

May 15, 1962

W. C. FURNAS ETAL
MAGNETIC SWITCH ASSEMBLAGE

3,035,137

Filed Sept. 4, 1959

3 Sheets-Sheet 1

Fig. 1

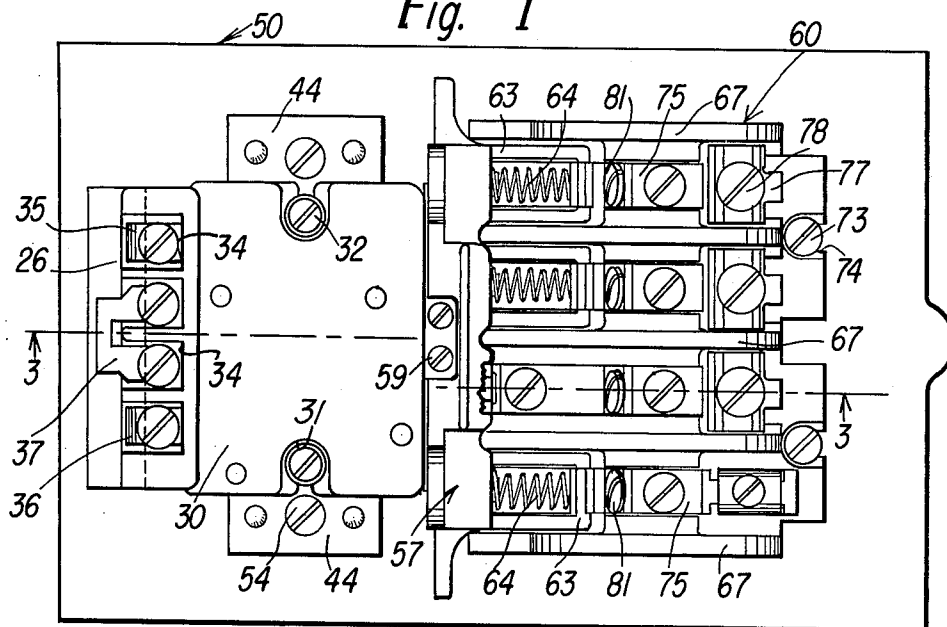
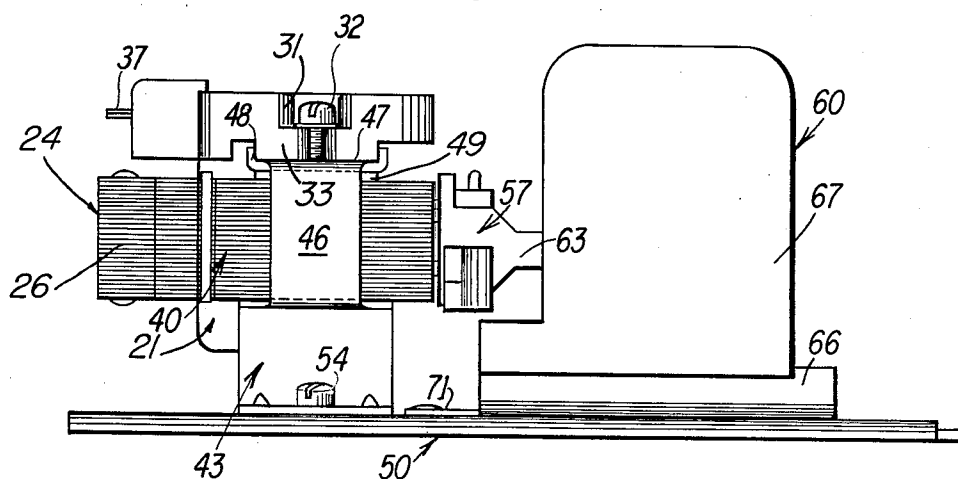


Fig. 2



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Fig. 3

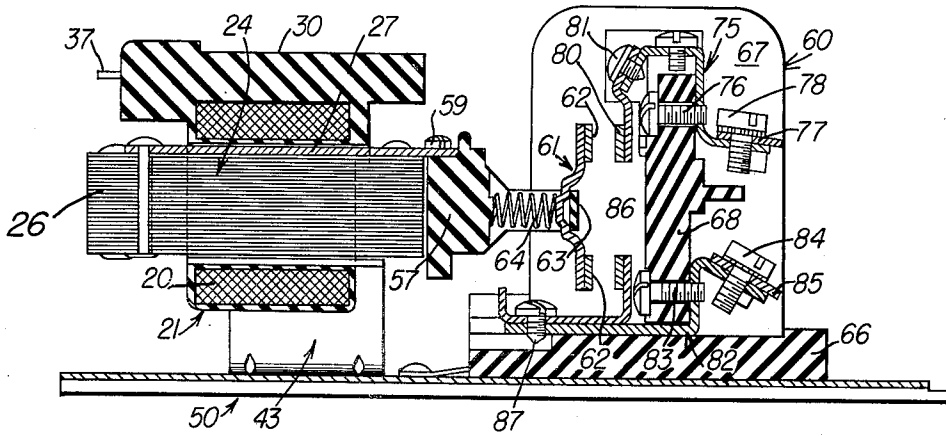


Fig. 4

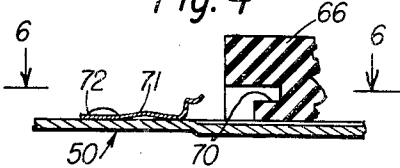


Fig. 5

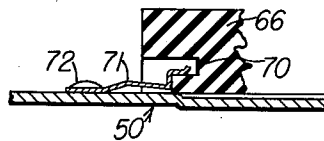


Fig. 6

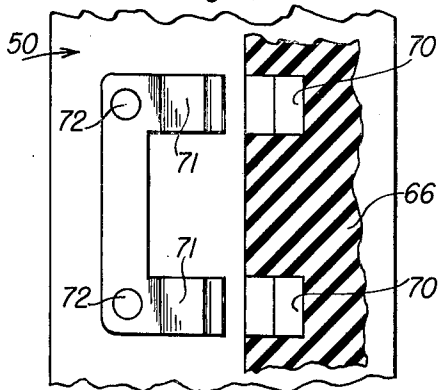
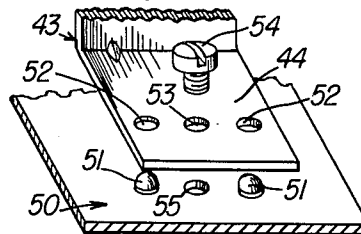


Fig. 7



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Fig. 8

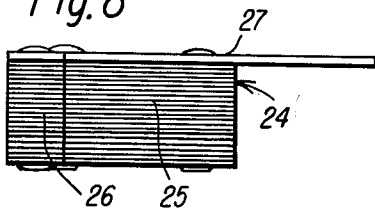


Fig. 10

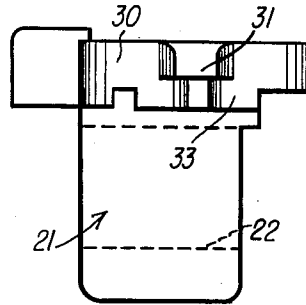


Fig. 9

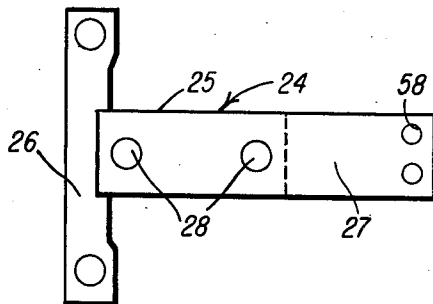


Fig. 11

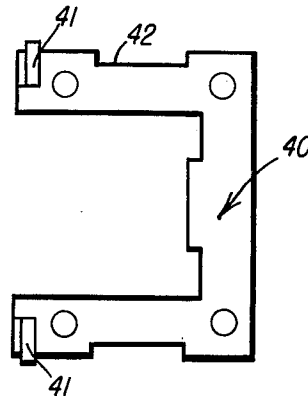


Fig. 12

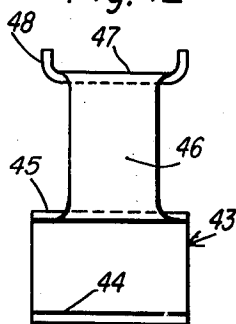
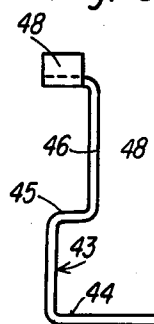


Fig. 13



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MAGNETIC SWITCH ASSEMBLAGE

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5 Claims. (Cl. 200-104)

The invention relates to improvements in switch structure and has reference in particular to a magnetically actuated switch assemblage employing a coil and a movable armature for actuating a plurality of switch contacts.

An object of the invention is to provide unitary devices for assemblage with each other on a common support and which may be easily and conveniently located on the support and locked in proper relative position for the maximum operating efficiency of the respective devices. One of the devices includes a coil and a movable armature and said device is conveniently and releasably supported by bracket structure, the same having openings for alignment with positioning lugs on the support. The other device consists of a terminal contact block releasably positioned and held on the support by resilient clips, said block providing the stationary switch contacts for coaction with the movable contacts carried by the armature.

In view of the foregoing, other objects of the invention reside in the provision of magnetic switch structure of the above mentioned type wherein the assembly and removal of the several unitary devices is facilitated, wherein the bracket structure for the coil and armature device is relatively simple in design for the greatest economy in manufacture, and wherein the stationary contacts provided by the terminal contact block are positioned for maximum accessibility so that the task of connecting conductors to the same can be easily performed by the operator.

The invention has for a further object to provide a coil and magnet arrangement wherein the coil is completely encased in a plastic housing, the top portion of which has a special shape for convenient securement to the bracket structure and wherein the top portion is also formed to provide insulated recesses for the respective terminals of the coil.

Another object is to provide bracket structure for engaging and supporting the magnetic field piece of the coil and armature device, the said bracket structure having a bent formation especially designed for engaging the magnetic field piece and also having an additional formation for engaging and retaining the top portion of the plastic encased coil.

A still further object is to provide a terminal contact block of strong and durable construction and a block of this type which will incorporate contact carriers having good electrical conductivity, and which extend through the insulating wall of the contact block and have terminal contacts secured thereto on respective sides of the block whereby the terminal contacts are located for convenient access by the operator.

With these and various other objects in view, the invention may consist of certain novel features of construction and operation, as will be more fully described and particularly pointed out in the specification, drawings and claims appended thereto.

In the drawings which illustrate an embodiment of the device and wherein like reference characters are used to designate like parts—

FIGURE 1 is a top plan view of a magnetically actuated switch assemblage embodying the improvements of the present invention;

FIGURE 2 is a side elevational view of the switch assemblage shown in FIGURE 1 and which includes a

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coil and armature device in associated relation with a terminal contact block;

FIGURE 3 is a longitudinal sectional view taken substantially along line 3—3 of FIGURE 1;

FIGURES 4 and 5 are fragmentary vertical sectional views showing the resilient clip and recess for receiving the same whereby the terminal contact block is releasably held in position on the support;

FIGURE 6 is a horizontal sectional view taken substantially along line 6—6 of FIGURE 4;

FIGURE 7 is a perspective view illustrating the positioning lugs on the support for locating the bracket structure;

FIGURE 8 is an elevational view of the movable armature;

FIGURE 9 is a top plan view of the movable armature;

FIGURE 10 is an elevational view of the plastic encased coil having a specially formed top portion integral therewith;

FIGURE 11 is a top plan view of the magnetic field piece for the coil; and

FIGURES 12 and 13 are front and side elevational views of the bracket support for the coil and armature device.

The embodiment selected for illustrating the present invention is shown in FIGURES 1 and 2 as including a plastic encased coil 20 having a movable armature 24 for actuating a plurality of bridging contacts 61 which, in turn, coact with stationary contacts 80 and provided by a terminal contact block 60. The coil 20 is best shown in FIGURE 2. The same is completely encased in a plastic housing 21, FIGURE 10, cored at 22 to form an opening transversely through the housing for receiving the armature 24. The armature, as shown in FIGURE 9, is shaped like a T to provide a shank 25 and a head 26. Also, the armature is formed of soft iron and the same is laminated to increase its magnetic efficiency. A metal tongue 27 is secured to the armature by the rivets such as 28, said tongue being disposed on the top surface of the armature and extending forward of the shank thereof for connection with the carriage which, in turn, carries the bridging contacts as will be presently described.

The plastic housing 21 also includes a top portion 30 having side recesses 31 for receiving the screws 32 by means of which the plastic coil housing is fastened to bracket structure for supporting the same. An abutment 33 depends from the top portion 30 on the respective sides of the same, and the said abutments facilitate the securement of the plastic housing to the bracket structure as is evident from an inspection of FIGURE 2. Said top portion 30 along the rear edge has a plurality of recesses 34 formed therein and the terminals of the coil 20 terminate in the recesses. The clips such as 35 and 36 electrically connect with the coil terminals and the said clips are thus readily accessible to the operator for electrically connecting the coil to a source of current. The coil may be wound for a voltage of 110-220 or for a 220-440 combination, and may be connected in either a series or a parallel circuit arrangement by the use of the connecting clips 37.

The magnetic field piece 40, FIGURES 2 and 11, has a special shape in plan and which simulates a U. The field piece is preferably formed of soft iron and the same is laminated similar to the armature for increasing its magnetic efficiency. Shading coils or loops 41 are located near the rear end of each leg of the field piece to prevent chattering of the armature when the coil is energized, all as is well known in the art. The bracket structure for supporting the magnetic field piece and for also supporting the coil and armature combination is best shown in FIGURES 2, 12 and 13. Two supporting elements designated in their entirety by numeral 43 constitute the said

bracket structure, each element being bent from a strip of metal into the shape as shown in FIGURE 13 and which provides a base portion 44, a ledge 45, a retaining portion 46, and a top yoke portion 47 having the bifurcated arms 48. The retaining portion 46 of each bracket is adapted to have location in the recesses 42 formed in each leg of the field piece. Rubber inserts 49 or similar padding may be located between the metal of the field piece and the bracket, and when inserts of this nature are employed, it will be observed that the field piece 40 is vertically retained by the portion 46, with the field piece being disposed centrally of the portion. The width of the recesses 42 is such as to provide for a press fit of the portion 46 to locate the same within the recesses and thus the brackets effectively grip and support the field piece 40 which has surrounding relation with the plastic encased coil 20.

The yoke 47 of each bracket 43 has contact with its respective abutment 33 and it will be observed that the bifurcated arms 48 are disposed in contact with respective side walls of an abutment. The screws 32, having location in the recesses 31, are disposed immediately above the yoke of the bracket at the particular side of the plastic encased coil and said screws are adapted to have threaded engagement with their respective yokes. In this manner the plastic encased coil is supported by and secured to the bracket structure. However, maximum accessibility is provided as regards the terminals of the coil and the housing 21 can be readily removed from the field piece merely by releasing the screws 32. Also the greatest ease of movement is provided for the armature since the cored opening 22 in the plastic encased coil provides smooth surfaces thus reducing friction in connection with the reciprocating movements of the armature.

It is desirable that the coil and armature device have a definite location on the support 50 and in accordance with the invention the support is formed with two or more upstanding lugs 51 for each bracket as shown in the perspective view of FIGURE 7. The base portion 44 of each bracket is provided with the openings 52 and 53. When the bracket is properly located on the support the openings 52 will align with and receive the lugs 51 and the base of the bracket is then secured to the support by inserting the screw 54 through opening 53 and threading the same into opening 55 provided therefor in the support.

The movable contacts of the present switch assembly are carried by a carriage 57, FIGURES 1 and 2, which in turn is secured to the armature 24 by the tongue 27. The forward end of the tongue is provided with openings 58 and screws such as 59 are adapted to pass through said openings for threaded relation with the carriage. Accordingly, forward movement imparted to the armature 24 by energization of the coil 20 is transmitted to the carriage 57. The movable contacts carried by the carriage are more properly termed bridging contacts, since they are designed to bridge and connect certain stationary contacts provided by the terminal contact block 60 and close the electrical circuit for these stationary contacts. Four bridging contacts are carried by the carriage 57 although the number is not critical to the invention. However, as a result of the four bridging contacts as disclosed, it is possible for the present magnetic switch assemblage to control two single phase electric currents or a three-phase electric current. As best shown in FIGURE 3 the bridging contacts are indicated in their entirety by numeral 61, each having a pair of silver contacts such as 62 and being resiliently held against a retaining member 63 by the coil spring 64. The coil spring is accordingly confined between the carriage 57 and the bridging contact 61 and has a location between the side arms of the U-shaped retaining member 63.

The terminal contact block generally designated by the numeral 60 consists of a unitary block of insulating material and which provides a base 66 and a plurality of upstanding partition walls 67. The partition walls are

connected centrally by a vertically disposed center wall 68 and it will be understood that the contact carriers for the block either pass through the wall 68 or over the wall so that their respective ends are located on respective sides of the wall. As regards the contact block it is also desirable that the same have a definite position on the support 50 so that proper spacing is maintained between the block and the coil and armature device. To provide for such proper spacing and also enable easy and convenient assembling of the block on the support, the rear edge of the base as best shown in FIGURES 4 and 5 is notched at 70, the said notches being located under the rearwardly protruding wall of the base. For coaction with said notches the support is provided with resilient clips 71 fixed to the support by the rivets 72. Accordingly, it is relatively easy for the operator to locate the contact block on the support, it being only necessary to move the block toward the resilient clips 71 until the clips have location within the notches 70. The block can then be secured in place by the screws 73 which are adapted to pass through openings 74 formed in the forward edge of the base 66 of the block, whereupon the screws can be threaded into the support 50.

In keeping with the number of bridging contacts 61 carried by the carriage 57, the terminal contact block is provided with five partition walls 67 which form four recesses for accommodating the contact carriers and the contacts associated therewith. As best shown in FIGURE 3 a top contact carrier 75 is secured to the center wall 68 by means of the securing screw 76. The line conductor from the power source is connected to the contact carrier 75 on the forward side of the wall 68 and for this purpose the terminal clip 77 and screw 78 are provided. A silver contact 80 is suspended from the contact carrier 75 on the opposite side of the wall 68, the said contact 80 being suitably secured to the contact carrier by the screw 81.

The numeral 82 indicates the bottom contact carrier and which extends under the center wall 68, being secured to the wall by the screw 83. On the forward side of the wall the screw 84 secures the clip 85 to the contact carrier 82. On the opposite side of said wall 68, the contact carrier extends parallel and in engagement with the base 66 for a short distance and to this parallel extending end the silver contact 86 is secured by the screw 87. The construction positions the two stationary contacts 80 and 86 in alignment with the contacts 62 of the bridging member and thus the said bridging contacts can be actuated to control the closing and opening of the particular circuit in electrical connection with the terminals 77 and 85.

The magnetic switch assemblage of the invention is characterized by bracket structure which has a gripping and supporting relation with the magnetic field piece 40 and a secured relation with the top portion 30 of the coil housing 21. It is relatively easy to assemble the parts and the bracket structure can be properly located on the support as the result of the positioning lugs 51. The carriage 57 is formed of insulating material as are also the retaining members 63. When the coil 20 is energized the armature is attracted by the magnetic field piece and the resultant movement of the carriage will cause the bridging contacts to engage the stationary contacts and close the electric circuit having connection therewith. Upon deenergization of the coil 20 the armature will be returned to its original inoperative position by gravity or by spring means such as may be provided for the purpose. Movement in this rearward direction as regards the armature will withdraw the bridging contacts from the stationary contacts and the electric circuits are accordingly opened.

We claim:

1. Operating means for an electric switch, the combination with a supporting plate, of a magnetic field piece, bracket structure for supporting the magnetic field piece

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above the plate including side bracket elements each having a base portion, an intermediate magnetic field piece gripping portion and a top yoke portion, said plate and base portions having coacting means for positioning and securing the bracket elements to the plate, a plastic encased coil having a plastic top portion, means integral with the top portion and having engaging relation with the yoke portions of the bracket elements for supporting the plastic encased coil in depending relation within the magnetic field piece, and an armature extending through a cored opening in the plastic coil and adapted to have coacting relation with said field piece when the coil is energized.

2. Operating means for an electric switch, the combination with a supporting plate, of a magnetic field piece, bracket structure for supporting the magnetic field piece above the plate including a pair of bracket elements disposed at each side of the said field piece, each bracket element having a base portion, an intermediate gripping portion adapted to have a contacting relation with the magnetic field piece and a top portion in the form of a yoke, said plate and base portions having coacting lugs and openings for positioning and securing the bracket elements to the plate, a plastic housing including a top portion and a depending portion, a solenoid encased in said depending portion, said top portion having a formation for engaging the top yoke portions of the bracket elements whereby to support the plastic housing with the plastic encased solenoid located within the magnetic field piece, said depending portion of the plastic housing having a cored opening extending through the solenoid, and an armature having a shank portion and a head portion, said shank portion of the armature being disposed within the cored opening for movement when the head portion is attracted by the magnetic field piece upon energizations of the solenoid.

3. In a magnetic switch assemblage, the combination including a coil and armature device and a terminal contact block, a supporting plate for said device and block, said coil and armature device including a pair of supporting bracket elements each having a base portion, coacting means on the plate and base portions for positioning and securing the said bracket elements to the plate, a resilient clip member fixed to the plate in predetermined spaced relation with respect to the coacting means on the plate for the base portions, said terminal contact block having notches formed therein for receiving the clip member to thereby releasably retain and position the contact block on the plate, and securing screws for fastening the contact block to the plate.

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4. In a magnetic switch assemblage, the combination including a coil and armature device and a terminal contact block, a supporting plate for said device and block, said coil and armature device including a pair of supporting bracket elements each having a base portion provided with a plurality of openings, a pair of upstanding lugs on the plate for coaction with the openings in the base portions of the bracket elements whereby to retain and position the bracket elements on the plate, a member fixed to the plate and providing a pair of resilient clips in predetermined spaced relation with respect to the lugs on the plate, said terminal contact block having notches formed therein for receiving the resilient clips to releasably retain and position the contact block on the plate, and securing screws for fastening the contact block to the plate.

5. In a magnetic switch assemblage, the combination including a coil and armature device and a terminal contact block, a supporting plate for said device and block, means releasably securing the device and block respectively to the plate in predetermined spaced relation, said coil and armature device including a movable armature, a plurality of bridging contacts carried by the armature for movement therewith, a plurality of stationary contacts provided by the terminal contact block and disposed in pairs for coaction respectively with a pair of bridging contacts, a top contact carrier and a bottom contact carrier for each pair of stationary contacts, said terminal contact block having an upstanding center wall of insulating material, each top contact carrier extending over the center wall from one side thereof to the opposite side, each bottom contact carrier extending through the center wall from one side thereof to the opposite side, and a terminal clip secured to the contact carriers respectively on the side of the center wall opposite the stationary contacts.

References Cited in the file of this patent

UNITED STATES PATENTS

2,394,090	McFarland	Feb. 5, 1946
2,617,846	Field	Nov. 11, 1952
2,649,521	Cobb et al.	Aug. 18, 1953
2,672,536	Rosing et al.	Mar. 16, 1954
2,721,963	Knight	Oct. 25, 1955
2,831,938	Moyer	Apr. 22, 1958
2,874,245	Moyer	Feb. 17, 1959
2,921,164	Becka	Jan. 12, 1960