



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
01.03.2017 Bulletin 2017/09

(51) Int Cl.:
H01H 33/40 (2006.01) **H01H 33/42** (2006.01)
H01H 33/666 (2006.01) **H01H 33/46** (2006.01)

(21) Application number: **15183202.9**

(22) Date of filing: **31.08.2015**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
MA

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(54) **MEDIUM OR HIGH VOLTAGE CIRCUIT BREAKER WITH MODULAR DRIVE**

(57) The invention relates to medium or high voltage circuit breaker for switchgear, with vacuum circuit breaker, with at least one fixed contact and at least one movable contact, driven by a drive, according to the preamble of claim 1. In order to result in a compact form with reasonable prefabrication of circuit breaker drive modules,

and finally with flexibility of arranging such drive modules, the invention is, that the drive is embellished as modular drive, and that the modular drive consist of modules, which are combinable in such, that the modular drive is adaptable to at least different circuit breaker ratings and pole distances.

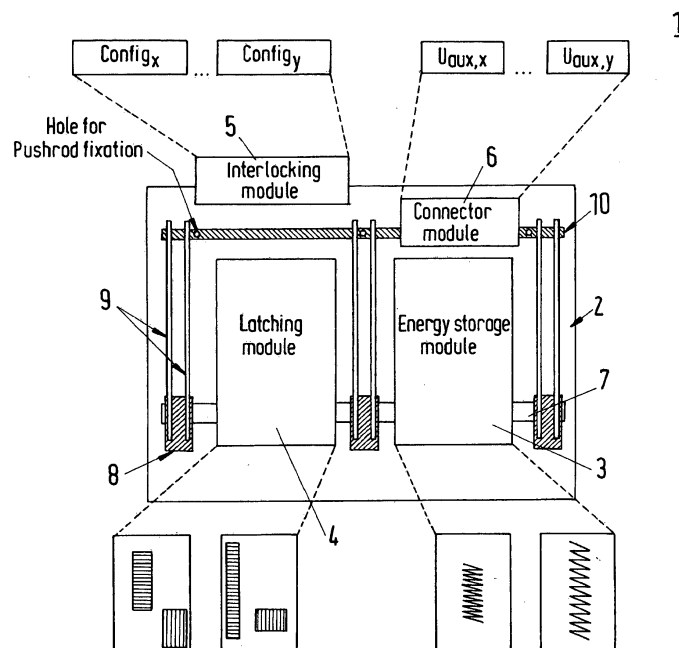


Fig.1

Description

[0001] The invention relates to medium or high voltage circuit breaker for gas insulated switchgear, with vacuum circuit breaker, with at least one fixed contact and at least one movable contact, driven by a drive, according to the preamble of claim 1.

[0002] In general such medium voltage vacuum circuit breakers mainly consist of a drive mechanism and electric poles. Vacuum interrupters are installed within the poles, such vacuum interrupters have at least one fixed contact and at least one movable contact. The movable contact is actuated, that means driven between open and closed relative contact position. The poles provide the mechanical support to the vacuum interrupters. The poles are fixed to the circuit breaker structure and therewith to the gas-insulated switchgear panel. The drive is connected to the vacuum interrupters via pushrods which drive the mechanical movement of the switching contacts inside the vacuum interrupters.

Traditional drives of medium/ high voltage circuit breakers are based on mechanical spring, electromagnetic, pneumatic or hydraulic energy storage mechanisms. Especially in circuit breakers with mechanical spring drive the parts of functional groups like energy storage-, latching-, releasing- and interlocking mechanism transmission parts and electrical connectors are more or less distributed within the drive housing.

[0003] Resulting disadvantages for such well known circuit breakers are,

- Too many variants, no construction kit setup, high effort on logistics, warehousing, first part inspection, etc.
- No reasonable prefabrication/ testing/ storage of circuit breaker elements possible.
- High effort on training and instruction of production and maintenance staff.
- Production of high variant of circuit breakers on stock instead of few prefabricated drive modules.
- High production time and costs.
- Production of drive and circuit breaker linked to one factory only instead of flexible production sites of drive modules and assembly of circuit breaker afterwards.

[0004] Well known circuit breaker like that are disclosed for example in DE 199 36 986 A1.

[0005] So it is the object of the invention, to overcome these disadvantages in a compact form with reasonable prefabrication of circuit breaker drive modules, and finally with flexibility of arranging such drive modules.

[0006] The invention is implemented in the feature

combination of claim 1.

[0007] Further advantageous embodiments are disclosed in the depending claims.

[0008] In order to overcome the aforesaid disadvantages and to fulfill the above mentioned object, the invention is, that the drive is embellished as modular drive, and that the modular drive consist of modules, which are combinable in such, that the modular drive is adaptable to at least different circuit breaker ratings and pole distances.

[0009] The aforesaid successive function implementation in the mentioned modules realize the intention of enhancement of manufacture by supporting the prefabrication.

[0010] In a further advantageous embodiment, the drive comprises a separate energy storage module, a latching module, an interlocking module and a connector module, which are interconnected mechanically and functionally successively in such, that the energy storage module and the latching module are mechanically fixed together to the console, and that the connector module is mechanically connected to the interlocking module and the energy storage module.

[0011] In a further advantageous embodiment, the energy storage module comprises a spring, and means for indicating the "spring charged" condition for mechanical charging. So all these mentioned relevant functionality and detection functions are directly and already implemented in the energy storage module.

[0012] In a further advantageous embodiment, the latching module comprises an interlocking mechanism, on/off buttons, and an on/off indicator for indicating the switching status of the circuit breaker.

[0013] In a further advantageous embodiment, the connector module comprises snap switches for charge indication and/or for charging motor control and/or an auxiliary switch, and/or an anti pumping relay and/or plugs to connect the circuit breaker drive to the switchgear panel.

[0014] In a further advantageous embodiment, the auxiliary switch is linked via a tooth wheel segment to the latching module. Thus, no adjustment of the stroke of the auxiliary switch is needed after assembly.

[0015] In a further advantageous embodiment, the energy storage module is linked to the latching module via a main shaft and leverage mechanism.

[0016] In a further advantageous embodiment, the energy storage module is prefabricated in variants of different defined actuation forces, and then placed on the circuit breaker arrangement for defined required actuation force.

[0017] Figure 1 shows an embodiment of the invention, considering all important elements.

[0018] Basical feature of the invention is, to create a modular drive for medium voltage circuit breakers. The modularity follows a defined functionally logical structure of construction. The drive 1 is fixed on a welded console 2. It does not comprise a discrete housing.

[0019] The energy storage module 3 and latching module 4 are screwed to the console 2. The interlocking module 5 is screwed to the latching module 4. The connector module 6 is screwed to the interlocking module 5 and the energy storage module 3.

[0020] The latching module 4 comprises the on/off push buttons, the on/off indicator, the latching and the interlocking release mechanism for on and off switching. The connector module 6 comprises snap switches for charge indication and for charging motor control, an auxiliary switch, the anti-pumping relay and plugs to connect the circuit breaker to the switchgear panel. The auxiliary switch is linked via e.g. a tooth wheel segment to the latching module 4.

[0021] The energy storage module 3, the latching module 4, the interlocking module 5, and connector module 6 are manufactured and stored independently from each other.

[0022] The drive 1 is completed by adding the main shaft 7, the curve disc 8, levers 9, and a coupling rod 10.

[0023] The energy storage module 3 is linked to the latching module 4 via the main shaft 7 and a leverage mechanism. Adapted energy storage, latching and connector and interlocking modules are designed to fulfill the requirements of different circuit breaker types, ratings and configurations.

[0024] Depending on the circuit breaker type and rating different variants of energy storage modules are designed to provide several levels of energy by using springs of several spring characteristics.

[0025] Parts of the latching modules are designed according to the spring which is used in the energy storage modules.

[0026] Connector module variants are designed for different auxiliary voltage levels. Interlocking modules are designed for different types of switchgear to which the circuit breaker is assembled to.

[0027] Thus drives for circuit breakers with different ratings can be composed out of a modular construction system of energy storage, latching, connector and interlocking modules.

[0028] A typical front view embodiment of the invented modular drive is, that the energy storage module is located right hand side of the latching module whereas the connector module is located on top of the energy storage module whereas the interlocking module is located left hand side of the connector module and above the latching module.

[0029] One special embodiment is that a clock spring is used inside the energy storage module.

[0030] Another special embodiment is that a ratcheting mechanism is used for manual and/or motor charging.

Numbering:

[0031]

1 drive

2 welded console
3 energy storage module
4 latching module
5 interlocking module
6 connector module
7 main shaft
8 curve disc
9 levers
10 coupling rod

Claims

1. A medium or high voltage circuit breaker for switchgear, with vacuum circuit breaker, with at least one fixed contact and at least one movable contact, driven by a drive,
characterized in,
that the drive is embellished as modular drive, and **that** the modular drive consist of modules, which are combinable in such, that the modular drive is adaptable to at least different circuit breaker ratings and pole distances.
2. A medium or high voltage circuit breaker according to claim 1,
characterized in,
that the drive comprises a separate energy storage module, a latching module, an interlocking module and a connector module, which are interconnected mechanically and functionally successively in such, that the energy storage module and the latching module are mechanically fixed together to the console, and that the connector module is mechanically connected to the interlocking module and the energy storage module.
3. A medium or high voltage circuit breaker according to claim 1 or 2,
characterized in,
that the energy storage module comprises a spring, and means for indicating the "spring charged" condition for mechanical charging.
4. A medium or high voltage circuit breaker according to claim 1, or 2, or 3
characterized in,
that the latching module comprises an interlocking mechanism, on/off buttons, an on/off indicator for indicating the switching status of the circuit breaker.
5. A medium or high voltage circuit breaker according to one of the aforesaid claims 1 to 4,
characterized in,
that the connector module comprises snap switches for charge indication and/or for charging motor control and/or an auxiliary switch, and/or an anti pumping relay and/or plugs to connect the circuit breaker

to the switchgear panel.

6. A medium or high voltage circuit breaker according to claim 5,
characterized in, 5
that the auxiliary switch is linked via a tooth wheel segment to the latching module.
7. A medium or high voltage circuit breaker according to one of the aforesaid claims, 10
characterized in,
that the energy storage module is linked to the latching module via a main shaft and leverage mechanism. 15
8. A medium or high voltage circuit breaker according to one of the aforesaid claims,
characterized in,
that the energy storage module is prefabricated for the use of different defined actuation forces, and then 20
placed on the circuit breaker arrangement for defined required actuation force.

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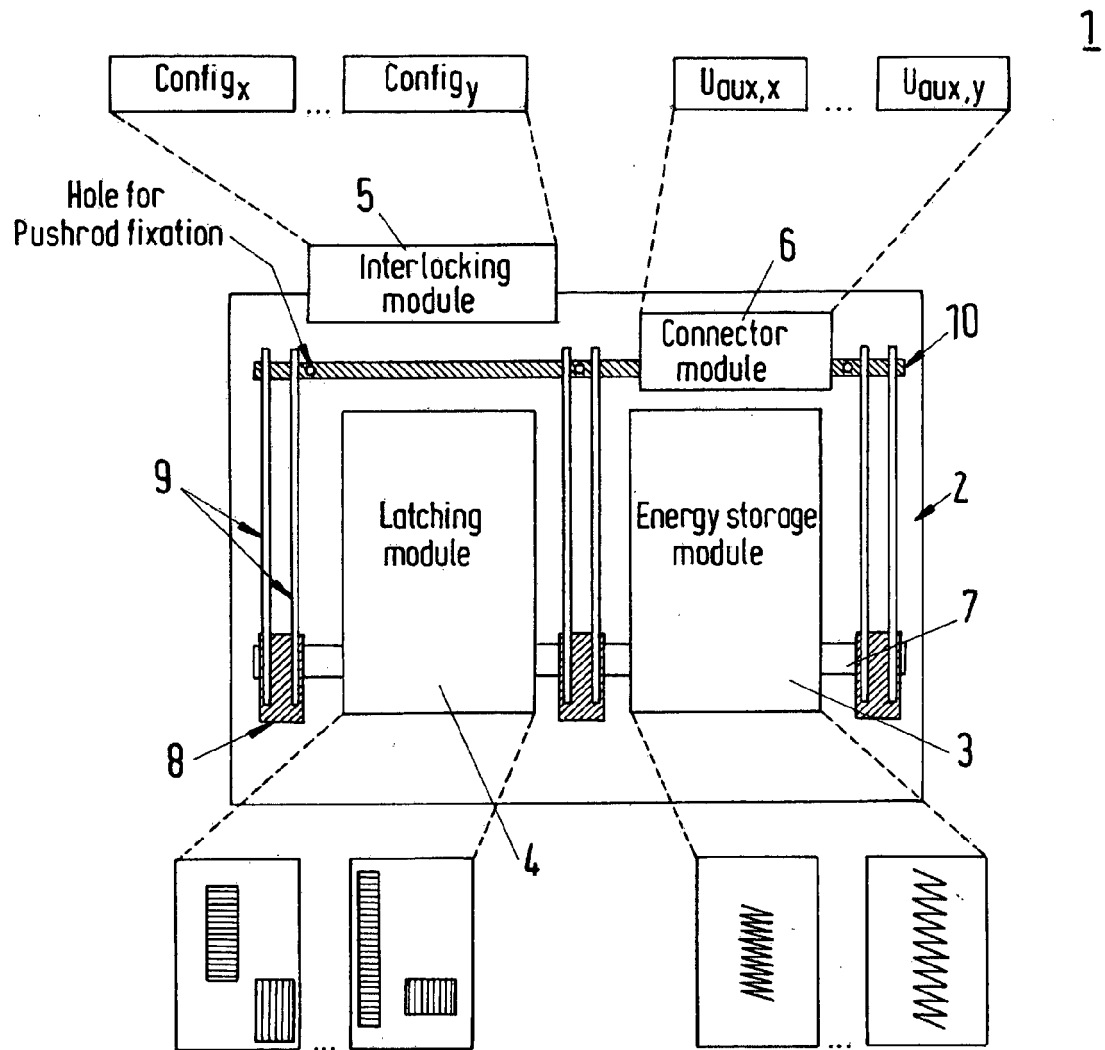


Fig.1



EUROPEAN SEARCH REPORT

 Application Number
 EP 15 18 3202

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EPO FORM 1503 03.82 (P04C01)

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 1 998 347 A1 (EATON CORP [US]) 3 December 2008 (2008-12-03) * abstract; figures 1-10 * -----	1-8	INV. H01H33/40 H01H33/42 H01H33/666
X	WO 01/50561 A1 (EATON CORP [US]) 12 July 2001 (2001-07-12) * abstract; figures 1-6 *	1	ADD. H01H33/46
A	DE 10 2008 026798 B3 (SIEMENS AG [DE]) 30 July 2009 (2009-07-30) * abstract; figures 1-4 *	2-8	
A	DE 10 2008 026798 B3 (SIEMENS AG [DE]) 30 July 2009 (2009-07-30) * abstract; figures 1-4 *	1-8	
A	US 2015/021298 A1 (SAWADA MASASHI [JP] ET AL) 22 January 2015 (2015-01-22) * abstract; figures 1-4 *	1-8	
A	DE 10 2012 008200 A1 (ABB TECHNOLOGY AG [CH]) 31 January 2013 (2013-01-31) * abstract; figures 1-2 * -----	1-8	
			TECHNICAL FIELDS SEARCHED (IPC)
			H01H
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 23 February 2016	Examiner Rucha, Johannes
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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 15 18 3202

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1998347 A1	03-12-2008	CN 101425405 A	06-05-2009
		EP 1998347 A1	03-12-2008
		US 2008296137 A1	04-12-2008
WO 0150561 A1	12-07-2001	AU 765671 B2	25-09-2003
		AU 2211901 A	16-07-2001
		BR 0016977 A	15-10-2002
		CA 2395661 A1	12-07-2001
		CN 1415129 A	30-04-2003
		DE 60004105 D1	28-08-2003
		DE 60004105 T2	22-04-2004
		EP 1245066 A1	02-10-2002
		ES 2202207 T3	01-04-2004
		US 6362445 B1	26-03-2002
		WO 0150561 A1	12-07-2001
DE 102008026798 B3	30-07-2009	CN 102047362 A	04-05-2011
		DE 102008026798 B3	30-07-2009
		EP 2283500 A1	16-02-2011
		ES 2554514 T3	21-12-2015
		US 2011073453 A1	31-03-2011
		WO 2009147032 A1	10-12-2009
US 2015021298 A1	22-01-2015	BR 102014017597 A2	06-10-2015
		CN 104299837 A	21-01-2015
		JP 2015023685 A	02-02-2015
		KR 20150010578 A	28-01-2015
		SG 10201404153P A	27-02-2015
		US 2015021298 A1	22-01-2015
DE 102012008200 A1	31-01-2013	CN 102903547 A	30-01-2013
		DE 102012008200 A1	31-01-2013
		WO 2013013774 A2	31-01-2013

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- DE 19936986 A1 [0004]