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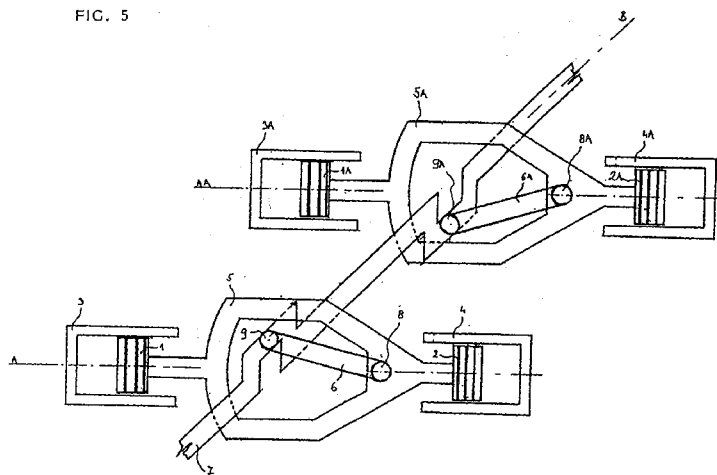
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(54) Title: FIXED WELD OF TWO OPPOSING PISTONS IN A SINGLE AXIS BY DOUBLE BRIDGING

FIG. 5



(57) Abstract: Solid construction weld of two opposing pistons into a single axis using double bridging so that the axis of linked (connected) pistons intersect the axis of crankshaft at right angle and the crankshaft rotates inside the bridging. The double bridging, which connects the opposing pistons, circumvents the crankshaft from two sides, while the crankshaft rotates inside the bridging. The invention relates to any two or more internal combustion piston engines, any two or more reciprocating (piston) machinery and equipment using the crank gear. Two fixed pairs of pistons on the axis are connected with the crankshaft via connecting rods. Pairs of pistons are working (functioning) against each other, thereby reducing vibration of the engine in which they are placed. The bridging can go through to axis of the crankshaft due to compression in cylinders. The length of the pistons can be reduced by almost half because two pistons in a fixed connection have high stability.

Designation: *JUSTER-system*

Fixed weld of two opposing pistons in a single axis by double bridging.

Field of technology:

The invention relates to any two or more internal combustion piston engines, any two or more reciprocating (piston) machinery and equipment using the crank gear.

The current situation of engineering technology:

Nowadays engines, machinery and equipment use the construction where each piston has one rod (connecting rod) and its single axis in which it is moving.

Such constructions exhibit uneven lateral (side) friction between piston and cylinder, and eventually it comes to deformation of the cylinder on an elliptical shape and to attrition of sealing rings. It is compensated by the length of the piston which is about the size of cylinder bore. Each piston creates a vibration by its movement independently from the other pistons and by these vibrations it burdens the crankshaft.

Object of the invention is to suppress these adverse (side) effects, reduce friction and vibration.

Description of the invention:

Solid construction weld of two opposing pistons into a single axis using double bridging so that the axis of linked (connected) pistons intersect the axis of crankshaft at right angle and the crankshaft rotates inside the bridging.

The bridging circumvents the crankshaft on both sides, parallel to the axis of connected pistons. The connecting rod is also placed inside the bridging.

Fixed connection of opposing pistons creates more (greater) stability when moving the piston in the cylinder, reducing the unsteadiness of friction between the cylinder and piston. The piston may have a smaller length, because adverse (negative) side forces act simultaneously on both pistons.

Each pair of pistons, firmly connected, has a rod which connects the crankshaft and bridge pistons. The number of connecting (piston) rod bearings is thus reduced to half, compared to constructions used nowadays. The length of the crankshaft is smaller because there is smaller number of connecting (piston) rod bearings. There is also smaller number of crank bearings. For example, it is enough to use three crank bearings for a four-cylinder engine, and therefore two less than used nowadays.

Shortening of crankshaft reduces overall vibration. By reducing the number of bearings and by reducing friction and vibration the service interval is extended and gear efficiency is increased.

Brief description of the drawings:

Further modifications, advantages and uses of the invention also arise (result) from the following description of an example implementation and the picture. Same time, the subject of this invention forms all properties separately or in any combination described and/or shown figuratively, independently of their summary in requirements or their withdrawal.

Shown schematically:

- Picture no. 1: Schematic illustration of fixed connection of opposing pistons by double bridging, rod storage inside the bridge and connection to the crankshaft.
- Picture no. 2: Schematic illustration of picture no. 1 rotated 90 degrees to the position of the crankshaft at top dead center and pistons in center.
- Picture no. 3: Schematic illustration of picture no. 1 rotated 90 degrees to the position of the crankshaft at the side of dead center and pistons on the edge. The crankshaft is at compressive position.
- Picture no. 4: Schematic illustration of crankshaft storage in the bridging. Crankshaft is at top dead center, pistons in center.
- Picture no. 5: Schematic illustration of *JUSTER – system* in four - cylinder version.

Exemplary embodiment of the invention:

For example, currently used horizontal flat four - cylinder BOXER engine has cylinders stored against each other, two on each side but not on the same axis. Each piston moving in a cylinder has its own separate axis movement and a separate rod. Thus, four pistons, four connecting rods, five crank bearings.

Schematic design of *JUSTER - system* of a flat four – cylinder internal combustion BOXER engine which will shorten the crankshaft 7 and embed it into three crank bearings is shown in figure 5. Therefore, the number of rods will be reduced from four (used nowadays) to two 6 and 6A.

Two fixed pairs of pistons, 1 and 2 on the axis A + 1A and 2A on the axis AA, are connected with the crankshaft 7 via connecting rods 6 and 6A. Pairs of pistons are working (functioning) against each other, similarly as in the Boxer engine, thereby reducing vibration of the entire engine.

The total width of the engine will increase only slightly because the bridging 5 can go through to axis of the crankshaft B due to compression in cylinders 4 and 4A. The bridging 5 can also go with its part into the cylinder space 4 and 4A. The length of the pistons can be reduced by almost half because two pistons in a fixed connection have high stability.

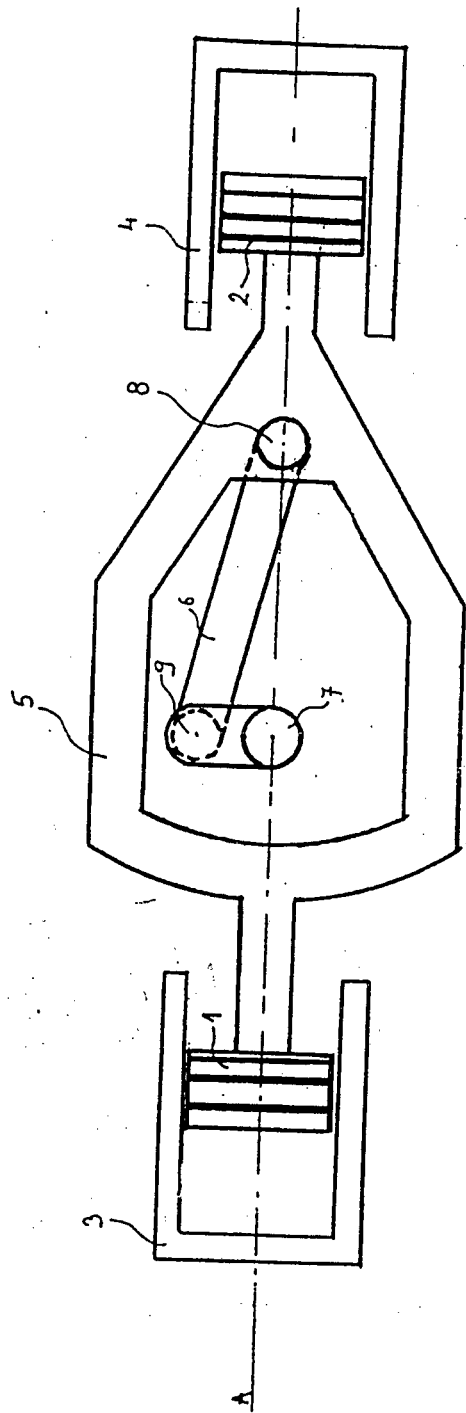
The number of pairs of pistons can be increased, preferably after double. For example, eight - cylinder engine will have half the crankshaft when using the *JUSTER - system* compared to the eight - cylinder inline engine.

The reference sings (list of marks):

<u>1</u>	PISTON
<u>1A</u>	PISTON
<u>2</u>	PISTON
<u>2A</u>	PISTON
<u>3</u>	CYLINDER
<u>3A</u>	CYLINDER
<u>4</u>	CYLINDER
<u>4A</u>	CYLINDER
<u>5</u>	DOUBLE BRIDGING
<u>5A</u>	DOUBLE BRIDGING
<u>6</u>	ROD (PISTON ROD)
<u>6A</u>	ROD (PISTON ROD)
<u>7</u>	CRANKSHAFT
<u>8</u>	CONNECTING ROD BEARING
<u>8A</u>	CONNECTING ROD BEARING
<u>9</u>	CONNECTING ROD BEARING
<u>9A</u>	CONNECTING ROD BEARING
<u>A</u>	AXIS OF FIXED CONNECTED PISTONS <u>1</u> and <u>2</u>
<u>AA</u>	AXIS OF FIXED CONNECTED PISTONS <u>1A</u> and <u>2A</u>
<u>B</u>	CRANKSHAFT AXIS

The patent claims:

1. Fixed weld (connection) of two opposing pistons (1) and (2) in a single axis (A) by double bridging (5), in all two or more internal combustion piston engines, in all two or more reciprocating (piston) machinery and equipment using the crank gear.
2. Two opposing pistons (1) and (2) wherein they are rigidly connected to one single axis (A).
3. The location of a firmly connected pistons (1) and (2) wherein the piston axis (A) intersects the axis of crankshaft (B) at a right angle.
4. Double bridging (5) which connects the opposite pistons (1) and (2) wherein it circumvents the crankshaft (7) from two sides while the crankshaft (7) rotates inside the bridging (5).
5. Storage of the rod (6) inside the double bridging (5) wherein the rod (6) connects bridging (5) and crankshaft (7).
6. Transmission of motion from two opposing pistons (1) and (2) wherein the transmission passes on to the crankshaft (7) by using one rod (6) (connecting rod).
7. Quantitative relationship between two opposing pistons and connecting rod wherein two opposing pistons require only one rod.



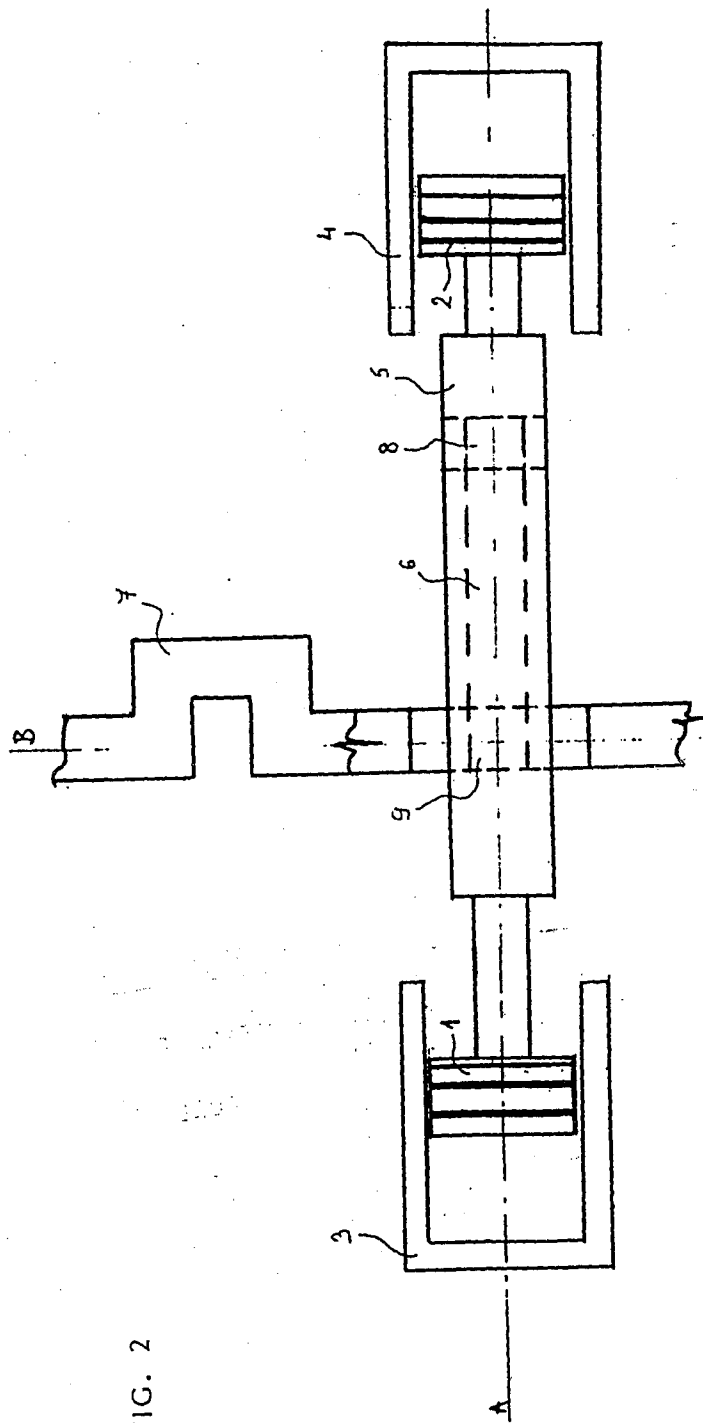
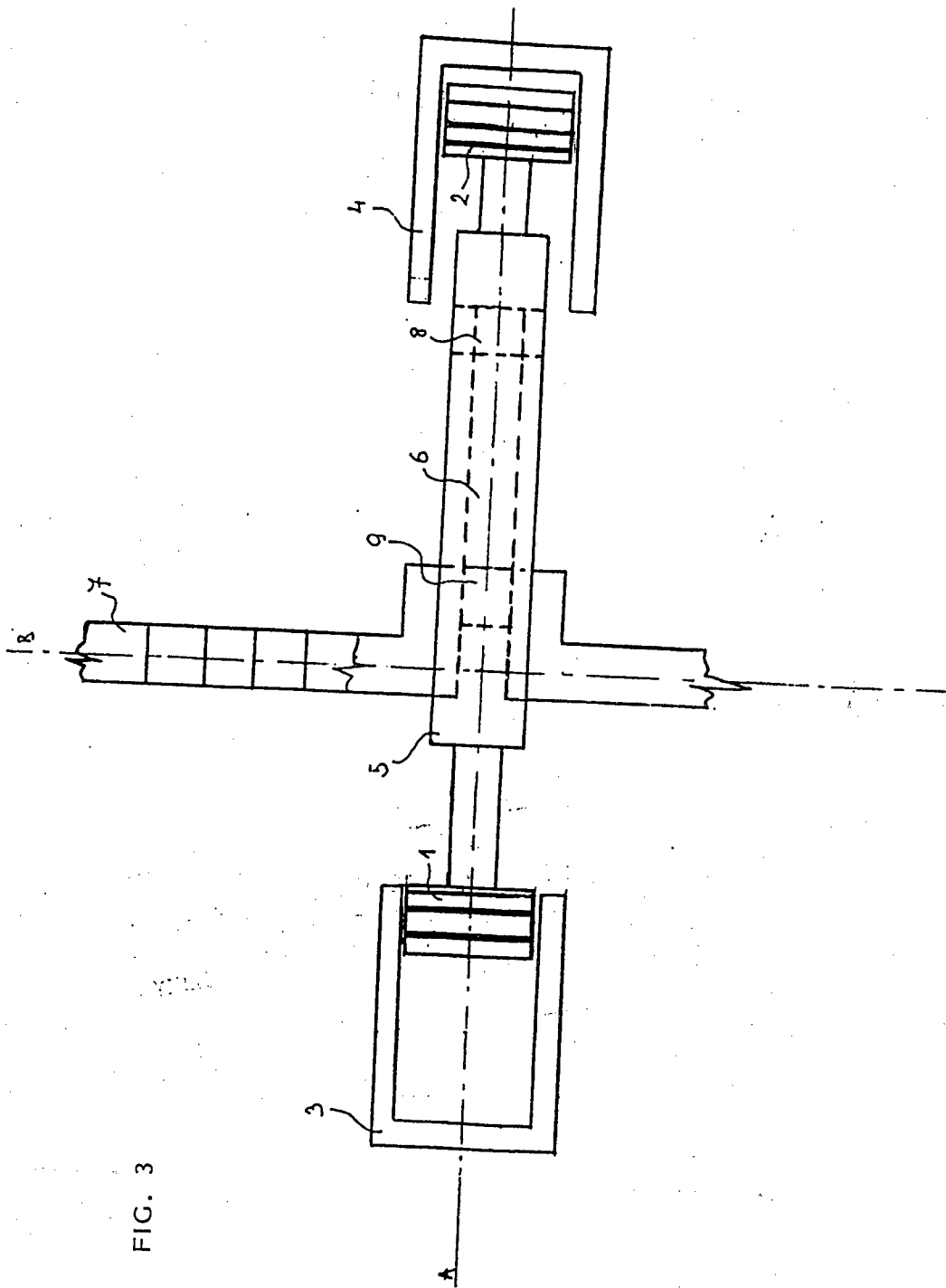


FIG. 2



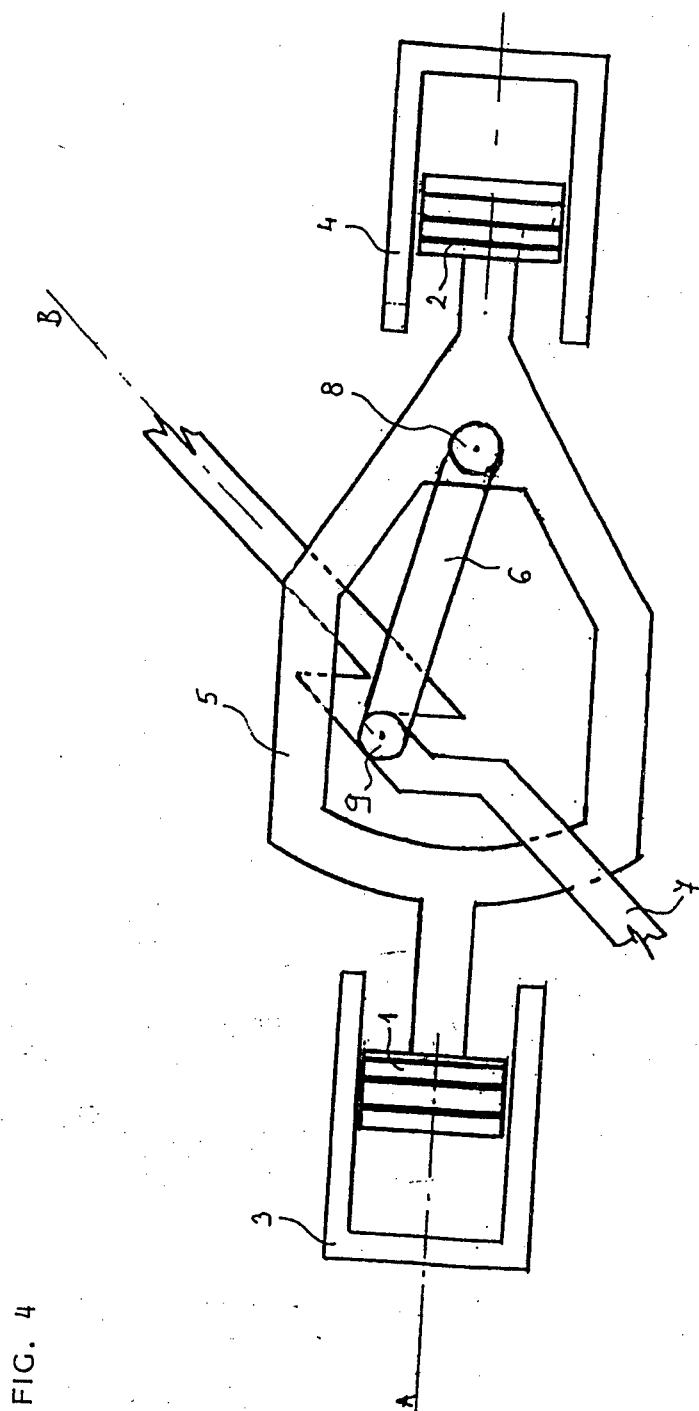
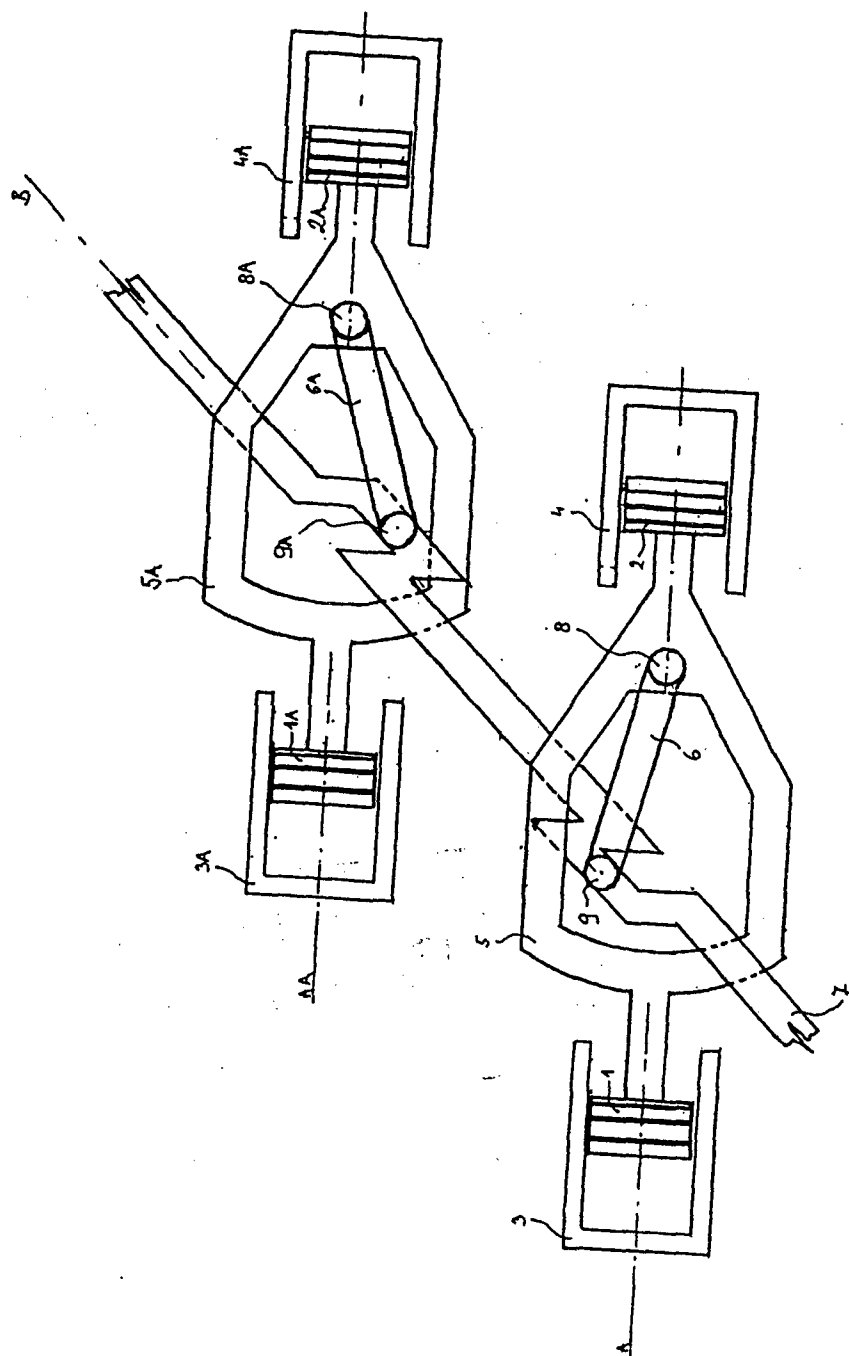


FIG. 4

FIG. 5



INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER
INV. F02B75/24 F01B9/02
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
F02B F01B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3 200 800 A (DU BOIS FRANCOIS M) 17 August 1965 (1965-08-17) figures 1-6	1-7
X	GB 280 795 A (FREDERICK HAYDEN GREEN) 24 November 1927 (1927-11-24) figures 1-4	1-7
X	US 999 518 A (PECK FREDERICK W [US]) 1 August 1911 (1911-08-01) figures 1-4	1-7
X	US 2 310 733 A (AUSTIN DUKE CHARLES) 9 February 1943 (1943-02-09) figures 1-3	1-7
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Further documents are listed in the continuation of Box C.



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Name and mailing address of the ISA/

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INTERNATIONAL SEARCH REPORT

International application No
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
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X	WO 89/06303 A1 (WAAL H P BV [NL]) 13 July 1989 (1989-07-13) figures 1-8 -----	1-7
X	EP 1 225 332 A1 (HAUG AG FRITZ [CH]) 24 July 2002 (2002-07-24) figures 1-4 -----	1-7

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 3200800	A	17-08-1965	NONE
GB 280795	A	24-11-1927	NONE
US 999518	A	01-08-1911	NONE
US 2310733	A	09-02-1943	NONE
WO 8906303	A1	13-07-1989	AU 2925289 A 01-08-1989 DE 68907807 T2 10-02-1994 EP 0348485 A1 03-01-1990 NL 8800036 A 01-08-1989 US 5123334 A 23-06-1992 WO 8906303 A1 13-07-1989 ZA 8900142 A 27-12-1989
EP 1225332	A1	24-07-2002	NONE