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Grunert

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[54] **GAS COOLED ELECTRICAL CONTACTOR**

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[52] **U.S. Cl.** ..... **200/166 K,** 174/16 R

[51] **Int. Cl.** **H01h 1/62**

[58] **Field of Search** ..... 200/166 K, 148 A; 317/100; 174/16 R

[56] **References Cited**

UNITED STATES PATENTS

2,741,735	4/1956	Wasserrals	200/166 K
2,993,971	7/1961	Pflanz	200/166 K X
2,824,939	2/1958	Claybourn et al.	200/166 K
3,088,013	4/1963	Watson	200/166 K X

FOREIGN PATENTS OR APPLICATIONS

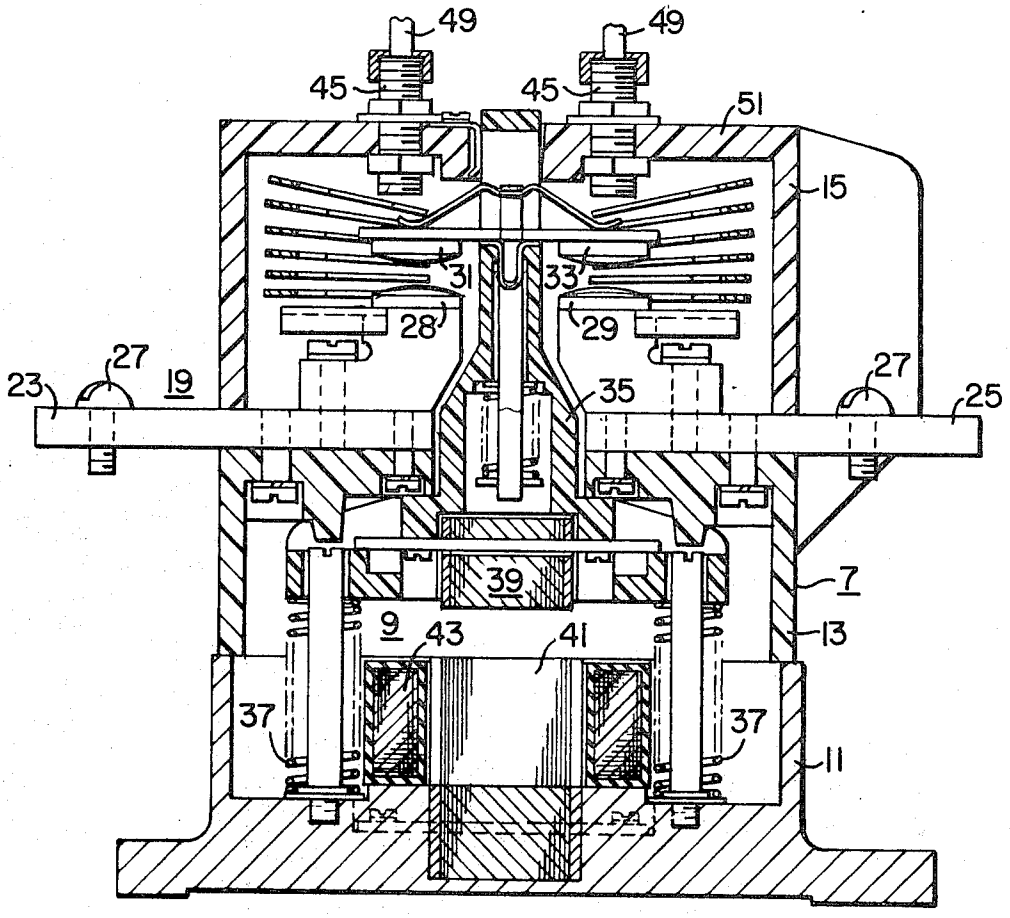
105,597	7/1924	Switzerland	200/166 K

Primary Examiner—J. R. Scott
Assistant Examiner—William J. Smith
Attorney—A. T. Stratton et al.

[57] **ABSTRACT**

A contactor characterized by an electrically insulating housing containing a plurality of sets of contacts including corresponding pairs of stationary contacts and movable contacts movable between open and closed positions with respect to each other; the housing having a top wall extending over the movable contacts, gas coolant means for directing currents of coolant gas onto each set of contacts in a direction aligned with the path of travel of the movable contacts, and the gas coolant means comprising a gas manifold connected to gas conduits leading to the top of the housing in which gas inlet nozzles are provided for directing the currents of gas to each set of contacts, particularly during the time the switches are closed.

10 Claims, 3 Drawing Figures



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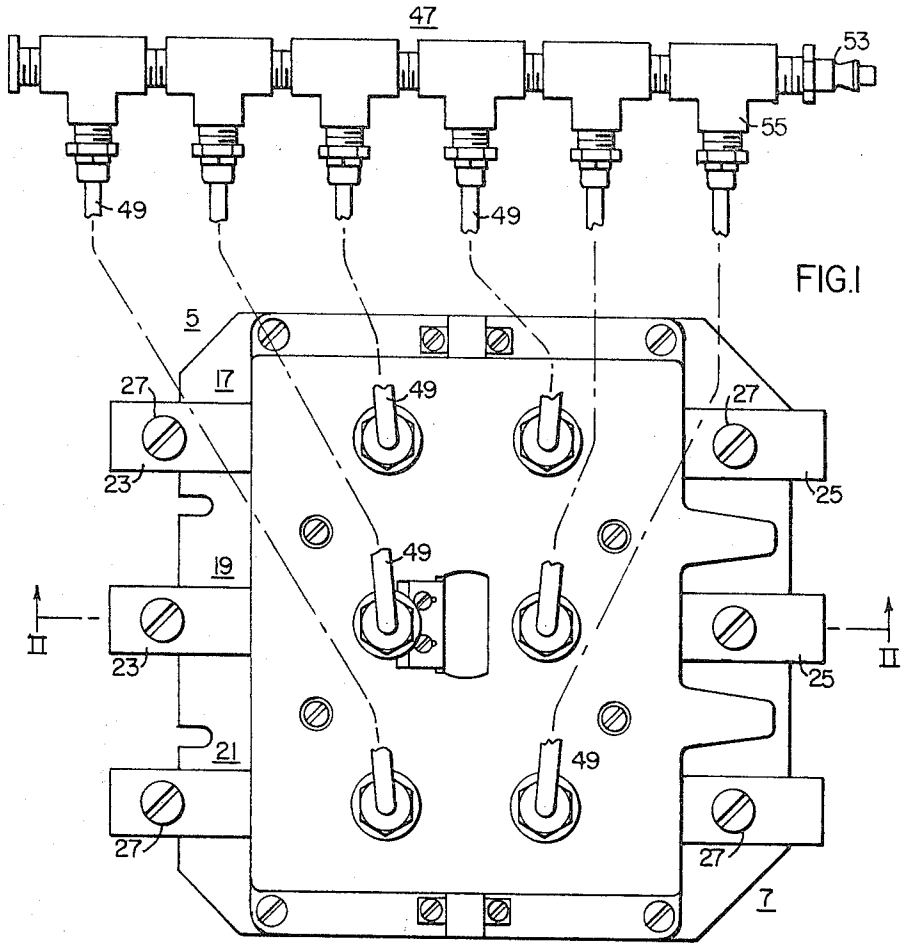


FIG.1

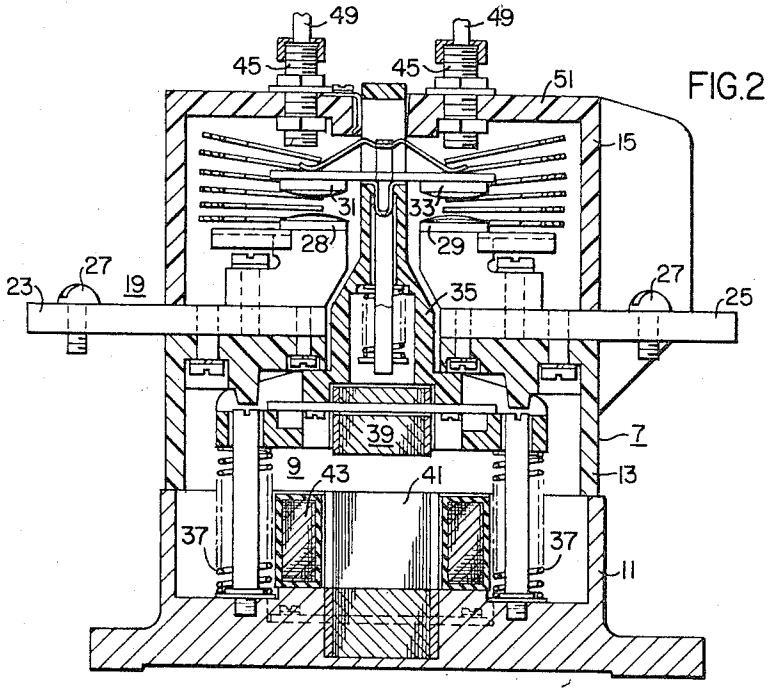
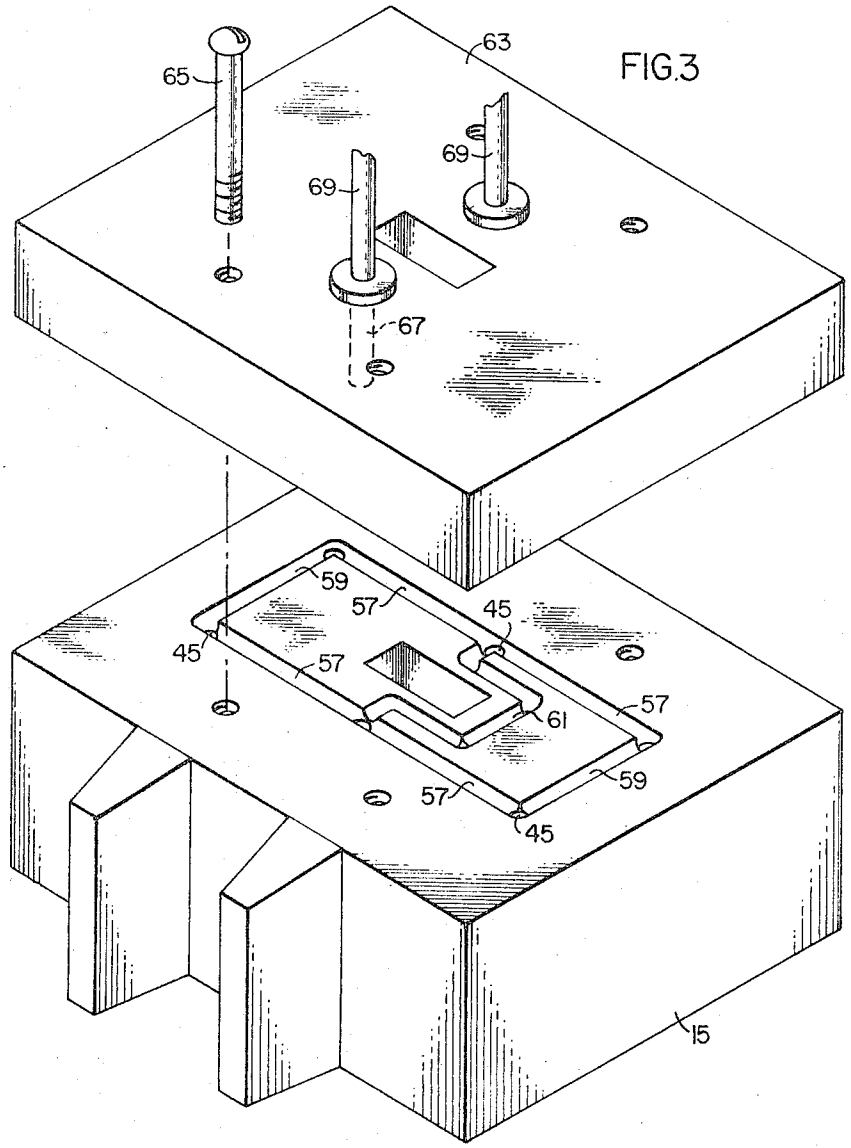


FIG.2

FIG.3



GAS COOLED ELECTRICAL CONTACTOR

CROSS REFERENCE TO RELATED APPLICATION

This invention is related to the invention disclosed in the application of Kurt A. Grunert, Ser. No. 136,058, filed Apr. 21, 1971.

BACKGROUND OF THE INVENTION

Field of the Invention

This invention relates to electric control devices and more particularly to an electrical contactor having air cooling means.

Description of the Prior Art

When switchgear is employed in relatively high-voltage systems, the primary disconnecting contacts for circuit breakers are usually disposed within an insulating housing. For that reason air is prevented from circulating freely about the contact members and reduces the dissipation of heat generated in the contacts. As a result the contacts and associated conductors have a reduced capacity to carry current.

Some devices such as disclosed in U.S. Pat. Nos. 1,702,085, 2,824,939, and 3,088,013, have been provided for dissipating heat generated in electrical switchgear. In some operating circumstances it is desirable to provide dielectric spacing between the contacts and the air conducting means, such as to prevent phase-to-phase or phase-to-ground dielectric breakdown. Moreover, where a coolant gas is directed to the area of the contacts at an angle other than that which is perpendicular to the path of travel of the contacts, an efficient cooling operation is obtained.

SUMMARY OF THE INVENTION

In accordance with this invention, it has been found that a more desirable gas cooled electrical circuit interrupter or contactor is provided which comprises an electrical insulating housing enclosing a plurality of sets of contacts within the housing including stationary contacts and movable contacts movable between open and closed positions, means for moving the movable contacts, the housing having a top wall extending across the area of the contacts, gas coolant means for directing currents of coolant gas onto each set of contacts in a direction that is not perpendicular to the path of travel of the movable contact, the gas coolant means comprising a gas inlet in the top wall and a gas conduit leading to each inlet, and a gas manifold connected to the gas conduit and adapted to be connected to a source of coolant gas.

The advantage of the device of this invention is to increase the electrical current carrying rating significantly depending upon such factors as gas temperature, a gas flow rate, and switching requirements.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan view of a three-pole contactor constructed in accordance with the principles of this invention;

FIG. 2 is a vertical sectional view taken generally along the line II—II of FIG. 1; and

FIG. 3 is an exploded perspective view of another embodiment of the contactor.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In FIGS. 1 and 2 of the drawings, a three-pole contactor of the electromagnetic type is generally indicated at 5. Inasmuch as the contactor is more particularly disclosed in the above-mentioned application Ser. No. 136,058, the description of the contactor herein is directed generally to the operating parts of the contactor with specific emphasis on the gas coolant means.

Generally, the contactor 5 comprises a housing structure 7 and a contactor structure 9 supported on the housing structure. The housing structure 7 comprises a die cast aluminum base 11, a molded insulating intermediate housing member 13 suitably secured to the base 11, and a molded insulating cover 15 suitably secured to the intermediate housing member 13.

As shown in FIG. 1, there are three-pole units generally indicated at 17, 19, and 21 of which the unit 19 is disclosed more particularly in FIG. 2. Each pole unit 17, 19, and 21 comprises a pair of aligned conductors 23 and 25 to which suitable solderless terminal connectors such as screws 27 are secured at the outer ends to enable connection of each pole unit in an electric circuit. Within the contactor 5, each pole unit, as shown in FIG. 2, comprises a pair of spaced stationary contacts 28 and 29 as well as movable contacts 31 and 33 which cooperate with the stationary contacts 28 and 29, respectively. The movable pair of contacts 31 and 33 for each pole unit are mounted on a single contact carrier 35 which is vertically movable between contact open and closed positions of which the open position is shown in FIG. 2. The carrier 35 is normally biased in the open position by spaced coil springs 37. Electromagnetic means are provided for moving the contact carrier 35 downwardly to close the circuit through the contact and comprises a movable structure or armature 39 and a generally U-shaped stationary magnetic member 41 supported on the base 11 and a conducting coil 43. The movable structure 39 is mounted in the lower end of the contact carrier 35 so that when the coil 43 is energized removable structure 39 is attracted to the magnetic member 41 and the contact carrier moves downwardly against the force of the coil springs 37.

In accordance with this invention, gas coolant means are provided in order to direct a current or blast of a coolant gas, such as air, into the area of the stationary and movable contacts in order to cool the contacts and associated current bearing components. The blast of coolant gas is sustained at least during the time the contacts are closed and it may be sustained when the contacts are opened if necessary to dissipate any heat generated while the contacts are closed. Thus, the electrical current carrying rating of the contactor is increased significantly, such as by twofold, depending upon the flow rate and temperature of the coolant gas. For the contacts of each pole of the contactor, the gas coolant means comprises a pair of inlets or nozzles 45 (FIG. 2), a manifold generally indicated at 47 (FIG. 1) and a plurality of flexible hoses or conduits 49 which extend between the manifold and the nozzles 45. As shown in FIG. 2, the nozzles 45 are disposed in a top wall 51 of the insulating housing cover 15. Each nozzle 45 is so disposed that it directs a continuous current of air onto the upper side of the assembly of the contacts 28, 29, 31, and 33. The coolant gas may flow continuously or only during the occasions when the contacts

are in the closed position. Suffice it to say, the currents or streams of coolant gas are directed from the nozzles **45** into the contact area and preferably in alignment with or generally parallel to the direction of travel of the movable contacts **31, 33.** However, the nozzles **45** may be disposed at another location in the insulating housing cover **15** so as to be directed at angles to the direction of travel of the contacts **31** and **33,** but not perpendicular or normal to that direction. If the gas were directed perpendicular or normal to the direction of travel of the contacts **31** and **33,** there would be the undesirable tendency of the arc to be blown back toward the contacts or contact support with resulting damage thereto.

The manifold **47** includes an inlet **53** and a plurality of outlets **55** to which the several flexible hoses are attached. The inlet **53** is connected to a source of a coolant gas such as air, SF_6, or an inert gas, an appropriate temperature and pressure such as between 5 and 30 psig.

The several flexible hoses or conduits **49** are separately connected at the other ends to the several nozzles **45.** The hoses **49** are composed of an electrically insulating material such as that sold under the trademark "Teflon" or nylon. Thus, the metal manifold **47** is separated from the contactor **5** by the electrically insulating flexible hoses **49** and thereby prevent phase-to-phase or phase-to-ground dielectric breakdown between the contactor and the manifold. This is particularly pertinent where the coolant gas such as air contains moisture. In such event, the longer the hoses **49** the less likely is the moisture in the gas to serve as an electrically conducting path for current between the contactor and the manifold.

Another embodiment of the invention is shown in FIG. **3** in which the insulating housing cover **15** is modified to include a built-in manifold by the provision of a plurality of interconnecting channels **57, 59,** and **61** extending between the several nozzles or inlets **45.** A cover plate **63** is attached to the upper surface of the cover **15** in a suitable manner, such as screws **65,** which cover plate extends over the several nozzles **45** and channels **57, 59,** and **61.** The cover plate **63** includes suitable gas conduit means such as aperture **67** to which external conduits **69** are attached in a suitable manner. The external conduits **69** lead to a source of pressurized coolant gas such as air (not shown). The cover **15** and the cover plate **63** are composed of an electrically insulating material, such as polyester or phenolic resins. Accordingly, the embodiment of FIG. **3** provides a built-in manifold for providing coolant gas for the several contacts **27–33** with the several channels **57, 59,** and **61** serving as interconnecting conduits between the several nozzles **45** so that the pressure of the coolant gas delivered at all of the nozzles is substantially equal.

In conclusion, it has been found that by providing the device of this invention, the electric current carrying rating of a contactor of the type disclosed in the above-mentioned patent application Ser. No. 136,058 may be significantly increased. For example, the current carrying rating may be increased twofold, such as from 400 amperes to 1,200 amperes by providing a continuous flow of coolant gas.

What is claimed is:

1. A circuit interrupter structure comprising an electrically insulating housing, a plurality of sets of contacts within the housing and comprising stationary contacts and movable contacts movable between open and closed positions with the stationary contacts, means for moving the movable contacts, the housing having a top wall extending across the area of the contacts, gas coolant means for directing a current of coolant gas onto the outer surfaces of the stationary and movable contacts of each set of contacts, the gas coolant means comprising a gas inlet in the top wall and a gas conduit leading to each inlet, and a gas manifold connected to the gas conduits and adapted to be connected to a source of coolant gas.

2. The circuit interrupter structure of claim **1** in which the gas conduits are composed of electrically insulating material.

3. The circuit interrupter structure of claim **1** in which the gas conduits are embedded in the top wall of the housing.

4. The circuit interrupter structure of claim **1** in which the gas conduits are elongated hoses extending between the manifold and the gas inlets.

5. The circuit interrupter structure of claim **1** in which the gas coolant means directs the gas onto the contacts in a direction substantially aligned with the path of contact travel.

6. The circuit interrupter structure of claim **1** in which the gas coolant is directed in a direction that is non-perpendicular to the path of travel of the movable contact.

7. The circuit interrupter structure of claim **6** in which the gas conduits are composed of electrically insulating material.

8. The circuit interrupter structure of claim **6** in which the gas conduits are embedded in the top wall of the housing.

9. The circuit interrupter structure of claim **6** in which the gas conduits are elongated hoses extending between the manifold and the gas inlets.

10. The circuit interrupter structure of claim **6** in which the gas coolant means directs the gas onto the contacts in a direction substantially aligned with the path of contact travel.

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