Jan. 31, 1939. H. L. VAN VALKENBURG 2,145,327

CONTACTOR CONSTRUCTION

Filed Feb. 11, 1935 2 Sheets-Sheet 1

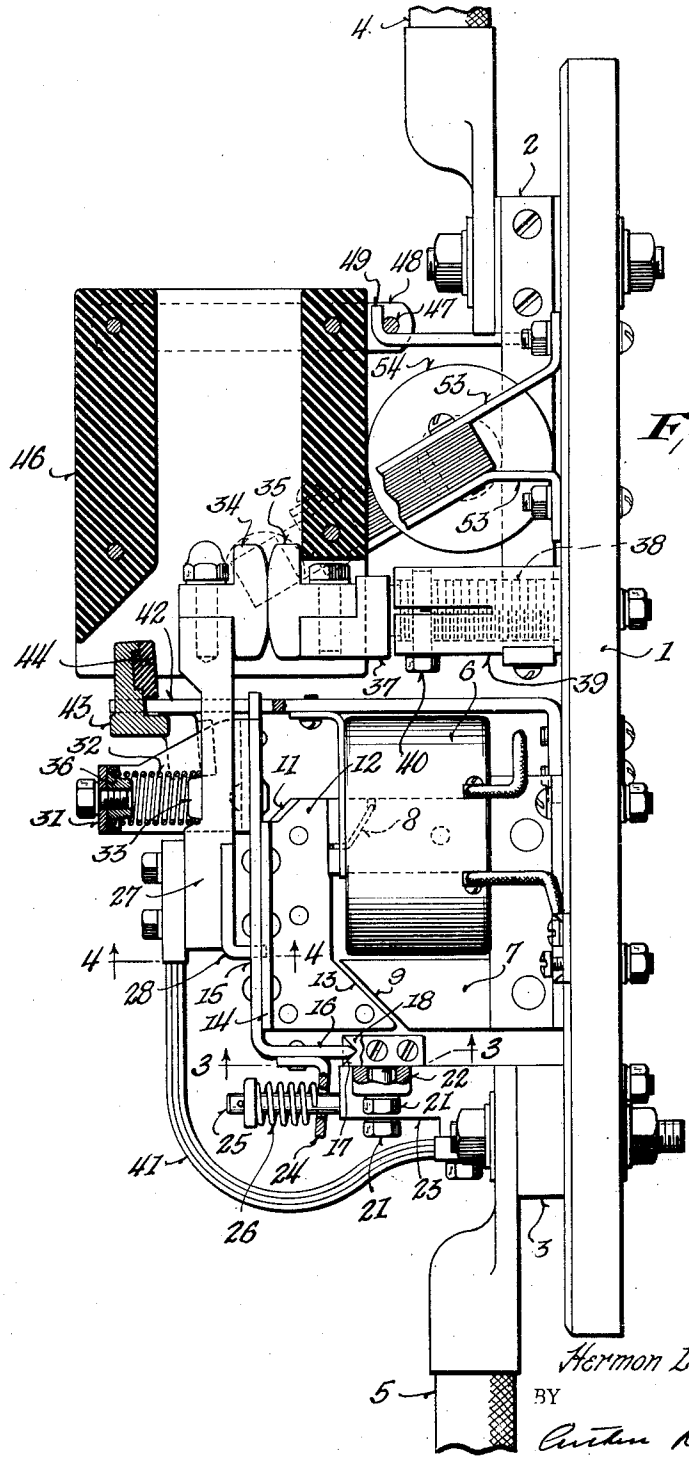


Fig. 1

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Filed Feb. 11, 1935 2 Sheets-Sheet 2

Fig. 2

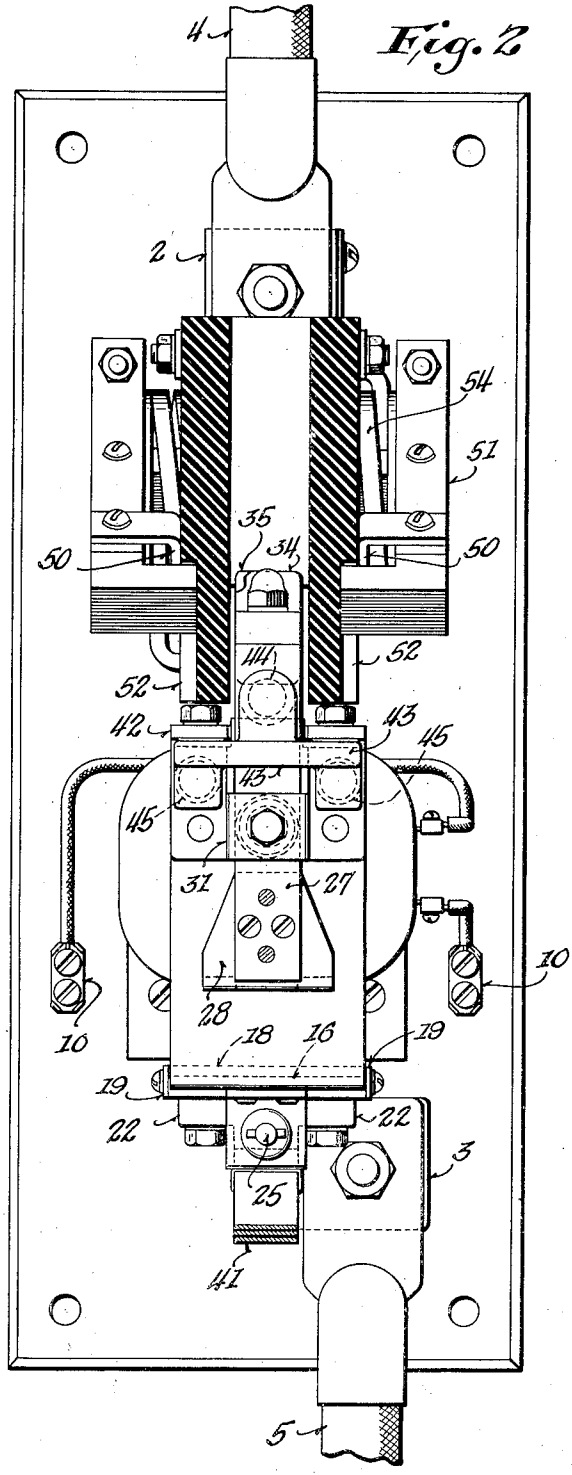


Fig. 3

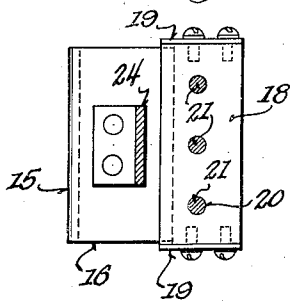
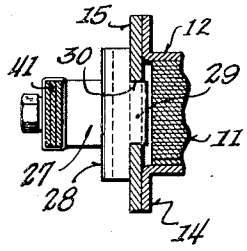


Fig. 4



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UNITED STATES PATENT OFFICE

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CONTACTOR CONSTRUCTION

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6 Claims. (Cl. 200—87)

This invention relates to contactor constructions.

Objects of this invention are to make a contactor which is very rapid in operation, in which the moving parts are so made that they are relatively light, in which a contact finger is carried by an armature assembly and is movable with reference to the armature assembly, being resiliently urged towards a fixed position with reference to the armature assembly but movable therefrom when contact is made to provide a slight wipe or scrape of the movable contact with the stationary contact, and in which though the contactor is designed for very rapid operation nevertheless is so constructed that it will handle relatively large current, as, for instance, in welding or other work of this order, without damage to the parts.

Further objects are to provide a construction of contactor in which the armature assembly carries the actual armature element closely adjacent the pivot point to thus reduce the moment of inertia about the pivot point, and in which a contactor finger formed of light material, such, for example, as aluminum, is provided and equipped with a brass or copper movable contact or contact tip to thereby reduce the weight of the contact finger, and to provide spring means tending to hold the contact finger relatively fixed with relation to the lever or armature assembly.

It has been found in a very rapidly operating contactor that there is great tendency for the contact finger, as well as the armature assembly, to rebound and thus cause improper operation of the contactor. This invention is designed to overcome this defect, and a further object of the invention is to provide means for greatly reducing, if not wholly preventing, the rebound of either the armature assembly or of the contact finger, and to so construct this rebound preventing means that a cushioning action takes place, preferably through the medium of non-resilient material which absorbs the force of the blow due to the recoil or opening of the contactor, and which not only forms a stop for the armature assembly or lever, but also forms a stop directly for the contactor finger itself and thus further guards against rebound.

Further objects are to provide a contactor construction in which the stationary contact is adjustable, in which both the contactor tip for the stationary contact and the movable contact are removable and renewable, and in which an extensive surface contact between the adjacent portions of the apparatus and the contact tips themselves is provided in all positions of adjustment, relatively massive parts being provided for freely and adequately conducting away the heat.

Further objects are to provide a contactor construction in which an arc chute is provided which is freely removable to provide free and unobstructed access to the contact tips for inspection or renewal, in which the heat from the arc is greatly reduced due to quick blowing out of the arc and due to the chimney-like action of the arc chute, so that the amount of heat at the contactor tips is relatively low as these tips are massive in themselves and are in face to face contact with relatively massive high heat conducting parts, thereby greatly reducing burning of the contact tips.

In contactors as heretofore constructed, it has been the usual practice to provide some form of pin bearing for the lever or armature assembly and this bearing had to be oiled from time to time to insure even a reasonable life of the parts. Very frequently oiling was overlooked with consequent rapid wearing of the parts and also with the resulting relatively noisy operation, the pin type of bearing also being relatively noisy due to the necessary amount of play at such point.

This invention overcomes these defects, and a further object of this invention is to provide a knife bearing or hinge bearing for the armature assembly or lever which does not require any oiling, but in which preferably an open notched, elongated bearing is provided cooperating with a knife bearing of the other part and requiring no oiling, these parts being case hardened or cyanide hardened or otherwise hardened bearing members.

Further objects are to provide a novel form of contactor construction in which a knife edge bearing is provided which may be of considerable width and in which a relatively heavy spring is mounted on the opposite side of the knife edge bearing from that occupied by the armature itself to thus hold the parts of the bearing together and also to effect a quick opening stroke or return of the armature, the spring itself accomplishing both these functions without requiring any additional elements.

Further objects are to provide a novel form of knife edge bearing for a contactor which is so made that the bearing is adjustable both in and out and angularly to thereby exactly align the face of the armature with the poles of the magnet, thus securing a quiet operation for the magnet, in which this adjustment is very simply and practically made through the medium of easily produced parts, and in which means are provided for preventing lateral shifting of the knife bearing member.

Embodiments of the invention are shown in the accompanying drawings, in which:

Figure 1 is a side elevation with parts broken away and in section showing the contactor in closed position.

Figure 2 is a face view of the contactor with parts sectioned off.

Figure 3 is a fragmentary sectional view on the line 3—3 of Figure 1.

Figure 4 is a sectional view on the line 4—4 of Figure 1.

The parts of the contactor may be carried on an insulating base or support 1 which is preferably mounted vertically. The upper and lower contact blocks or terminal members 2 and 3 are rigidly mounted on the plate and the terminals of the cables 4 and 5 are secured to such blocks in a flat face to face good electrical contact.

The contactor comprises an electromagnet whose energizing coil is indicated at 6 and whose core 7 is formed of laminated material and may be U-shaped with a central section extending through the magnet and provided with a shading coil 8 to assist in the quiet operation of the magnet and with the lower section bevelled, as indicated at 9. This body portion of the magnet is rigidly secured to the base and the conductors from the energizing coil are brought to the control terminals 10, see Figure 2.

The armature assembly comprises the laminated armature 11 which has side portions 12, all of the parts being securely riveted together, and which is provided with a bevelled lower portion 13 mounted closely adjacent the bevelled portion 9 of the body or yoke of the electromagnet. The side portions 12 are outwardly turned, as indicated at 14 and are riveted or otherwise rigidly secured to the L-shaped lever 15. This lever is carried on a knife bearing and is provided with an inturned bottom portion 16 which has a sharpened point or knife edge fitting within the elongated V-shaped slot 17 of the stationary portion 18 of the knife edge bearing.

Both the knife edge and the member 18 are cyanide or case hardened so as to provide a very hard bearing edge and socket therefor, it being noted from Figure 1 that the taper on the member 16 is considerably sharper than the taper of the elongated notch 17 so as to provide for rocking motion of the knife edge within the slot or socket. This knife edge bearing is relatively long, as may be seen from Figures 2 and 3, and the member 18 is preferably provided with end plates 19 held by screws, or in any suitable manner, to the member 18, see Figure 3. The bearing member 18 is provided with threaded holes 20 into which the bolts 21 are screwed, such bolts passing through ears 22 formed on the extension 23 of the lower contact member 3 and through such extension 23. The holes through which the bolts 21 pass are somewhat larger than the bolts to provide for adjustment of the bearing member 18.

The bearing member 18 may be adjusted by moving it in and out or may be adjusted by moving it angularly to thus exactly align the face of the armature with the corresponding portion of the electromagnet, thereby securing a quiet operation of the magnet.

The inturned portion 16 of the L-shaped lever of the armature assembly is provided with a downwardly projecting apertured extension 24 through which the spring carrying pin 25, see Figure 1, freely extends. A relatively heavy spring 26 surrounds the pin and bears against the projecting member 24.

It is to be noted particularly that this relatively heavy spring not only serves to return the armature assembly to open position, but also acts to hold the parts of the knife edge bearing in their correct assembled relation. The spring, it will be noted from Figure 1, is located on one side of the knife edge bearing and the armature on the other side thereof, so that the forces acting on the armature assembly all tend to hold the V-shaped bearing in place.

The armature assembly carries a contact finger 27 which is preferably formed of aluminum and is relatively light. It is provided with an L-shaped bearing member 28 which, as may be seen from Figure 4, is provided with a rectangular tongue 29 which fits within a notch 30 formed in the lever 15. The laminated armature 11 stops short of the tongue 29, as clearly shown in Figure 4.

A U-shaped straplike member 31 is rigidly carried by the lever 15, as shown in Figures 1 and 2, and supports one end of the spring 32, the other end of the spring fitting over a projecting portion 33 formed on the contact finger 27 and tending to hold such finger in a fixed relation to the lever 15, namely, contacting with the lever at the upper end of the assembly, although when contact is made, the armature assembly moves to the right, as viewed in Figure 1, and as shown in such figure, thereby compressing the spring, allowing the contact finger 27 to rock with reference to the armature assembly a slight amount. This provides a yielding and wiping contact between the movable contact member or contact tip 34 and the stationary contact member or contact tip 35, see Figure 1.

The outer end of the spring 32 may be held in any suitable manner, as, for example, by means of the member 36 bolted to the underside of the strap member 31.

The contact tips or members 34 and 35 are relatively massive and are preferably formed of copper. The movable contact member 34 has a face to face flat contact with the upper end of the relatively massive though light contact finger 27 so as to insure free conducting of heat away from the movable contact 31.

The stationary contact 35 has an extensive face to face contact with a shouldered extension 37, see Figure 1, integral with the threaded shank 38 which is screw threaded into the supporting block 39. This supporting block is split and is provided with clamping bolts 40 so that after the in and out adjustment of the stationary contact 35 has been made by rotating such contact the desired amount, the bolts 40 may thereafter be tightened to lock the stationary contact in adjusted position. At all times, however, it is to be noted that the relatively massive support 39 has an extensive surface bearing with the threaded portion of the shank 38 and that the contact 35 has an extensive surface contact with the shouldered portion 37 so as to insure excellent heat conduction away from the contact member 35 in all positions of adjustment. The lower contact block or member 3 is connected directly with the contact finger 27 by means of a stranded, relatively flat conducting cable 41, see Figure 1.

A supporting arm 42 extends outwardly from the base and is bifurcated adjacent its outer end and carries the casting 43, see Figures 1 and 2. This casting 43 constitutes a bumper or stop member for both the contact finger 27 and the armature lever 15. It is provided with a centrally located upstanding portion which carries a leather or other non-resilient cushioning shock absorbing pad 44 and a pair of lower pads 45. The pads 45 engage the lever 15 on its outward stroke simultaneously with the engagement of the pad 44 with the contact finger 27, and due to the non-resilient cushioning nature, any rebound of either the armature assembly or of the contact lever is greatly reduced, if not wholly stopped.

The pads may be formed of different materials, though leather has been found eminently satisfactory. This construction provides a very effective cushioning means and, it is to be noted, practically absorbs the shock from the blow not only of the armature assembly but also directly of the contact lever.

An arc chute **46** is provided just above and surrounding the movable and stationary contacts and is formed of a heat resisting insulating material. It is removably supported by means of a transverse pin **47**, see Figure 1, carried by projecting straplike members **48**, the pin **47** resting within a hook-shaped support **49** carried by the back member **1** to thus permit free removal of the arc chute for inspection or renewal of the movable or stationary contacts.

The arc chute may be guided by inturned arms **50**, see Figure 2, rigidly carried by the yoke portion **51** of the blow-out magnet. The poles of the blow-out magnet are arranged transversely of the movable and stationary contacts and may extend into thinned or slotted parts **52** formed in the arc chute, as shown most clearly in Figure 2.

The blow-out magnet core is laminated, as indicated, and may be carried by supports **53** extending from the back member or main support **1**, as shown in Figure 1. The blow-out coil **54** is connected between the supporting member **39** for the stationary contact and the upper terminal **2**.

It will be seen that a contactor has been provided in which the moving parts are relatively light, in which the moment of inertia about the axis of rotation of the armature is small, and in which means are provided for cushioning not only the armature assembly but the contact finger itself to thus prevent recoil.

It will be seen further that a novel form of oilless bearing has been provided in the form of an elongated knife bearing and that a restoring spring is positioned on one side of the knife edge bearing and the armature on the other side thereof, such spring not only acting in the capacity of a restoring spring but also holding the parts in their assembled position.

It will be seen further that an extensive surface face to face contact has been provided between the contact tips and their associated parts to thus conduct away heat in a free manner.

It will also be seen that the contactor is of simple and practical construction, is easy to adjust to insure exact alignment of the armature with the magnet, is rapid in operation, and may be constructed to handle relatively large currents without undue heating.

Although this invention has been described in considerable detail, it is to be understood that such description is intended as illustrative rather than limiting, as the invention may be variously embodied and is to be interpreted as claimed.

I claim:

1. In a circuit controlling device, a base, a bearing supported on said base, a contact arm having a knife edge thereon, means for biasing said knife edge against said bearing to pivotally support said arm, said bearing being adjustable relative to the base to adjust the position of said arm.

2. A contactor comprising a stationary body portion, an electromagnet supported therefrom, said stationary body portion having one element of a knife edge bearing adjustably mounted thereon, an armature, means supporting said armature and having the other element of said knife edge bearing thereon, a movable contact carried by said support for said armature, and a stationary contact supported from said body portion, said armature and said electromagnet having opposed faces, said faces being accurately aligned by the adjustment of the adjustable member of said knife edge bearing.

3. A contactor comprising a stationary body portion, an electromagnet carried thereby, an armature positioned in front of said electromagnet, a lever supporting said armature, said lever having one element of a knife edge bearing, the other element of said knife edge bearing being carried by said body portion, said armature and said electromagnet having opposed faces, said knife edge bearing being angularly adjustable to accurately align the face of said armature with respect to said electromagnet, means for locking said knife edge bearing in its angular adjustment, a stationary contact supported from said body portion and adjustable in and out with reference to said body portion, means for locking said stationary contact in adjusted position, and a movable contact supported from said lever and cooperating with said stationary contact.

4. A contactor comprising a stationary body portion, an electromagnet carried thereby, pivot means supported from said body portion, an armature unit supported from said pivot means, a contact finger pivotally carried by said armature unit, a spring tending to hold said contact finger in a fixed relation to said armature unit, a movable contact carried by said contact finger, a stationary contact supported from said body portion, and a yielding cushioning stop for said contact finger positioned adjacent the movable contact, said stop directly arresting the outward motion of said contact finger independently of said armature.

5. A contactor comprising a stationary body portion, an electromagnet carried thereby, pivot means supported from said body portion, an armature unit supported from said pivot means, a contact finger pivotally carried by said armature unit, a spring tending to hold said contact finger in a fixed relation to said armature, a movable contact carried by said contact finger, a stationary contact supported from said body portion, and yielding cushioning stop means for both said armature unit and contact finger to prevent rebound of said contact finger, said stop means being respectively positioned adjacent the outer end of said armature and the outer end of said contact finger.

6. A contactor comprising a stationary body portion, an electromagnet supported therefrom, said stationary body portion having one element of a knife edge bearing, an armature, means supporting said armature and having the other element of said knife edge bearing thereon, a movable contact operated by said armature, and a stationary contact supported from said body portion, said armature and said electromagnet having opposed faces, the first mentioned element of said knife edge bearing being angularly adjustably mounted to secure accurate alignment of the face of said armature with respect to the face of said electromagnet.

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