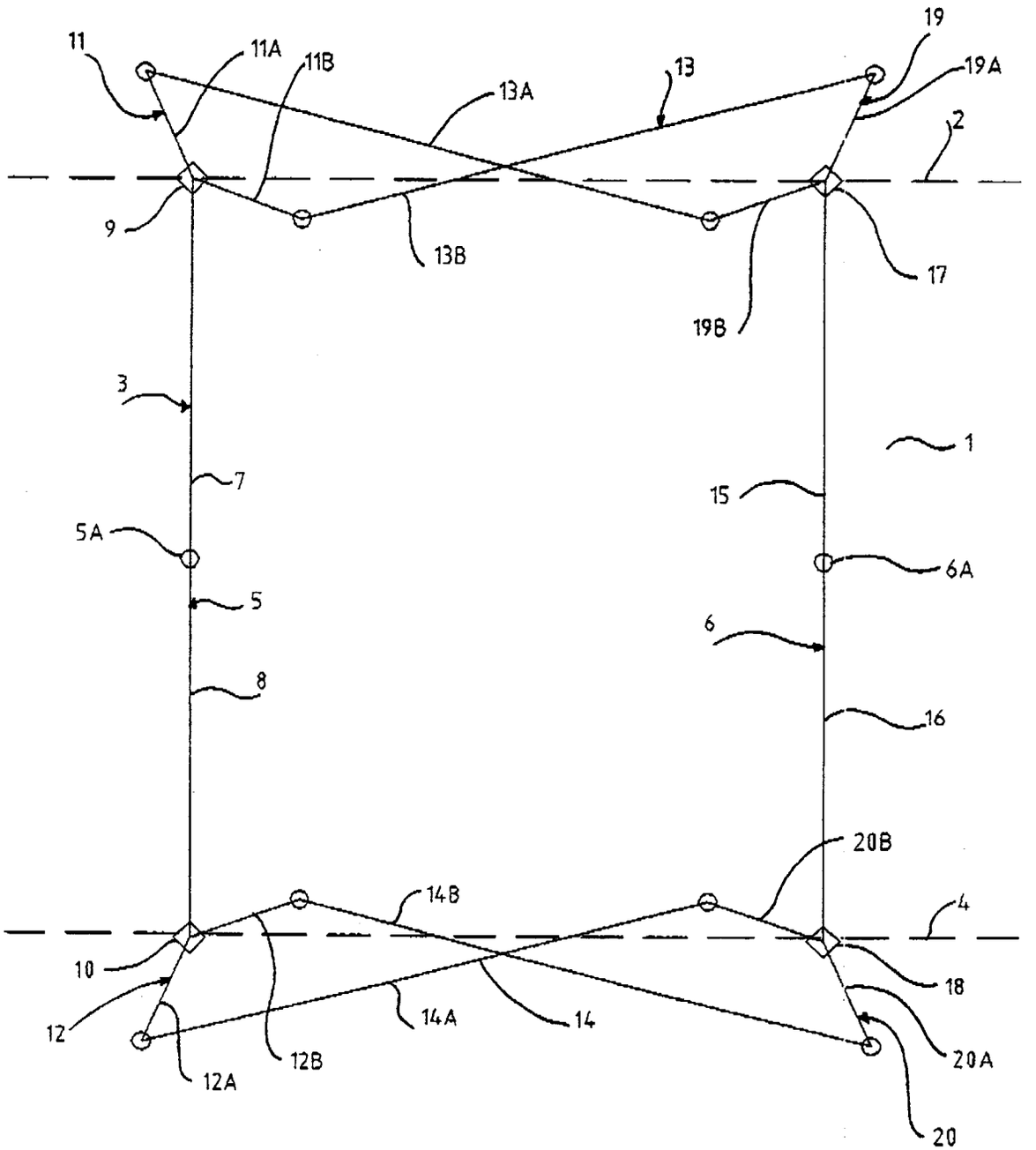
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Fig. 2A

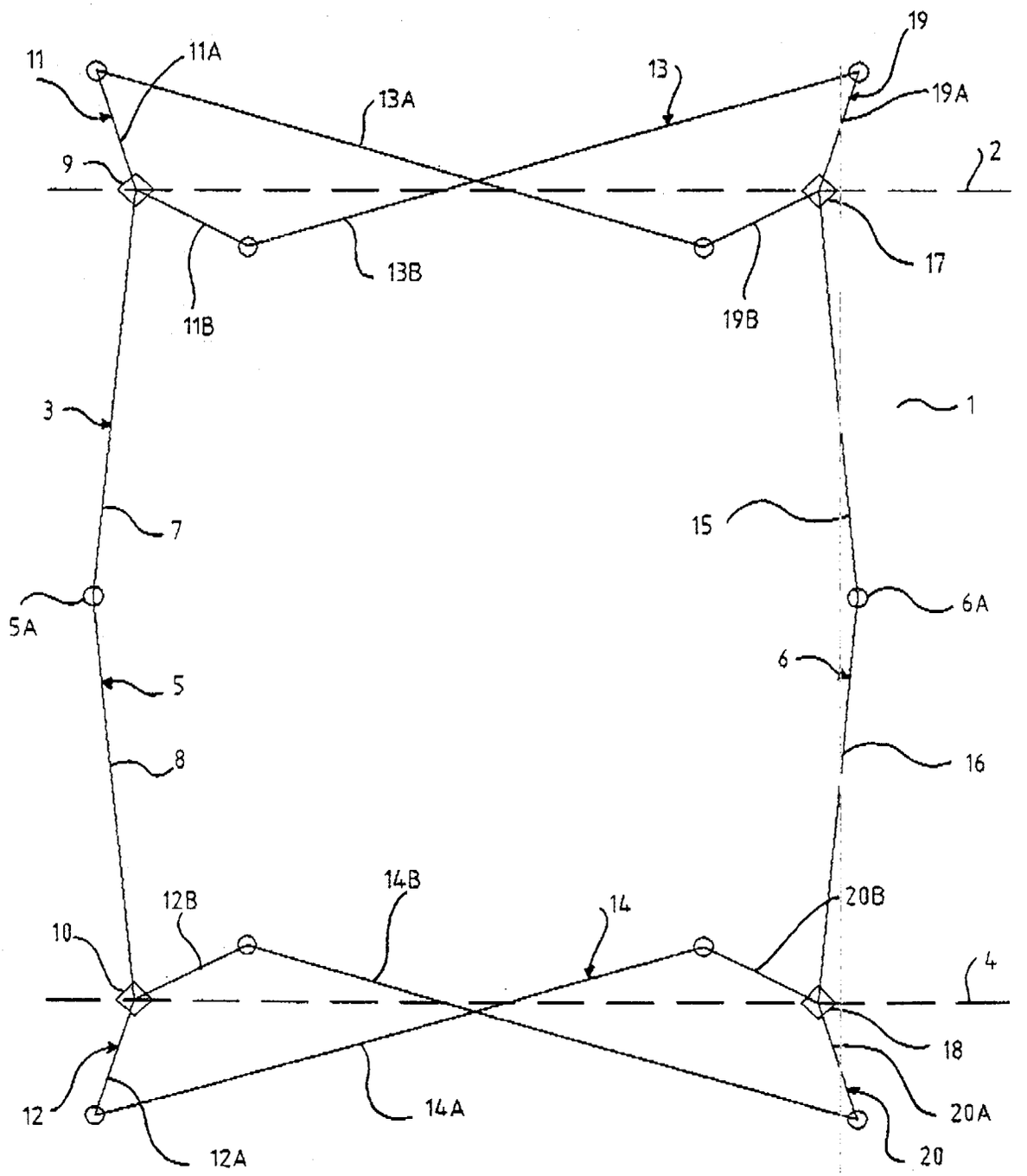
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Fig 3

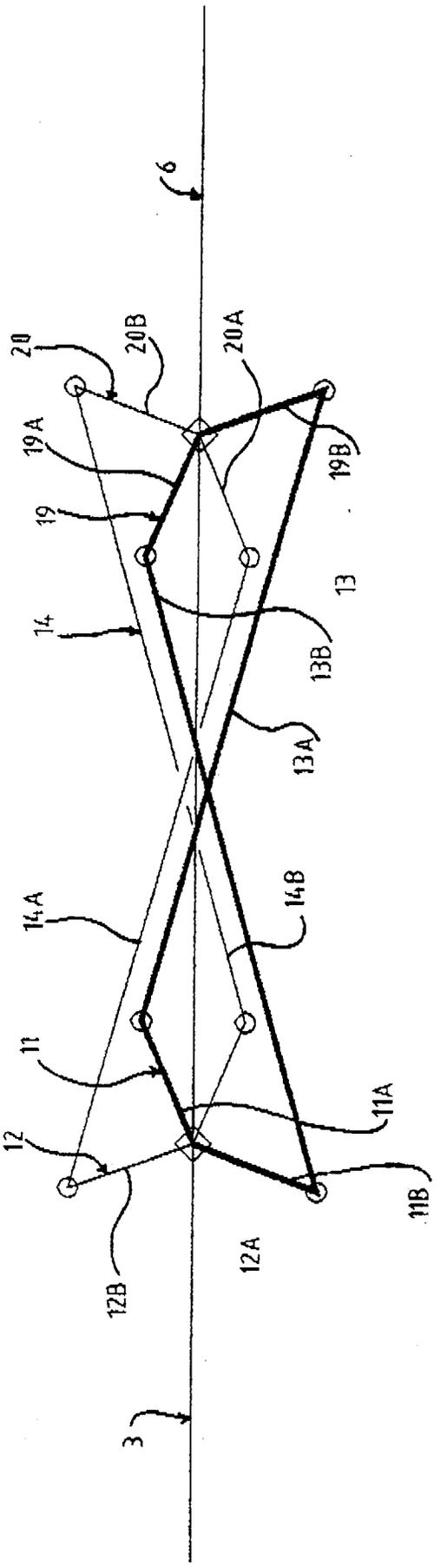
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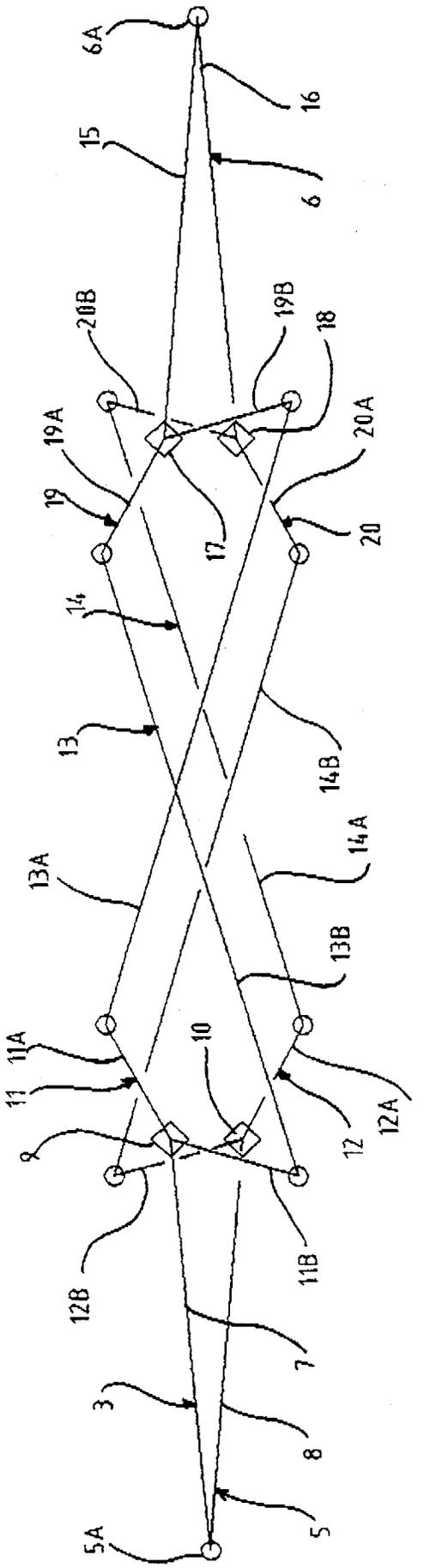
Fig 3A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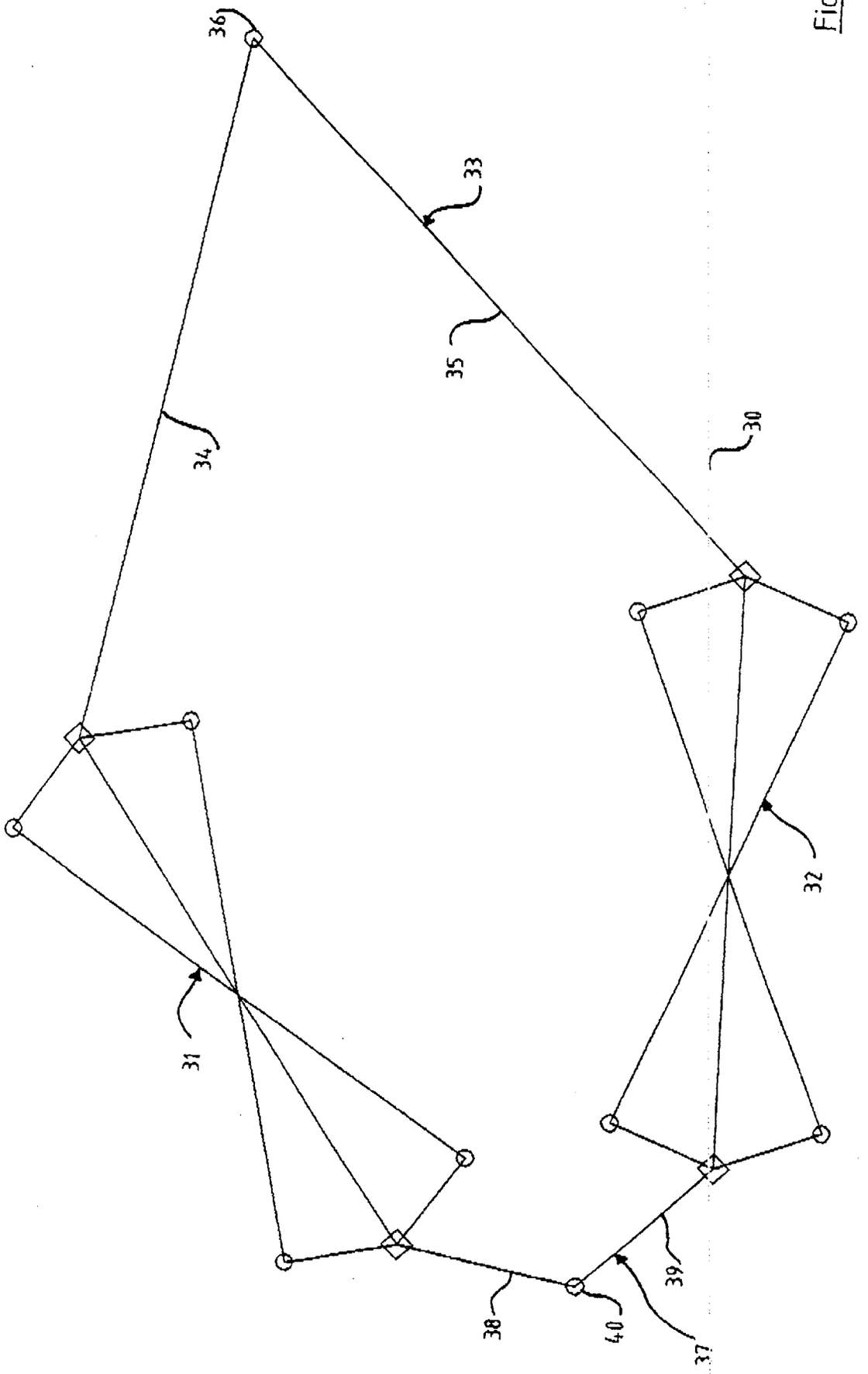


Fig 4

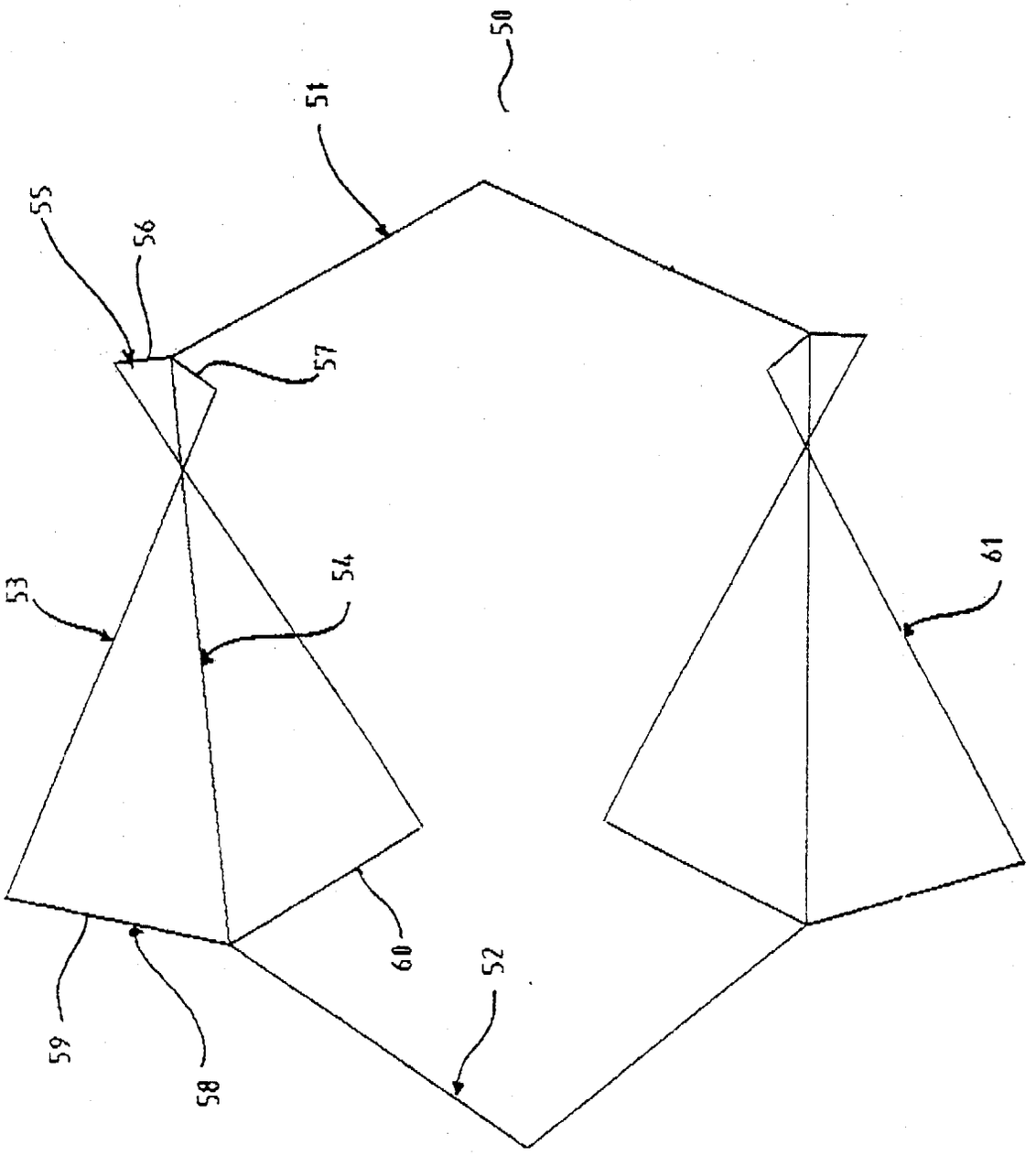
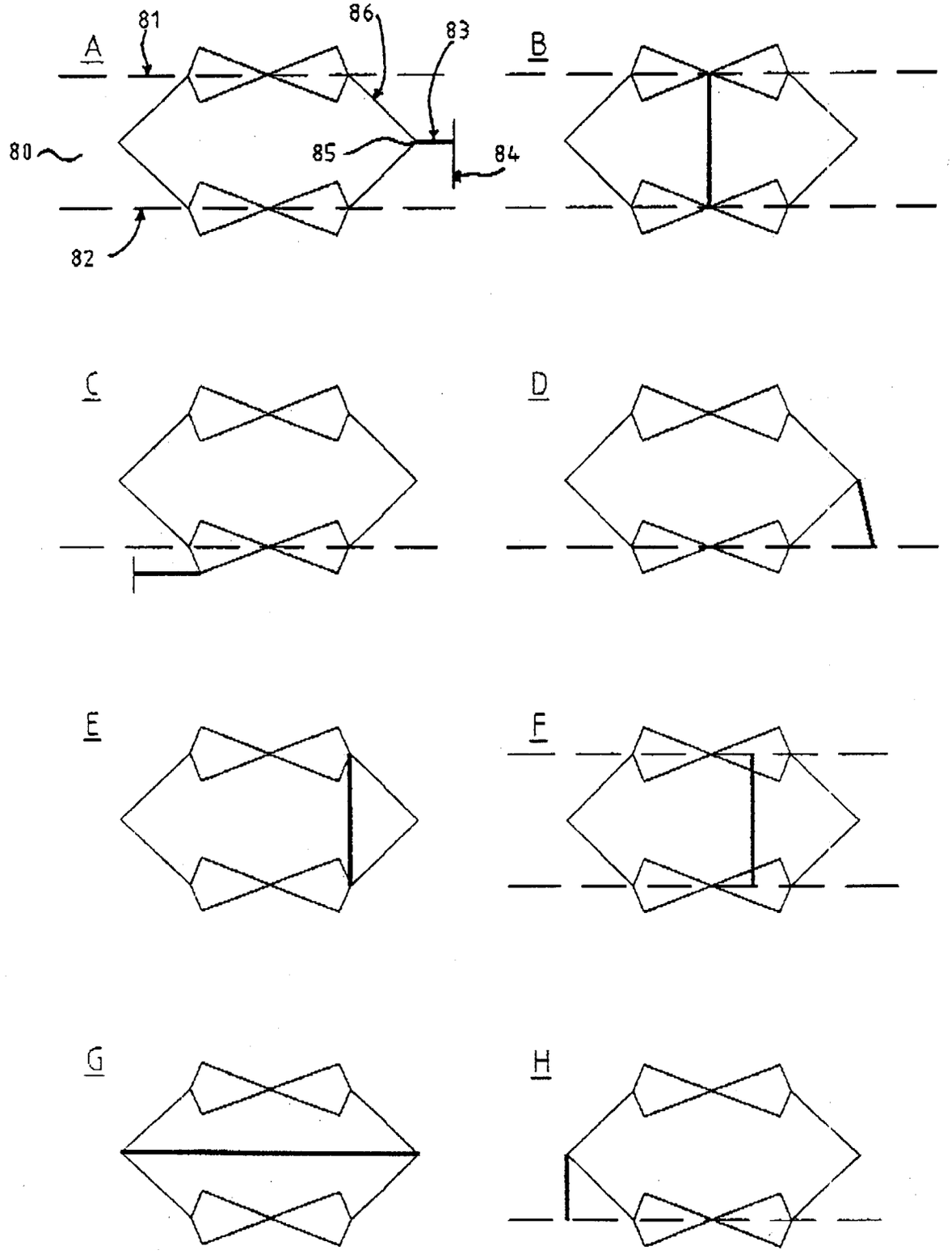


Fig 5

Fig 6



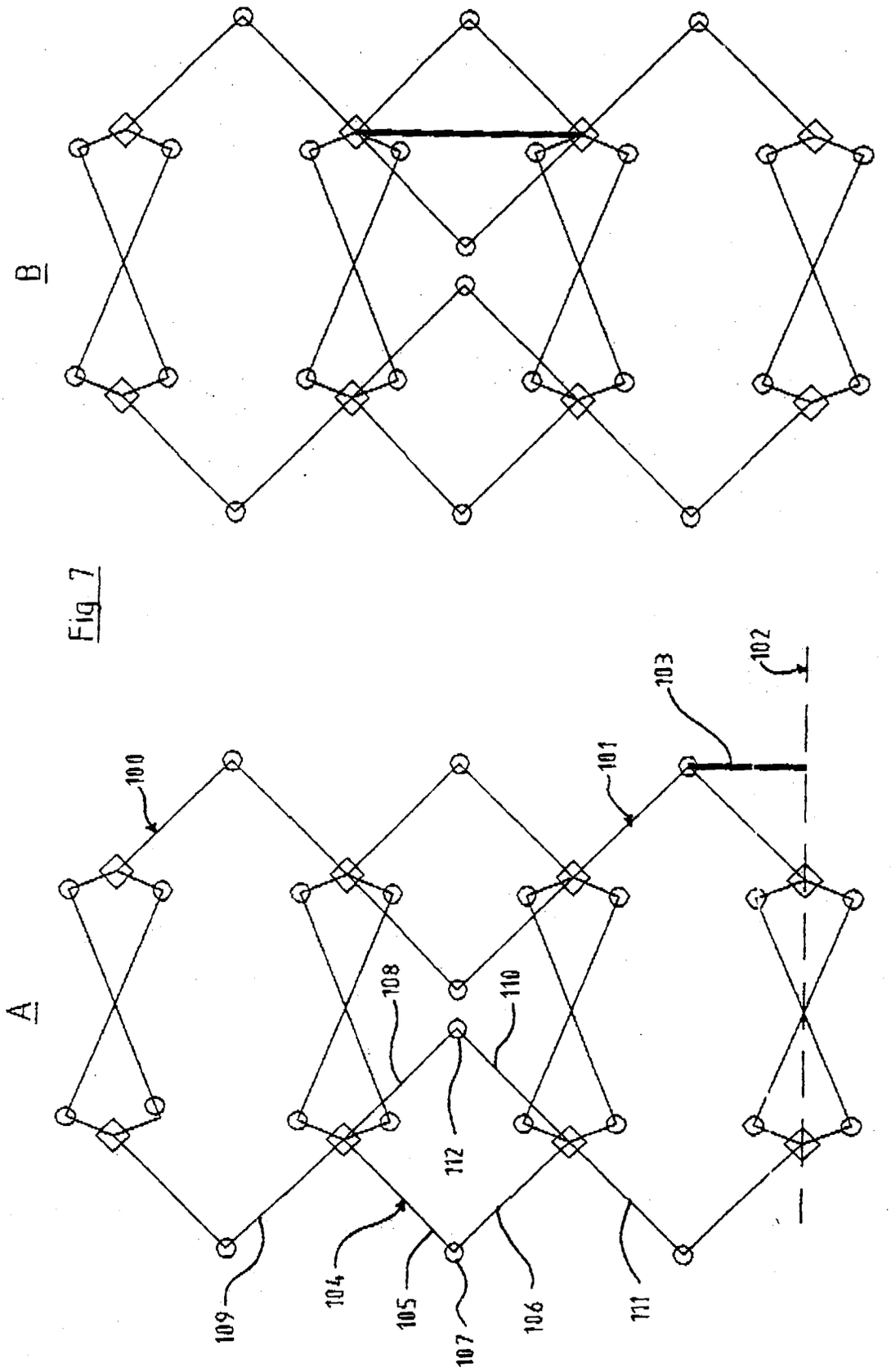


Fig 7

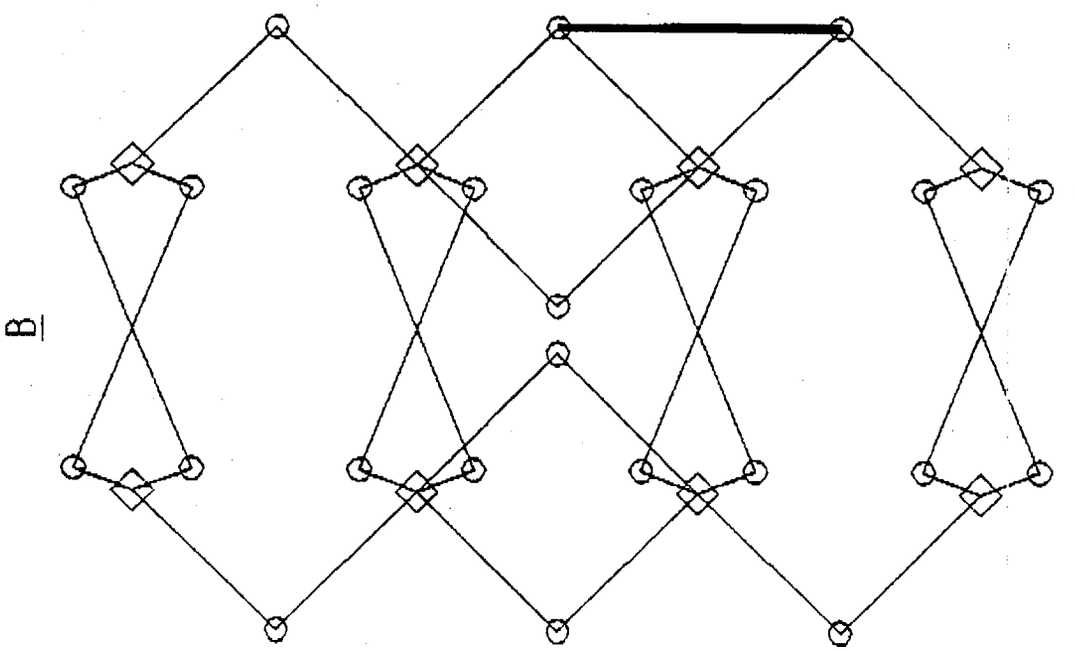
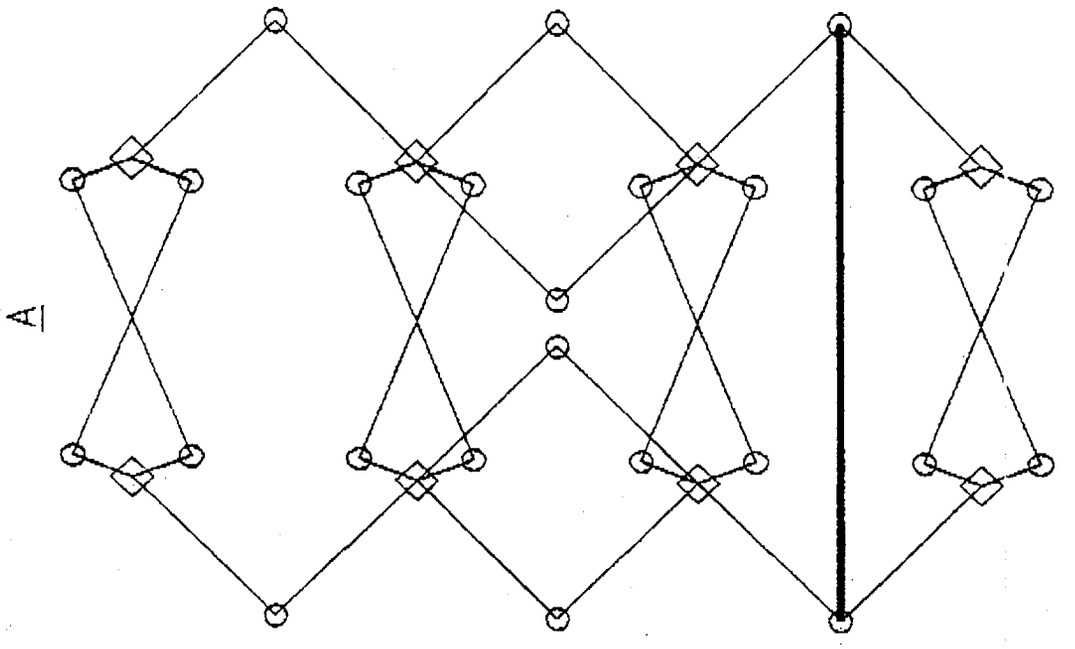
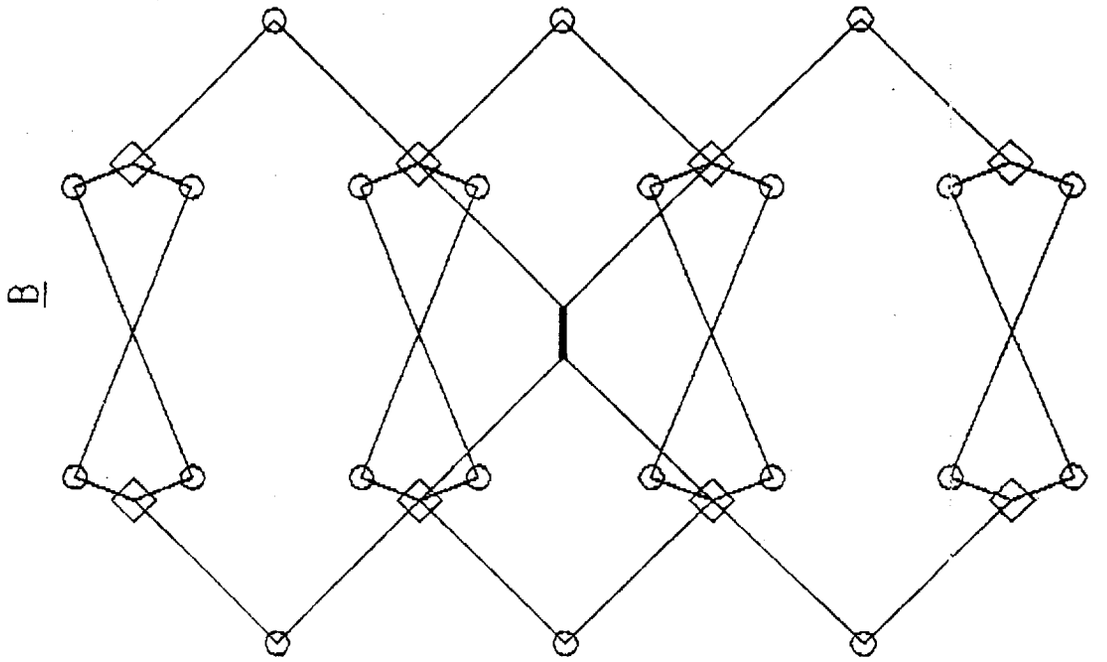


Fig. 8





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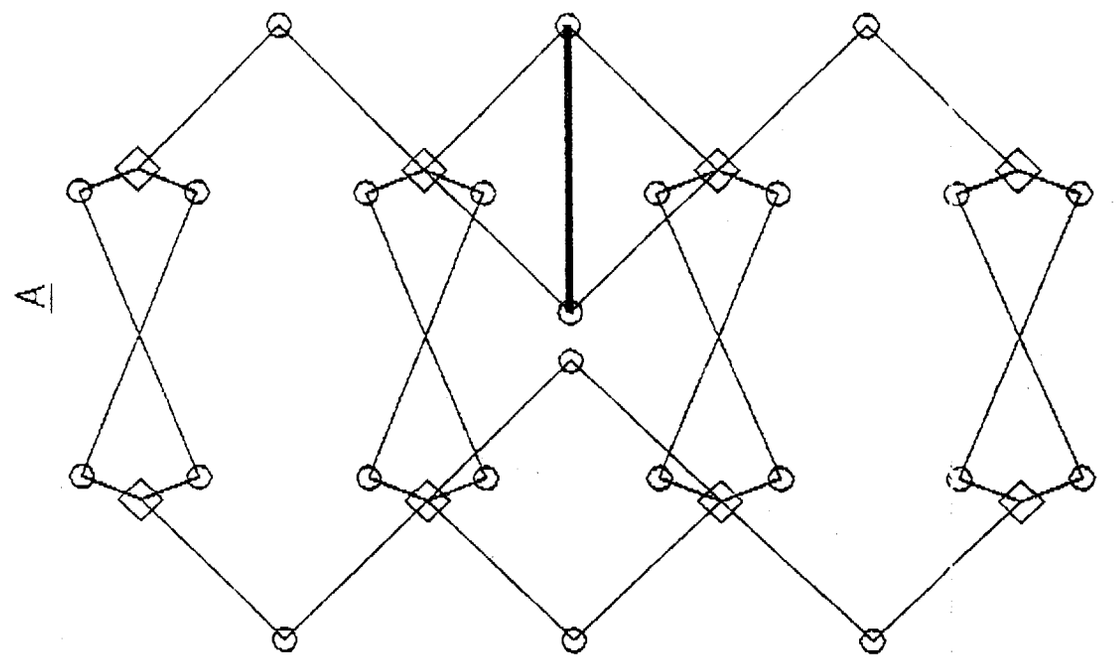

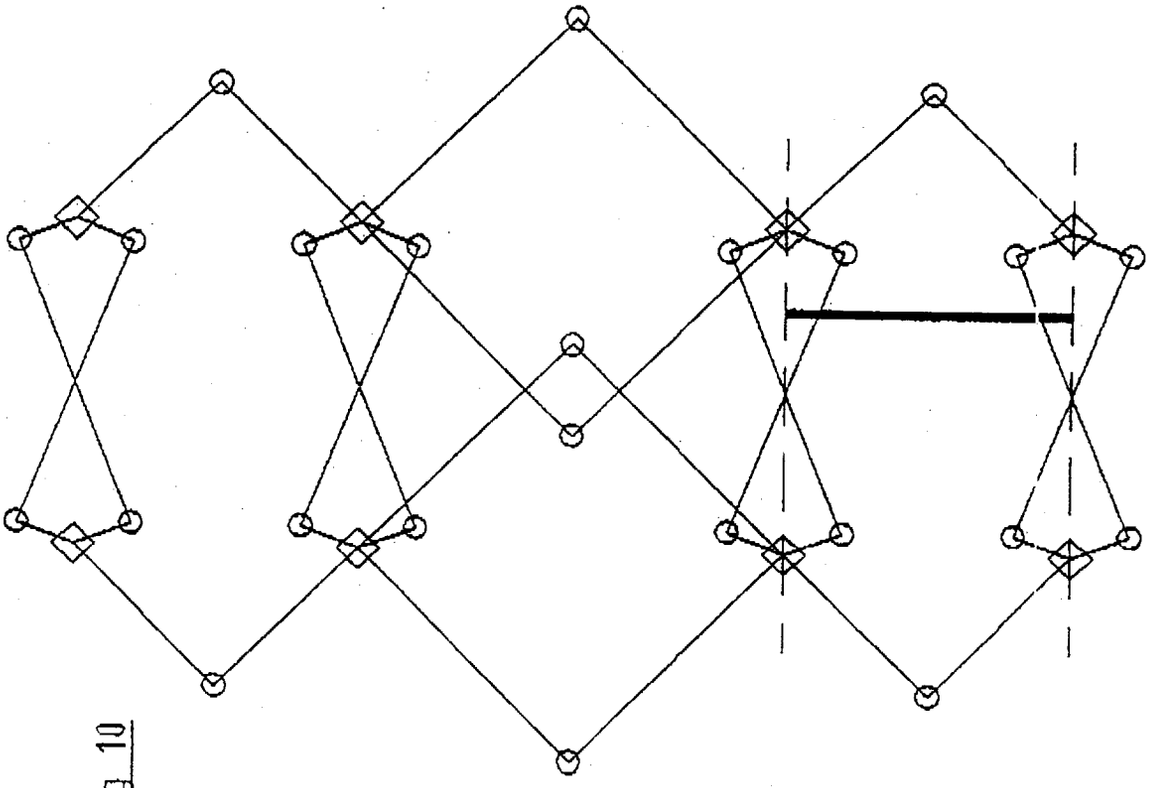

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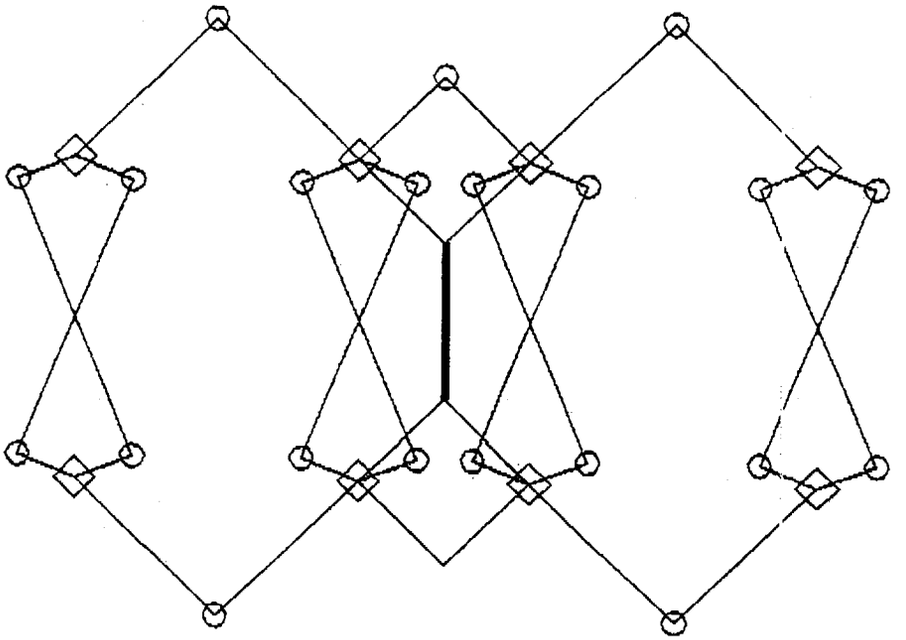

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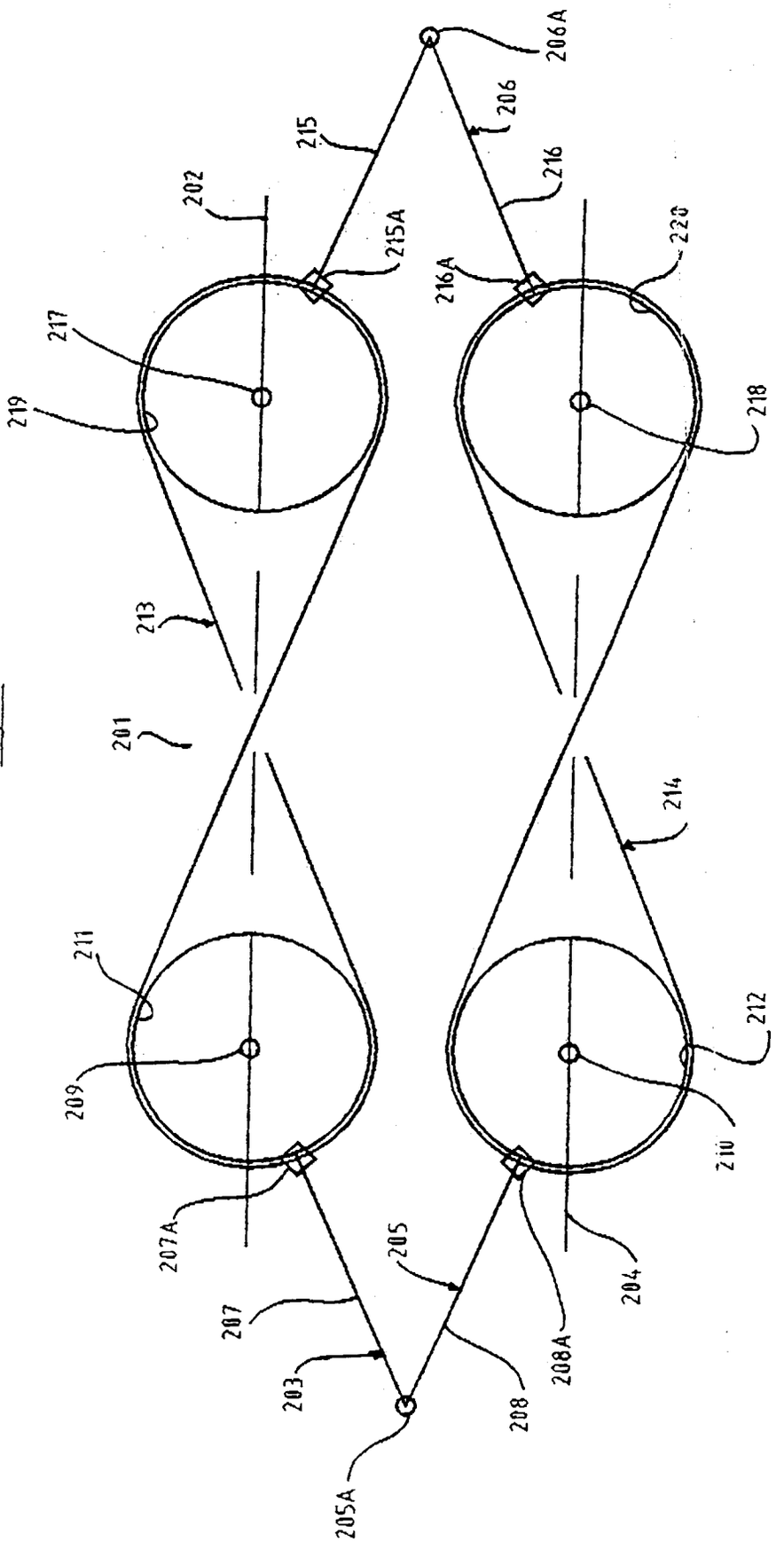
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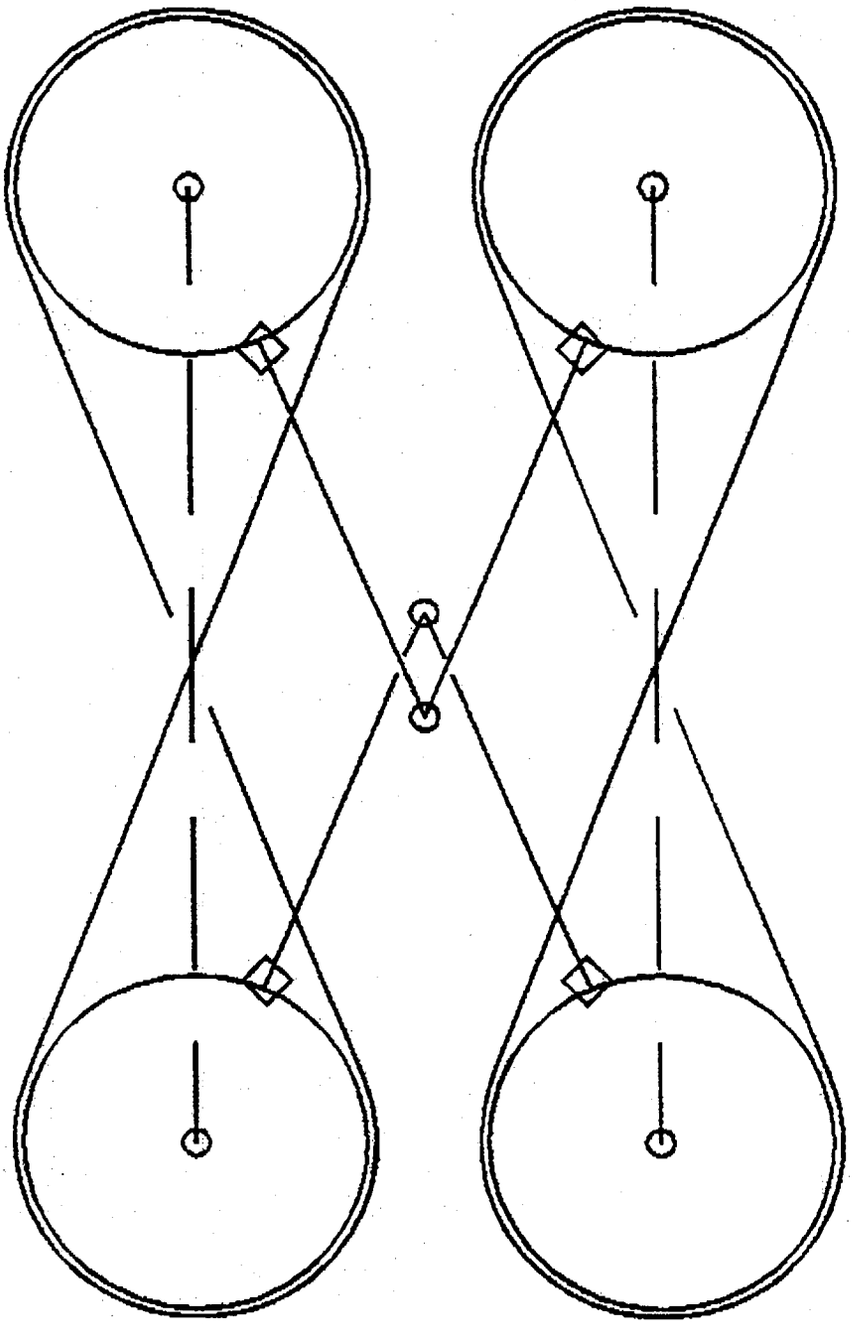
Fig 12



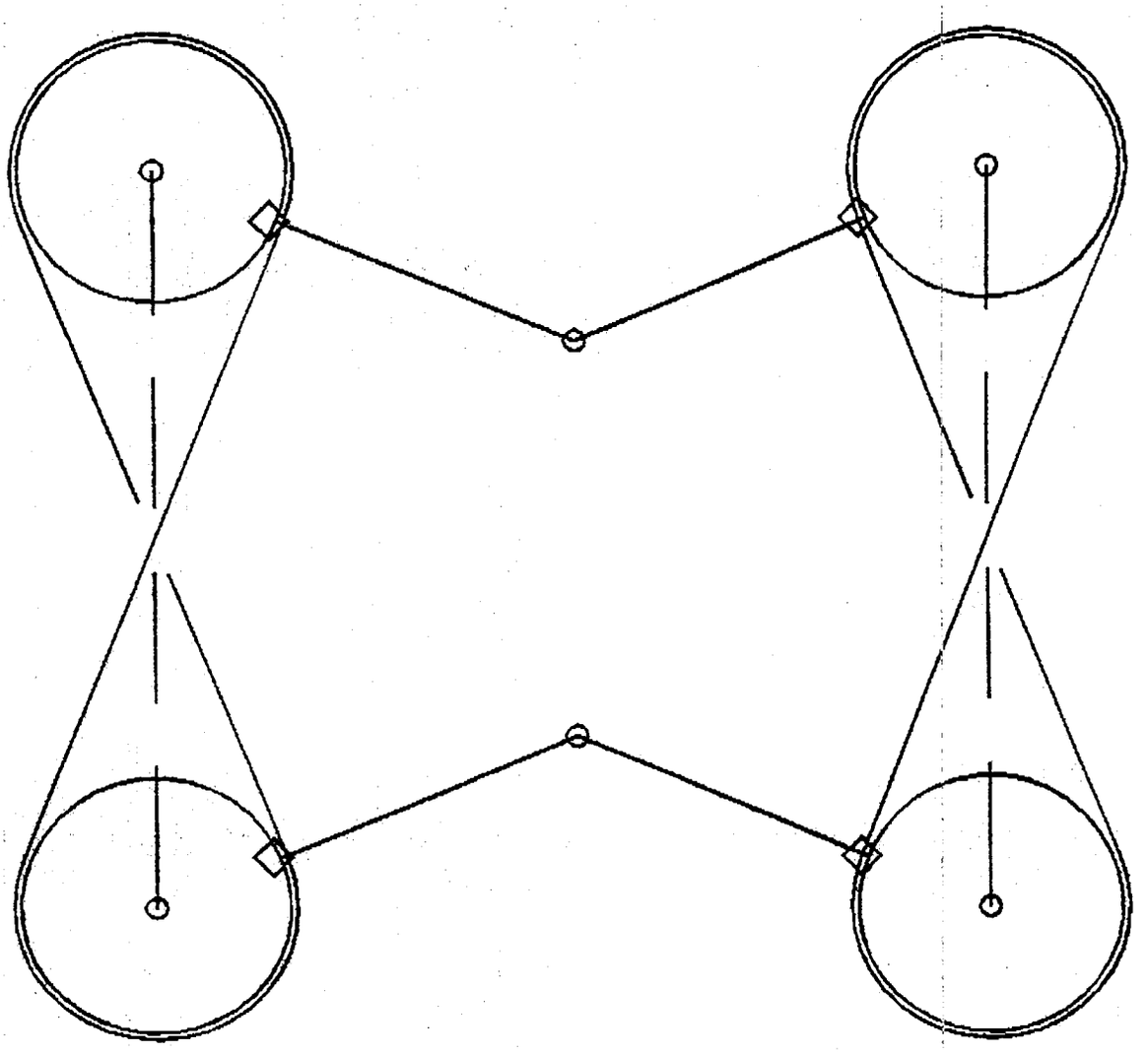


Fig 13

Fig 14

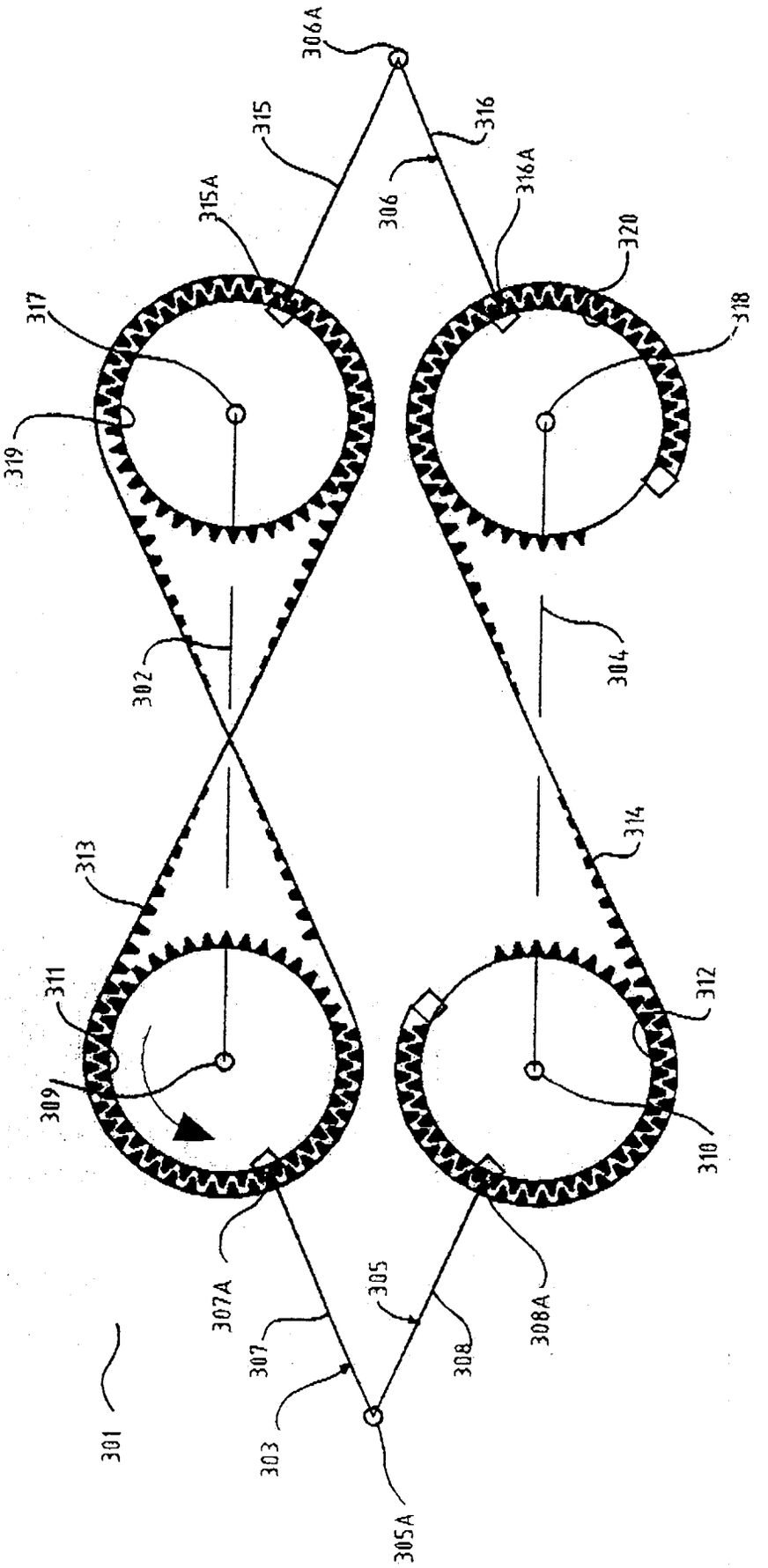

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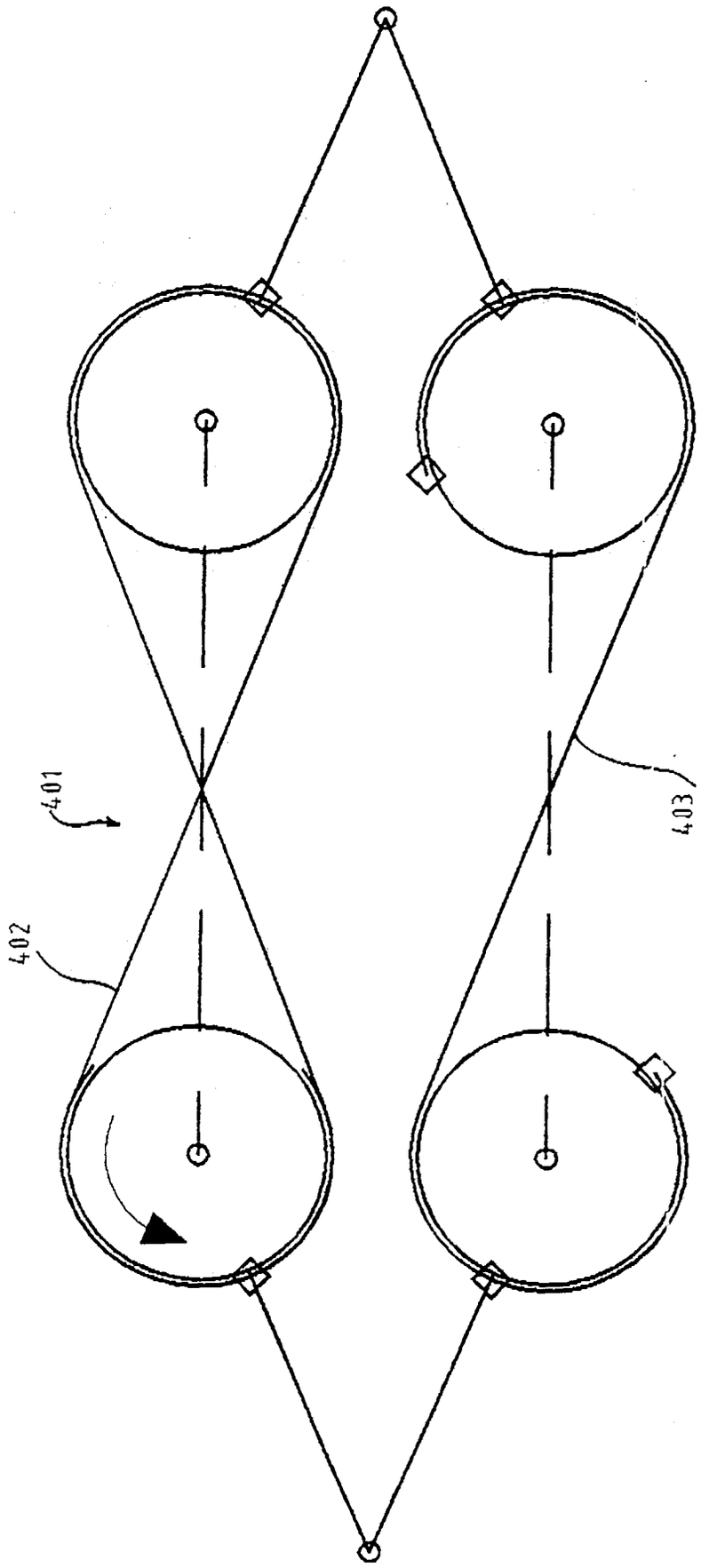
Fig 15



European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 95 11 3794

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	EP-A-0 560 256 (KANAZAWA) * claim 1; figures 1-6 *	1,2,6,7, 13-16	B66F7/06 B66F11/04
A	DE-U-86 31 449 (ZAPF) * claims 1,2,4,5,7; figures 1-3 *	1-3,5,21	
A	DE-U-91 08 825 (LANGEWELLPOTT) * page 3, paragraph 2 - last paragraph; figure 1 *	17,29,30	
A	DE-C-33 15 136 (ANTON RUTHMANN GMBH) * column 4, line 15 - line 21; figures 1,2 *	17,18, 29,30	
A	US-A-4 499 970 (HUSSEY)		
A	FR-A-2 609 975 (S.E.R.A.)		
A	US-A-4 638 610 (HEIKKINEN)		

TECHNICAL FIELDS SEARCHED (Int.Cl.6)
B66F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	15 February 1996	Thomas, C

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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