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(71) Applicant: **Suzuki Motor Corporation**
Hamamatsu-shi, Shizuoka 432-8611 (JP)

(72) Inventor: **ITO, Akira**
Hamamatsu-shi, 432-8611 (JP)

(74) Representative: **Haseltine Lake Kempner LLP**
Cheapside House
138 Cheapside
London EC2V 6BJ (GB)

(54) **CONTROL DEVICE OF INTERNAL COMBUSTION ENGINE**

(57) [Object]

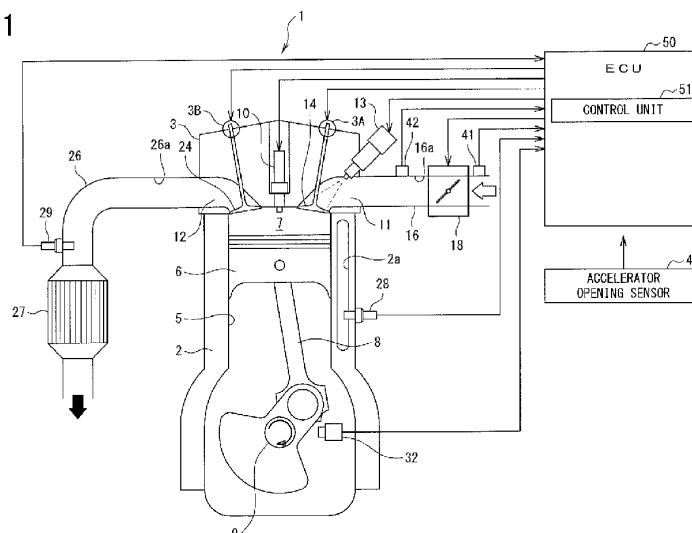
It is to provide a control device of an internal combustion engine capable of efficiently starting the internal combustion engine at a recovery from a fuel cut.

[Solution]

There are provided: cylinders 5; an intake variable valve mechanism 3A to change valve opening and closing characteristics of intake valves 14 of the cylinders; an exhaust variable valve mechanism 3B to change valve opening and closing characteristics of exhaust valves 24

of the cylinders; and a control unit 51 to perform an exhaust introduction control of respectively closing and opening, while a fuel-supply to the cylinder(s) is stopped, the intake and exhaust valves using the intake and exhaust variable valve mechanisms. If there is an all-cylinders fuel cut request for stopping the fuel-supply to all the cylinders, the control unit introduces a fresh air into all the cylinders and thereafter, performs the exhaust introduction control.

FIG. 1





EUROPEAN SEARCH REPORT

Application Number

EP 23 18 3258

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	US 2013/255606 A1 (NISHIKIORI TAKASHI ET AL) 3 October 2013 (2013-10-03)	1	INV.
A	* abstract *; figures 2,3, 6-12 * * paragraphs [0011] - [0016], [0061] - [0079], [0094], [0095], [0098] *	3	F02D41/00 F02D13/06 F02D13/02 F02D41/12 F02D17/02
Y	US 2017/306893 A1 (LEONE THOMAS G ET AL) 26 October 2017 (2017-10-26)	1	
A	* abstract *; figures 1,4-8 * * paragraphs [0084] - [0091] *	3	
A	US 2015/083073 A1 (NAGATSU KAZUHIRO ET AL) 26 March 2015 (2015-03-26) * abstract *; figures 5-10 * * paragraphs [0005] - [0011], [0042] - [0046], [0055], [0086] - [0103] *	1,3	
A	US 2018/171884 A1 (ULREY JOSEPH NORMAN ET AL) 21 June 2018 (2018-06-21) * abstract *; figures * * paragraphs [0115], [0117], [0122], [0142] - [0148], [0243] - [0247] *	1,3	TECHNICAL FIELDS SEARCHED (IPC)
A	US 2017/114735 A1 (SCHEIDT MARTIN ET AL) 27 April 2017 (2017-04-27) * abstract *; figures * * paragraphs [0007] - [0013], [0024] - [0026], [0032] - [0035] *	1,3	F02D F02M
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 14 August 2024	Examiner Döring, Marcus
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO.

EP 23 18 3258

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

14-08-2024

	Patent document cited in search report	Publication date	Patent family member(s)	Publication date
10	US 2013255606 A1	03-10-2013	CN 103189621 A	03-07-2013
15			EP 2634397 A1	04-09-2013
			JP 5382236 B2	08-01-2014
			JP WO2012056535 A1	20-03-2014
			US 2013255606 A1	03-10-2013
			WO 2012056535 A1	03-05-2012

20	US 2017306893 A1	26-10-2017	CN 107313868 A	03-11-2017
			DE 102017108734 A1	26-10-2017
			RU 2017110658 A	03-10-2018
			US 2017306893 A1	26-10-2017

25	US 2015083073 A1	26-03-2015	CN 104454176 A	25-03-2015
			DE 102014013880 A1	26-03-2015
			JP 6268864 B2	31-01-2018
			JP 2015063940 A	09-04-2015
			US 2015083073 A1	26-03-2015

30	US 2018171884 A1	21-06-2018	CN 108204287 A	26-06-2018
			DE 102017129977 A1	21-06-2018
			RU 2017140837 A	23-05-2019
			US 2018171884 A1	21-06-2018

35	US 2017114735 A1	27-04-2017	CN 106164450 A	23-11-2016
			DE 102014206305 A1	08-10-2015
			EP 3126652 A1	08-02-2017
			KR 20160140848 A	07-12-2016
			US 2017114735 A1	27-04-2017
			WO 2015149765 A1	08-10-2015
40	-----			
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EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82