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RESISTORS

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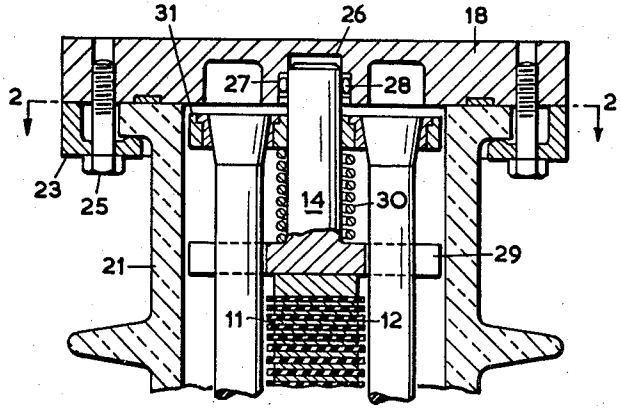
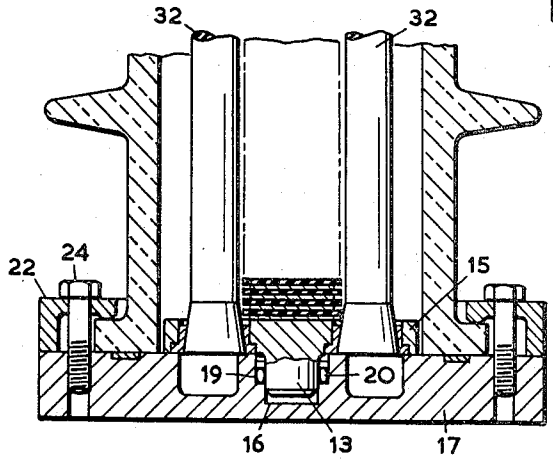


FIG. 1



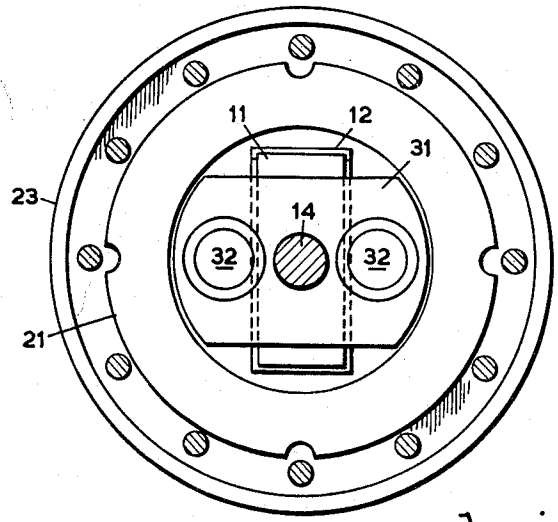


FIG. 2

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RESISTORS

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This invention relates to resistors such as are used for example in parallel with the contacts of circuit-breakers used for high power high voltage applications.

In heavy duty alternating current switchgear including circuit-breakers, it is usual to provide a resistor in parallel with the main contacts, and the final interruption of the circuit may be achieved by opening of contacts in series with the resistor, these contacts operating at lower current values than would be main contacts in the absence of such a resistor.

The contacts in series with the resistor are in one arrangement also in parallel with the main contacts, in which case the main interrupter contacts alone carry the full fault current and the contacts in series with the resistor carry the resistance current after the main contacts have opened, until these contacts themselves open; in another known arrangement, the series contacts are in series both with the resistor and with the main contacts, the latter being in parallel with one another; in this case both the main interrupter and the series interrupter carry the full fault current until the main interrupter opens, when the current drops so that the series interrupter then only carries the current flowing through the resistor.

The thermal capacity of the resistor is of prime importance since there is little time available for heat to be conducted or radiated away. The resistor in accordance with the invention has the advantages of high thermal capacity combined with compactness, together with high electrical strength and low inductance.

One embodiment of resistor in accordance with the invention will now be described with reference to the accompanying drawings of which:

FIG. 1 shows a transverse section through the resistor; and

FIG. 2 shows a section on the line 2—2 of FIG. 1.

The resistor forms part of a 132 kv. air-blast circuit-breaker and is connected to be electrically in parallel with the main contacts of the circuit-breaker.

The resistor comprises a strip **11** of high-resistance metallic material such as Nichrome (registered trademark) which is folded in a multiplicity of convolutions, adjacent convolutions being separated by strips **12** of insulating material such as mica. There may, for example, be approximately 2,000 such convolutions. Held against the end convolutions of the metallic strip are oppositely-directed T-shaped parts **13**, **14** of a material of good thermal and electrical conductivity such as copper. The strip **11** is secured to the T-shaped parts **13**, **14** by means of clamping plates secured by screws. The part **13** is formed with a flange **15** and has its stem portion received in an aperture **16** in an end housing member **17** which may be of mild steel. The housing member **17** together with the corresponding member **18** at the other end of the rseistor assembly form part of the electric circuit in paallel with the main contacts of the switchgear (not shown) and in order to ensure good electrical contact between the strip element **11** of the resistor and the end housing member **17**, the aperture **16** is formed with a groove **19** containing a garter spring **20** which surrounds the stem of part **13**.

The end housing members **17** and **18** are spaced apart by a ribbed hollow bushing **21** of porcelain or similar material to which they are secured in conventional manner by clamping rings **22**, **23** and set screws **24**, **25**.

The part **14** has its stem slidably mounted in an aperture **26** in the end housing member **18**, the latter being formed with an annular groove **27** containing a garter spring **28** which surrounds the stem and ensures good electrical contact between the part **14** and the end housing member **18**. The part **14** is formed at its end with a flange **29** which abuts the end convolution of the strip **11** through a conducting block, the strip **11** being held in compression between the flanges **15** and **29** by means of a coil spring **30** which is placed in compression between the flange **29** and an end beam **31**.

The flange **15** forms a corresponding end beam at the other end of the resistor assembly, and the two end beams **15**, **31** are connected by two bolts **32** of insulating material, for example of porcelain or a suitable ceramic, which are in tension. The compressive force applied to the assembly of the convoluted strip **11** and the mica strips **12** may be determined by the dimensions of the spring **30** and may be of the order of 100 pounds.

The strip **11** should be of uniform cross section so that the current density is uniform and localized heating is avoided.

It will be appreciated that current flows between the end housing members **17** and **18** through the T-shaped parts **13**, **14** and the strip **11**. The assembly, including the convoluted strip **11**, mica strips **12**, end beam members **15**, **31**, and bolts **32** may readily be inserted within the bushing **21** by removal of one of the end housing members **17**, **18**.

The resistor is capable of operation in air or inert gas and may also be used submerged in oil, though in the latter case the temperature which can be withstood is unlikely to be as high as when suitable gas is used. The bushing may alternatively be filled with dry fused bubble alumina in air.

The invention provides a high-voltage resistor assembly of compact dimensions which can withstand high temperatures. It has been found that temperatures calculated to be of the order of 1,000° C. have been generated over a short period without ill effect.

What we claim as our invention and desire to secure by Letters Patent is:

A resistor comprising an assembly including a thin elongated member of high-resistance metallic material formed into a multiplicity of convolutions, temperature-resistant electrically insulating material filling the spaces between the convolutions, a pair of transverse flanges, one at each end of said assembly, an end beam substantially parallel to and spaced from one said transverse flange, a compression spring compressed between said end beam and said one transverse flange, and at least one tension member of electrically-insulating material joining said end beam and the other said transverse flange, whereby said thin elongated member is held in compression between said transverse flanges, said resistor also comprising a pair of apertured electrically-conducting end housing members and an electrically-insulating bushing spacing apart said members, and said assembly comprising oppositely-directed stem portions formed one on each of said transverse flanges and engaging in the apertures in the respective end housing members.

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