Sept. 16, 1930. J. F. TRITLE 1,776,138

CONTACT FINGER

Filed Sept. 7, 1927

Fig. 1.

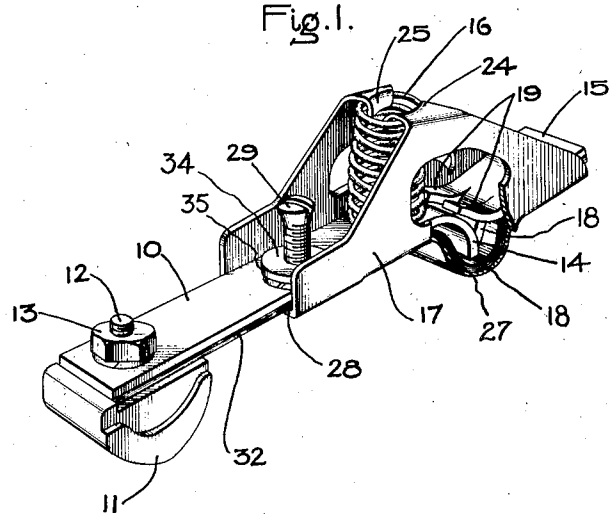
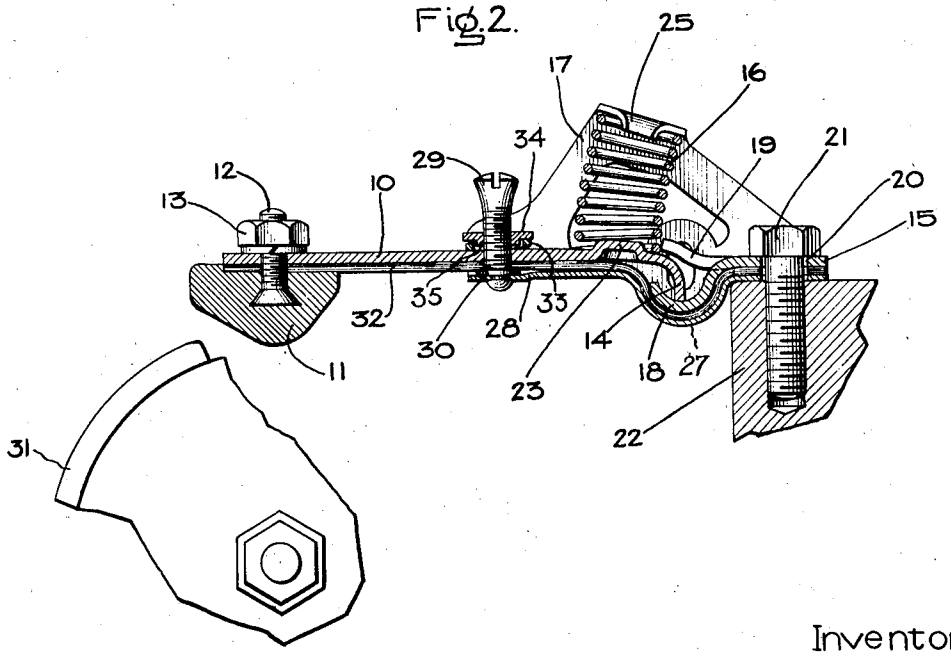


Fig. 2.



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UNITED STATES PATENT OFFICE

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CONTACT FINGER

Application filed September 7, 1927. Serial No. 218,095.

This invention relates to electrical contacts and provides an improved form of contact finger that is particularly advantageous for use in motor controllers of the drum type.

Among the advantageous features of the present invention are; an improved mounting of the movable contact finger permitting both pivotal and tilting movement thereof in order to obtain self-alignment of the finger with the contact element cooperating therewith; an improved arrangement of the current conductor connecting the movable contact element with the fixed terminal; an improved arrangement of the biasing spring to permit ready assembly and disassembly of the several cooperating parts of the finger; and also improved means for adjusting the finger into proper operating relation with the cooperating contact. In addition, the construction in accordance with the present invention results in a contact finger which is efficient in heavy current service and is rugged and capable of withstanding long continued severe duty and at the same time may be manufactured at relatively low cost.

In the accompanying drawings, Fig. 1 is a perspective view of a preferred form of contact finger embodying the improvements of the present invention with certain parts broken away in order to more fully reveal the construction, and Fig. 2 is a longitudinal cross-sectional view showing more fully the operative relation of the various cooperating parts of the finger.

As shown in Figs. 1 and 2, the contact finger comprises the movable contact arm 10 having the contact tip 11 removably secured at one end thereof by means of the stud 12 embedded in the tip and the nut 13. The other end 14 of the contact arm 10 is bent or hooked over to form a knife edge bearing upon which the arm is mounted for both pivotal and tilting movement by means of the support 15. The support 15 together with the biasing spring 16, is mounted within the enshrouding casing or housing 17. Preferably the bent over knife edge end 14 of the contact arm is slightly rounded, as shown in Fig. 2, so as to facilitate the pivotal and tilting movement of the arm.

As shown more in detail in Fig. 2, the tilting and pivotal support for the bent-over end 14 of the contact arm 10 is formed by the spaced apart portions 18 and 19 of the support 15. Preferably the support is formed by splitting the end of the support 15 into the strips and bending the middle strip downward to form the hooked portion 18 and the two outside strips upward to form the cooperating stop portions 19, which engage with the outside of the hook at the end of the contact arm 10 to prevent endwise movement thereof in one direction although the support may be formed of separate pieces suitably secured together, if desired. The support 15 is provided with the hole 20 for receiving the holding down bolt 21 by means of which the entire contact finger may be fastened to the terminal support 22, as indicated in Fig. 2.

One end of the biasing spring 16 is seated upon the boss 23 which preferably is struck up from the contact arm 10 at the same time the end 14 is bent or hooked over. The other end of the compression spring 16 is seated upon the two overturned spaced apart projections 24 and 25 extending from the channel sides of the housing 17. The compression spring 16 serves to bias the contact arm 10 into engagement with the bottom portion 28 of the channel shaped housing 17 and at the same time prevent disengagement of the bent over end of arm 10 from the hooked strip 18 when these parts are assembled in the pocket 27 formed in the bottom of the housing 17, as shown in Fig. 2. Due to the fact that the bent-over portion 18 and the stop portions 19 of the support 15 straddle the bent-over knife edge end 14 of the contact arm 10, disengagement of the contact arm 10 from the support except upon endwise movement of the contact arm to the left is effectively prevented. Thus, in case the contact should improperly engage with the segments on the controller drum, the portions of the support 15, straddling the bent-over end of the contact arm effectively resist the end thrust and at the same time prevent accidental disengagement of the bent-over end of the contact arm from its support.

An adjusting screw 29 threaded into the contact arm 10 and having its end bearing upon the reinforcing rivet 30 provided in the housing 17, permits the free end of contact arm 10 to be raised or lowered so as to carry the contact tip 11 into the proper relation with the contact segment 31 on the controller drum cooperating therewith, as indicated diagrammatically in Fig. 2. The adjusting screw 29 is prevented from turning from any position to which it is adjusted by means of the large diameter split lock washer 33 and the cooperating locking disc 34. The locking disc 34 is screw threaded on the adjusting screw 29 and the projecting circular shoulder or boss 35 is formed on the lower side of the disc 34 so that the lock washer 33 is maintained coaxial with the adjusting screw 29, even though of much greater diameter than the screw 29.

In assembling the adjusting screw and the locking means therefor, the disc 34 is run to the top of the screw threads on the adjusting screw 29 and the screw 29 is then screwed into the threaded opening in the contact arm 10 with the lock washer 33 adjusted to fit over the shoulder 35. Upon tightening the screw 29, the disc 34 compresses the split lock washer 33. Thereupon the adjusting screw 29 may be unscrewed to adjust the position of the contact finger as desired without producing rotation of the locking disc 34. This is due to the fact that the frictional engagement of the split lock washer 33 with the disc 34 at the increased radius of the shoulder 35 produces a greater friction than that existing between the threads of the disc 34 and the adjusting screw 29. However, this thread friction serves effectively to prevent accidental movement of the adjusting screw 29 from its adjusted position due to vibration or other causes.

Current is carried from the contact tip 11 to the terminal support 22 to which the contact finger is secured by the laminated flexible connector 32. It will be noted that the connector 32 is interposed between the contact arm 10 and the contact 11 so as to be secured in good conducting relation with the contact tip upon tightening the securing nut 13. Likewise, the connector 32 is secured in good current conducting relation with the supporting terminal 22 upon tightening of the holding down bolt 21. The connector 32 is secured in good current conducting relation with the supporting terminal 22 upon tightening of the holding down bolt 21. The connector 32 extends entirely beneath the contact arm 10 and the support 15 in the channel shaped conduit formed by the pocket 27 of the housing 17, thereby protecting the connector from damage.

The improved contact finger construction described readily permits assembly and disassembly of the cooperating parts of the finger. It will be evident that in case the contact tip 11 should become worn or damaged it may be readily removed and a new tip substituted simply by unscrewing the nut 13. To disassemble the parts of the contact finger it is only necessary to unscrew the holding down bolt 21 and remove the compression spring 16. The channel form of the housing 17 permits ready access to the head of the holding down bolt 21 and the spring 16 may be readily removed by inserting a screwdriver or other instrument between the spaced apart shoulders 24 and 25 of the housing 17. With the holding down bolt and the spring 16 removed the contact arm 10 and the support 20 are entirely disconnected from the housing 17.

In service the large knife edge bearing surface provided by the bent-over end 14 of the contact arm and the spaced apart split projections at the end of the support 15 insure long wear without material deterioration. Moreover, these parts cooperate to form substantially an open hinge joint permitting not only limited pivotal and tilting movement of the contact arm to insure alignment with the cooperating contact segment, but also effectively resist the end thrust to which the contact arm 10 is subjected upon engagement of the contact tip with the controller segment. The contact arm 10 itself being entirely rigid, the compression spring 16 maintains a substantially constant pressure upon the contact tip to thereby insure firm engagement between the tip and the controller segment.

What I claim as new and desire to secure by Letters Patent of the United States is:—

1. A contact finger comprising a movable contact arm having a contact at one end and the other end bent in the form of a hook, a support for the contact arm having spaced apart portions, one portion cooperating with the hooked end of the contact arm to form an open hinge bearing and the other portion cooperating with the outside of the hook to stop endwise movement of the contact arm in one direction and permit endwise movement thereof in the other direction.

2. A contact finger comprising a movable contact arm having a hooked end, a support therefor having cooperating parts disposed in diverging spaced relation to form an open hinge connection between the contact arm and the support permitting limited pivotal and tilting movement of the contact arm, one part of the support being curved around the said hooked end of the contact arm and another part of the support engaging the outside of the hook to maintain the end thereof in engagement with the said curved part, and resilient means cooperating with the support for yieldingly holding the hooked end of the contact arm in hooked engagement with the parts of said support.

3. A contact finger comprising a movable contact arm having a hooked end, a support therefor having cooperating parts disposed in diverging spaced relation for receiving the said hooked end therebetween with one part hooked around the hooked end of the contact arm and another part engaging the outside of the hook to permit limited pivotal and tilting movement of the contact arm, and means cooperating with the support for yieldingly holding the contact arm in a predetermined position.

4. A contact finger comprising a movable contact arm having a hooked end, a support therefor having a plurality of cooperating parts disposed in spaced relation to form an open hinge connection between the contact arm and the support permitting limited pivotal and tilting movement of the contact arm, one part of the support being narrower than the contact arm and curved to engage the middle of the hooked end of the contact and the other parts of the support being spaced apart to engage the convexly curved side of the hooked end of the contact arm to maintain the same in hooked engagement with said curved part, a compression spring having one end engaging with the contact arm adjacent the hooked end thereof for yieldingly holding the same in hooked engagement with the support.

5. A contact finger comprising a movable contact having a bent-over end, a support therefor fixed at one end and having the other end split with one split portion curved around the bent-over end of the contact arm and another split portion disposed to engage the contact arm adjacent the bend for maintaining the bent end of the contact arm in hooked engagement with said one split portion, and means cooperating with the support for yieldingly holding the contact arm in a predetermined position.

6. A contact finger comprising a contact arm having a knife edge projection at the end thereof opposite the contact, a support having cooperating parts straddling the knife edge of the contact arm to form a hinge connection therebetween permitting both pivotal and tilting movement of the contact arm with respect to the support, a housing substantially enclosing the support and contact arm adjacent the hinge connection therebetween to prevent lateral displacement thereof and having a portion in cooperating relation with the contact arm for limiting the pivotal movement thereof, and a resilient member interposed between the housing and the contact arm for biasing the contact arm into engagement with said portion of the housing.

7. A contact finger comprising a substantially channel shaped housing, a contact arm having a contact at one end and the other end loosely fitting into the channel space of the housing and bent in the form of a hook, terminating in a knife edge bearing, an open pivotal support for the bent-over knife edge end of the contact arm mounted within the channel space of the housing and having a plurality of cooperating parts spaced apart to stop endwise movement of the contact arm in one direction and permit endwise movement thereof in the other direction, and a compression spring supported in the housing with one end engaging the contact arm adjacent the hooked end thereof for maintaining the same in yielding hooked engagement with said support.

8. A contact finger comprising a substantially channel shaped housing having projections extending in opposing spaced relation from the sides thereof, an arm having a contact element at one end and the other end bent in the form of a hook, a support comprising a plurality of co-operating parts disposed in spaced relation in the channel space of the housing for receiving the hooked end of the contact arm therebetween to form an open hinge bearing permitting pivotal and tilting movement of the contact arm, one part of the support being curved in hooked engagement with the hooked end of the contact arm with the remaining parts engaging the opposite side of the hooked end of the contact arm to prevent lateral disengagement thereof from said curved part, and a compression spring having one end jointly supported by said projections from the sides of the housing and the other end engaging the contact arm adjacent the hooked end thereof for maintaining the same in yielding hooked engagement with said support and biasing the same into engagement with the bottom of said channel housing.

9. A contact finger comprising a substantially channel shaped housing having a pocket in the bottom thereof, a contact arm mounted within the channel space of the housing and having a bent-over end extending into said pocket, a support for the bent-over end of the contact arm mounted in the channel space of the housing and having a portion extending between the end of the contact arm and the bottom of the pocket, and an electrical connector disposed between the bottom of the housing and both the contact arm and the support.

10. A contact finger comprising a substantially channel shaped housing having a pocket formed in the bottom portion thereof, a contact arm having a bent-over end projecting into said pocket, a contact arm mounted within the channel space of the housing and having a bent-over end projecting into said pocket, a support for the bent-over end of the contact arm mounted within the channel space of the housing and having a portion extending between the bent-over end of the contact arm and the bottom of the pocket in

the channel housing, and a spring mounted in the housing in engagement with the contact arm intermediate the ends thereof for biasing the contact arm into engagement with the bottom of the housing.

11. A contact finger comprising a contact arm, a hinge support for the end of the contact arm, a channel shaped housing for enshrouding the contact arm and the support adjacent the hinge connection therebetween and having projections extending in spaced relation from each side of the channel over the contact arm, and a compression spring having one end seated on the contact arm and the other end jointly supported by said projections.

12. A contact finger comprising a substantially channel shaped housing having a pocket formed in the bottom thereof, a contact arm mounted within said channel and having a contact tip secured to one end thereof and having the other end bent over and extending into said pocket, a support for the bent-over end of the contact having one end fixed and the other end split with an intermediate split portion curved around the bent end of the contact arm and the split adjacent thereto disposed in engagement with the contact arm adjacent the bend therein, and a compression spring mounted in a channel housing with one end engaging the contact arm intermediate its ends to bias the arm into engagement with the bottom of the channel.

13. A contact finger comprising a substantially channel shaped housing having a pocket formed in the bottom portion thereof and projections extending in spaced relation from the top thereof, a contact arm mounted for movement within the channel space of the housing and having a contact tip removably secured to one end thereof and having the other end bent over at substantially right angles to the axis of the contact arm, a support for the bent-over end of the contact arm mounted within the channel shaped housing and having a portion curved around the bent-over end of the contact arm and other portions spaced apart and disposed in engagement with the contact arm adjacent the bend therein to maintain the bent-over end of the contact arm in hooked engagement with said one portion of the support, a connector interposed between the contact tip and the contact arm and extending between the bottom of the channel and both the contact arm and the said support, and a compression spring having one end engaging the contact arm intermediate its ends and the other end jointly supported by said projections from the channel sides at the housing.

In witness whereof, I have hereunto set my hand this 2nd day of September, 1927.

JOHN F. TRITLE.