Jan. 24, 1956 J. A. JACKSON ET AL 2,732,452

ELECTRIC SWITCHGEAR

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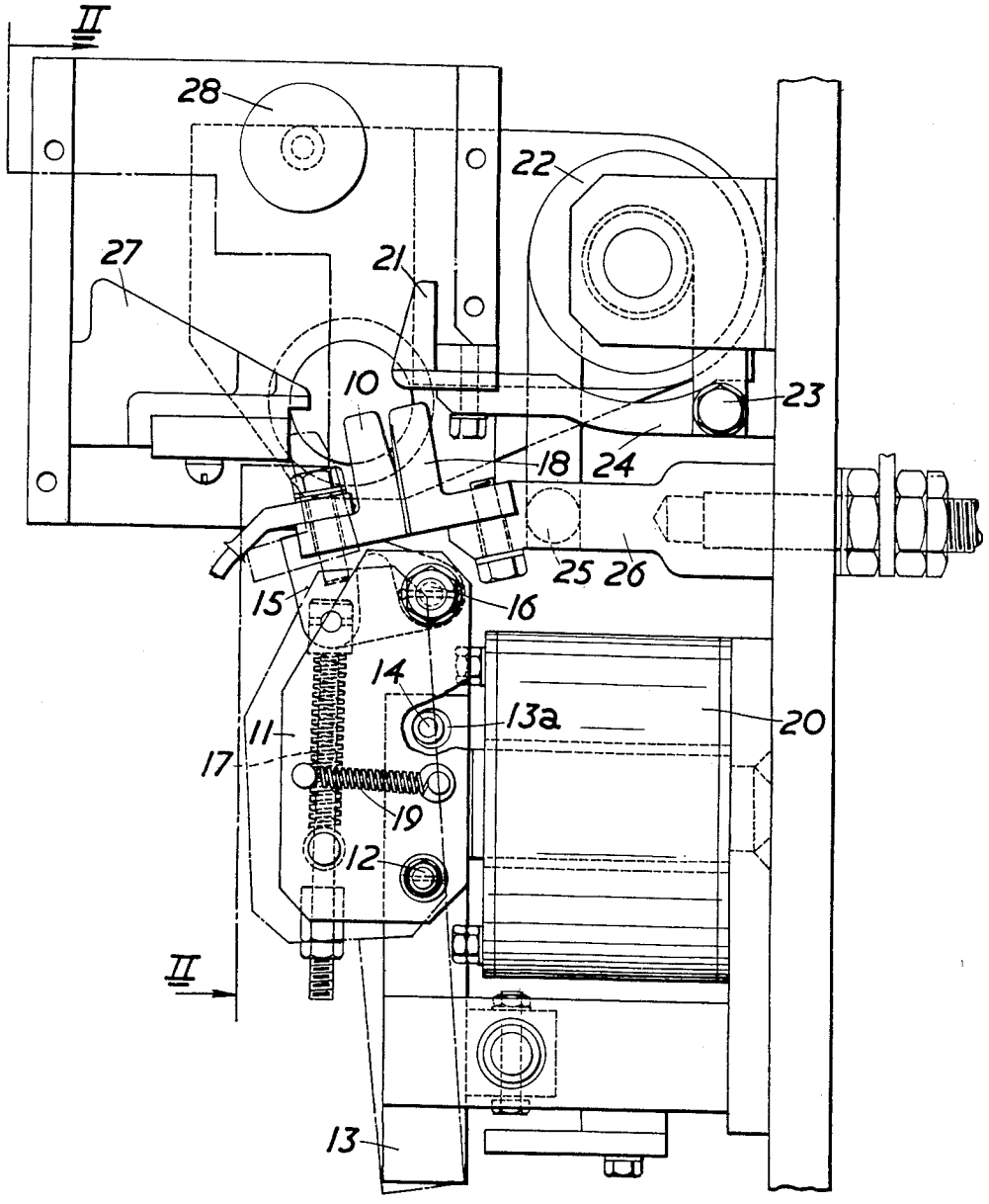


Fig. 1.

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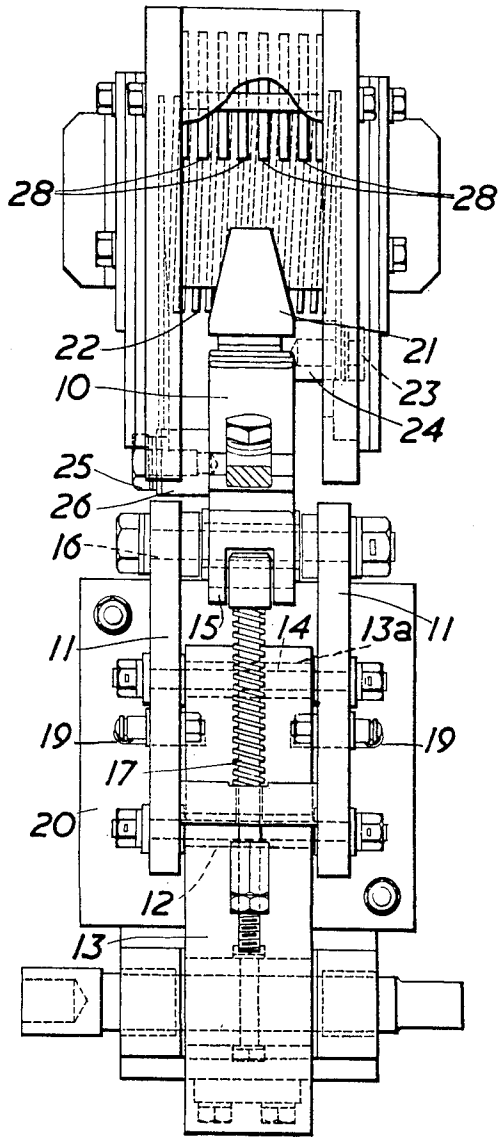


Fig. 2.

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ELECTRIC SWITCHGEAR

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4 Claims. (Cl. 200—87)

The present invention relates to electric switchgear and more particularly relates to contactor switches.

One object of the invention is the provision of improved constructions of contactor switches.

One trouble which arises with existing constructions is that when the armature closes, the contacts meet at high speed, and, due to the momentum of the moving contact attached to the armature, this contact bounces, which results in arcing. Such arcing, particularly in heavy duty work, seriously reduces the life of the contacts.

Accordingly, another object of the invention is to provide a novel and improved electromagnetic contactor including cushioning or damping means in form of a double pivoting arrangement which counteracts the tendency of the moving contact to bounce away from the fixed contact thereby reducing or even completely eliminating the formation of arcs when the contactor is actuated for closing its contacts. As a result, the useful life of the contacts is appreciably prolonged.

One specific construction of contactor incorporating this feature will now be described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a side elevation of the contactor, one of the arc shields adjacent the contacts being shown removed for clarity, whilst

Figure 2 is an end elevation taken along the line II—II in Figure 1.

In this construction the moving contact **10** is supported by a pair of plates **11** of insulating material which are pivotally mounted near their lower ends on a spindle **12** passing through the contactor armature **13**, the plates **11** lying on opposite sides thereof. A second spindle **14** is also fixed to the plates **11** and passes through a hole **13***a* in the armature **13** near to the top of the latter, the diameter of the hole **13***a* being somewhat larger than that of the spindle **14**. The moving contact **10** is mounted by a bracket **15** on a third spindle **16** fixed to the plates **11** near their upper end, the moving contact **10** being normally maintained at a predetermined inclination by means of the usual compression spring **17** which ensures a rolling and slight rubbing contact action when the moving contact **10** makes with the fixed contact **18**. A pair of light springs **19** each fixed between one of the plates **11** and the armature **13** normally maintain the plates **11** relative to the armature **13** in a position such that the second spindle **14** engages that side of the hole **13***a* in the armature **13** nearest to the contactor coil **20**.

When the contacts **10** and **18** meet, the continued movement of the armature **13** brings the second spindle **14** into engagement with the other side of the hole **13***a* (as shown in Figure 1), until the armature **13** engages the pole surface. Any tendency of the moving contact **10** to rebound is counteracted by the plates **11** moving forward in relation to the armature **13** under the control of the pair of light springs **19** until the momentum of the moving contact **10** and bracket **15** is absorbed by the spring **17**. The design is such that the momentum is

absorbed before the spindle **14** engages the side of the hole **13***a* nearest to the contactor coil **20**. Thus, although the moving contact **10** tends to move backwards away from the fixed contact **18**, the sideplates **11** move forward towards the contactor coil **20** and the moving contact **10** is kept in engagement with the fixed contact **18**. This relative movement between the armature **13** and the plates **11** is possible due to the enlarged hole **13***a* through which the second spindle **14** passes.

A further feature of the invention is concerned with extinguishing the arc drawn between the contacts **10** and **18** when they are interrupted. According to this feature a magnetic blow-out coil is connected between a conductor from the fixed contact and an auxiliary contact mounted above the fixed contact, whereby a blow-out coil is not energised when the contacts are made but is energised during breaking of the contacts due to jumping of the arc from the fixed contact to the auxiliary contact.

In the embodiment of this arrangement which is shown in the drawings, an auxiliary contact **21** is mounted above the fixed contact **18**, and one end of a blow-out coil **22** is connected by a stud **23** to an electrically conductive lead-in bracket **24** which supports this auxiliary contact **21**. The other end of the blow-out coil **22** is connected by a stud **25** to the lead-in bracket **26** which supports the fixed contact **18**.

With this arrangement drawing of the arc on breaking of the contacts will result in the arc jumping from the fixed contact **18** to the auxiliary contact **21**, so that the arc current then flows through, and thus energises, the blow-out coil **22**.

As the blow-out coil is only in circuit temporarily it can be of much higher rating than is normal, and the blow-out coil may be designed so that the magnetic value obtained is much greater than usual.

The moving contact **10** may be arranged to drop back onto a second auxiliary contact **27** of greater mass which, in the position when the moving contact **10** has fallen back (as shown in chain-dotted lines) onto the second auxiliary contact **27**, is nearer to the first auxiliary contact **21** than the moving contact **10**. With this arrangement the arc is then transferred from the moving contact **10** to the second auxiliary contact **27** which, due to the greater mass of the latter, can more readily dissipate the heat generated.

According to another feature of the invention a plurality of discs of ferrous material are mounted in the magnetic field of the blow-out coil, whereby on energisation of the blow-out coil the discs are magnetised to intensify the field acting to draw the arc.

In the embodiment illustrated, the discs **28** are mounted above the auxiliary contacts **21**, **27**.

The discs, which may for example be eight or ten in number, will also help to quench the arc owing to their heat conducting properties.

What is claimed is:

1. An electromagnetic contactor, comprising a field member, an armature movably mounted on a fixed part, said armature being attractable to and releasable from said field member, a carrier element pivotally mounted on said armature, a movable contact mounted on said carrier element pivotal about an axis spaced apart from the axis of the carrier element, a relatively stationary fixed contact, first spring means biasing said movable contact relative to said carrier element, to a given limit in the direction towards said fixed contact, and second spring means biasing said carrier element relative to said armature to a given limit in the direction to move said movable contact towards said fixed contact, the movement of said armature, when attracted to said field member, being in the direction to move said movable contact to said fixed contact, whereby, upon engagement of said movable

contact with said fixed contact in response to the movement of said armataure to the attracted position, said second spring means initially yields before the armature has reached its final position, and subsequently recovers, leaving said first spring means in a condition of yield.

2. An electromagnetic contactor, comprising a field member, an armature movably mounted on a fixed part, said armature being attractable to and releasable from said field member, a carrier element pivotally mounted on said armature, a movable contact mounted on said carrier element pivotal about an axis spaced apart from the axis of the carrier element, a relatively stationary fixed contact, first spring means biasing said movable contact relative to said carrier element, to a given limit in the direction towards said fixed contact, and second spring means biasing said carrier element relative to said armature to a given limit in the direction to move said movable contact towards said fixed contact, said carrier element being movable in opposition to said second spring means to another given limit, the movement of said armature, when attracted to said field member, being in the direction to move said movable contact to said fixed contact, whereby, upon engagement of said movable contact with said fixed contact in response to the movement of said armature to the attracted position, said second spring means initially yields to the extent of said other given limit of said carrier element before the armature has reached its final position, and subsequently recovers, leaving said first spring means in a condition of yield.

3. An electromagnetic contactor, comprising a field member, an armature movably mounted on a fixed part, said armature being attractable to and releasable from said field member, a carrier element pivotally mounted on said armature, a movable contact mounted on said carrier element pivotal about an axis spaced apart from the axis of said carrier element, a relatively stationary fixed contact, first spring means biasing said movable contact relative to said carrier element, to a given limit in the direction towards said fixed contact, and second spring means biasing said carrier element relative to said armature to a given limit in the direction to move said movable contact towards said fixed contact, said carrier element being movable in opposition to said second spring means to another given limit, the movement of said armature, when attracted to said field member, being in the direction to move said movable contact to said fixed contact, whereby, upon engagement of said movable contact with said fixed contact in response to the movement of said armature to the attracted position, said second spring means initially yields to the extent of said other given limit of said carrier element, before

the armature has reached its final position, and subsequently recovers to the first named given limit of said carrier element, leaving said first spring means in a condition of yield.

4. An electromagnetic contactor, comprising a field member, an armature having a hole, said armature being movably mounted on a fixed part and attractable and releasable from said field member, a carrier element pivotally mounted on said armature, said carrier element comprising two plates mounted one each side of said armature, a bar coupling said plates, parallel to and spaced from the pivot axis of said carrier element, said bar passing through said hole in the armature, said hole being large enough to afford play of said bar therein, a movable contact pivotally mounted on said carrier element, a relatively stationary fixed contact, first spring means biasing said movable contact relative to said carrier element to a given limit in the direction towards said fixed contact, and second spring means biasing said carrier element relative to said armature, in the direction to move said movable contact towards said fixed contact, to a limit as determined by said bar abutting against one side of said hole, the movement of said armature, when attracted to said field element, being in the direction to move said movable contact to said fixed contact, whereby, upon engagement of said movable contact with said fixed contact, in response to the movement of said armature to the attracted position, said second spring means initially yield to the limit as determined by said bar abutting against the other side of said hole, before the armature has reached its final position, and subsequently recover to the limit determined by the abutting of said bar against the first-named side of said hole, leaving said first spring means in a condition of yield.

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