

March 10, 1942.

G. E. WHITEHEAD
ELECTRICAL CONTACT MEANS

2,276,130

Filed May 10, 1941

2 Sheets-Sheet 1

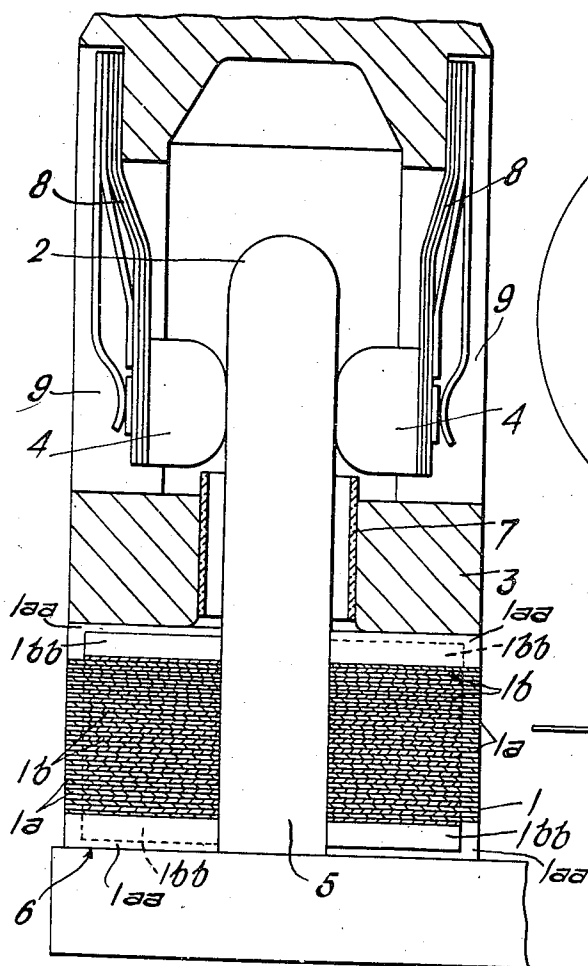


FIG. 1.

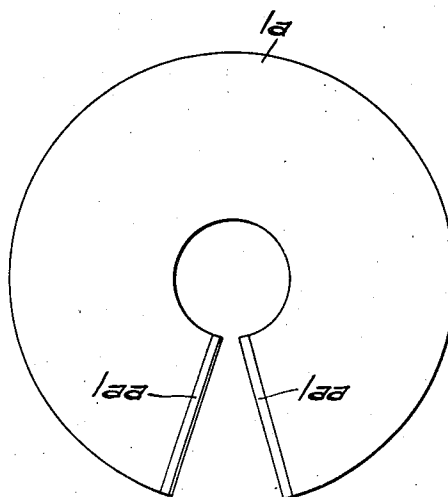
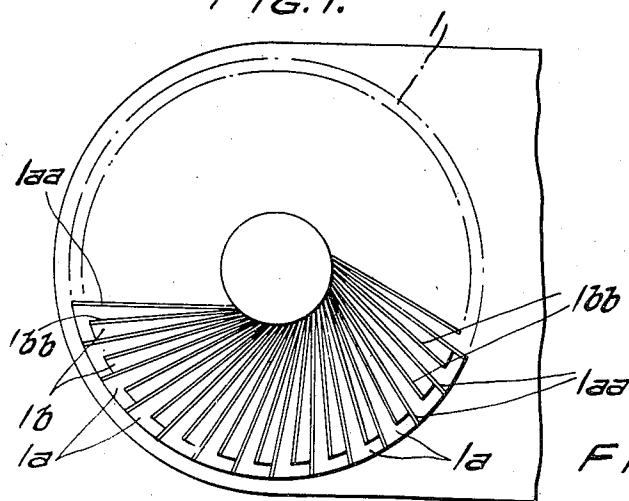


FIG. 3.

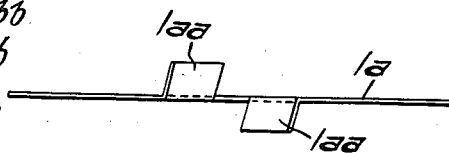


FIG. 4.

INVENTOR
G. E. Whitehead
By
FIG. 2. *Robert R. Cobb*
ATTORNEYS

March 10, 1942.

G. E. WHITEHEAD
ELECTRICAL CONTACT MEANS

2,276,130

Filed May 10, 1941

2 Sheets-Sheet 2

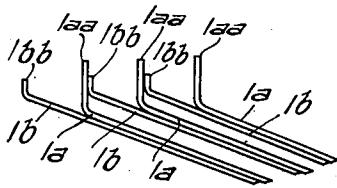


FIG. 5.

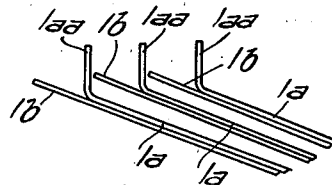


FIG. 6.

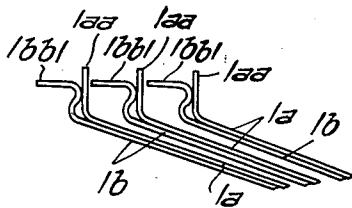


FIG. 7.

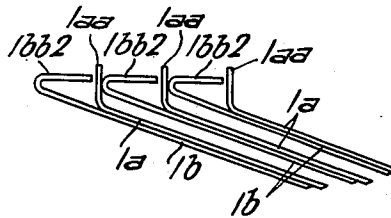


FIG. 8.

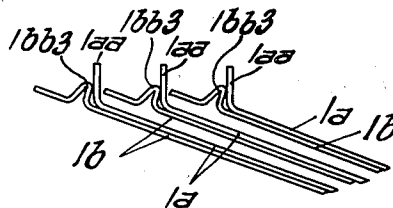


FIG. 9.

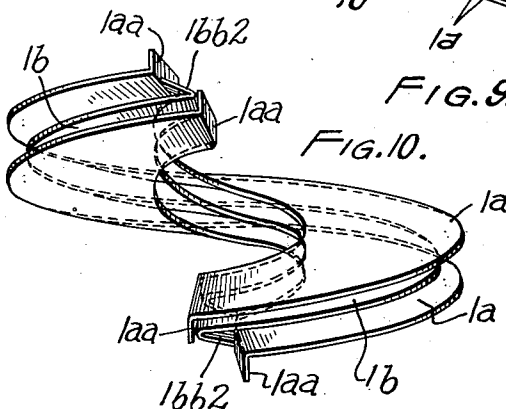


FIG. 10.

INVENTOR
G.E. Whitehead
By Robb & Robb
ATTORNEYS

UNITED STATES PATENT OFFICE

2,276,130

ELECTRICAL CONTACT MEANS

George Ethelbert Whitehead, Pontypridd, Wales

Application May 10, 1941, Serial No. 392,968
In Great Britain January 25, 1940

12 Claims. (Cl. 200—166)

This invention relates to contacts for electric circuit breakers, switches, current carrying connectors and the like, and has particular reference to devices such as that described in prior British specification No. 409,085, in which one contact element is constituted by a plurality of flexible laminae whose edges make line contact with the complementary contact element.

The invention comprises the arrangement in which the contact element which is constituted by a plurality of flexible laminae is a butt contact element.

The invention further comprises the arrangement that the laminae are of helical form.

In order that the invention may be the more clearly understood a switch in accordance therewith will now be described, reference being made to the accompanying drawings wherein—

Figure 1 is a sectional side elevation of said switch in the closed position.

Figure 2 is a plan of the laminated contact element.

Figure 3 is a plan illustrating one of the laminations of said laminated contact element in course of formation.

Figure 4 is a side elevation of the same.

Figure 5 is a fragmentary view of the upper extremities of three of the contacting laminations of said laminated contact element together with the stiffening and spacing laminae between them.

Figures 6, 7, 8 and 9 are similar views to Figure 5 illustrating alternative forms of stiffening and spacing laminae; and

Figure 10 is a detail view showing a pair of the helical contacting laminae in spaced condition and an intermediate helical spacing lamina, the ends of the spacing lamina being illustrated as similar to that shown in Figure 8.

Referring to Figures 1 and 2, the movable switch element comprises a main moving contact 1 of roughly cylindrical form and an auxiliary moving contact 2 extending axially from said main moving contact in the forward direction; and the stationary switch element comprises a main stationary contact 3 in the form of an annulus against one face of which the main moving contact 1 is adapted to abut, as shown in Figure 1, after the auxiliary moving contact 2 has passed through it, while the auxiliary stationary contact 4 takes the form of a suitable spring loaded contact at the rear of the main stationary contact, with which said auxiliary moving contact engages.

The parts are so arranged that, when the movable switch element is moved into and out of engagement with the stationary switch element, the auxiliary moving contact 2 engages the auxiliary stationary contact 4 before the main moving contact 1 engages the main stationary contact 3,

and disengages said auxiliary stationary contact after said main moving contact has disengaged said main stationary contact.

In the present arrangement the main moving contact 1 is constituted by a multiplicity of laminae 1a arranged around a central support 5 whose axis is in the line of movement. Each of these laminae 1a is in the form of a helix (that is the form of a screw thread) with its plane transverse to the axis of the helix, the extent of the helix being rather less than one turn and the extremities 1aa being bent outwardly parallel to the axis of the helix. These laminae 1a are threaded on to the central support 5 one above the other so that their lower or rear ends 1aa rest on a shoulder 6 extending outwardly from said central support. It will be seen that, to make this possible, the laminae 1a have to be angularly spaced from one another around said central support 5.

It will be seen that the upper or forward extremities 1aa of the laminae 1a lie on the surface of a flat disc. It is these upper or forward extremities which constitute the contacting surface of said main moving contact and engage, as shown, against the flat face of the annulus 3 forming the main stationary contact.

It will be appreciated that the extremities 1aa of each lamina 1a will make independent line contact both with said main stationary contact 3 and with the shoulder 6 on the central support 5 and that each will yield resiliently and independently so that good contact is ensured between the laminae 1a as a whole and both said main stationary contact 3 and said shoulder 6. The latter contact establishes electrical connection between the laminae and the terminal for the moving switch element.

If said moving switch element is arranged in an upright position, the laminae 1a may rest freely by gravity on the aforesaid shoulder 6.

Interleaved alternately with these operative or contacting laminae 1a are stiffening and spacing laminae 1b. These stiffening and spacing laminae 1b have their bent over extremities 1bb made short so as not to extend quite to the shoulder 6 and to the main stationary contact 3 respectively. The length of said stiffening and spacing laminae 1b in a circumferential sense is however slightly greater than that of the contacting laminae 1a and thus said stiffening and spacing laminae act to space the contacting laminae in a circumferential sense, maintaining a constant space between each adjacent pair of bent over ends 1aa. This will be understood if it is observed that the upper end of each stiffening and spacing lamina abuts the upwardly bent end 1aa of the contacting laminae immediately below it while the lower end of the same stiffening and spacing lamina abuts the downwardly

bent end *1aa* of the contacting lamina immediately below it. Thus the bent over ends *1aa* of each two adjacent laminae *1a* are held apart by the action of the whole length of the stiffening and spacing lamina *1b* between them. In addition to this the stiffening and spacing laminae *1b* are so formed, as to exert separating pressure on the contacting laminae *1a* between which they lie. Thus each stiffening and spacing lamina *1b* is so formed that, at or near its lower or rear end it presses against the contacting lamina *1a* beneath it and at or near its upper end it presses against the contacting lamina *1a* above it. Thus said contacting laminae are also spaced in an axial sense and added resiliency is given to the contact. The contacting laminae *1a* may suitably be of copper and the stiffening and spacing laminae of phosphor bronze.

The outer diameter of the stiffening and spacing laminae *1b* may be less than that of the contacting laminae *1a* as indicated in Figure 2.

Each lamina *1a* is formed from a blank as illustrated in Figures 3 and 4. The extremities *1aa* are bent on opposite sides of the blank not quite to the normal as clearly shown in these figures and when the blank is then given its helical form said extremities will become parallel to the axis as heretofore stated. The stiffening and spacing laminae *1b* will be made in exactly the same way.

Referring now to Figures 6 to 9, these show alternative forms of stiffening and spacing laminae *1b*. Thus in Figure 6, the extremities of the laminae *1b* are not bent over at all. These laminae *1b* operate however in precisely the same way as those illustrated in Figures 2 and 5.

In Figures 7, 8 and 9, however, the laminae *1b* are formed with portions lying directly between adjacent pairs of bent over ends *1aa* of the contacting laminae *1a*. In this way the whole length of the stiffening and spacing laminae is not relied on to space the bent over ends *1aa* and a more positive and less flexible spacing is attained. Thus, in Figure 7, the ends of the laminae *1b* are bent backwardly and forwardly as shown so as to form a horizontal portion *1bb'* lying between adjacent pairs of the bent over ends *1aa*. In Figure 8 the ends of said laminae *1b* are simply bent backwards to form a similar horizontal portion *1bb''* lying between adjacent pairs of bent over ends *1aa*. Finally in Figure 9 said laminae *1b* are formed with a ridge *1bb'''* near their ends so that adjacent pairs of bent over ends *1aa* abut respectively against the extremity of the lamina *1b* between them and the ridge *1bb'''* of said lamina *1b*, so that, as before, they are firmly spaced.

It is to be understood that, in each of the Figures 5 to 9, the lower ends of the laminae *1a*, *1b*, will be identical with the upper but reversed, that is to say at the lower ends the laminae *1b* will press downwardly against the laminae *1a* beneath them.

The circumferential extent of the laminae may be in many cases considerably less than shown in Figure 3 and the laminae may be narrower than shown in Figure 3.

An arc shield 7 is provided in the form of a tube of refractory material lining the inner circumferential periphery of the annulus 3 forming the main stationary contact, said tube extending a short distance forwardly from said annulus, that is towards the auxiliary contacting region.

The auxiliary contacts 2 and 4 may take any

suitable form—for example any of the forms described in the provisional specification of our co-pending British application No. 1527/40 of even date herewith would be suitable.

In the particular arrangement illustrated the auxiliary contact 2 takes the form of an axial rod forming a continuation of the central support 5 and there are a plurality of contacts 4 carried by leaf springs 8 and engaging the periphery of said contact 2.

Openings 9 are provided for freely admitting the surrounding air or oil to the contacting region of the auxiliary contacts.

What I claim and desire to secure by Letters Patent is:

1. A butt contact for an electric circuit breaker or the like, comprising a plurality of flexible contacting laminae, each in the form of a helix with its plane transverse to its axis, said contacting laminae being stacked together, and successively angularly spaced around their common axis, and having their ends bent outwardly whereby edges are formed which make contact with a complementary butt contact.

2. A butt contact for an electric circuit breaker or the like, comprising a plurality of flexible contacting laminae, each in the form of a helix with its plane transverse to its axis, said contacting laminae being stacked together, and successively angularly spaced around their common axis, and each having both its ends bent outwardly, and a supporting base with which the ends of said contacting laminae at one end make edge contact, the ends of said contacting laminae at the other end being adapted to make edge contact with a complementary butt contact.

3. A butt contact for an electric circuit breaker or the like, comprising a plurality of flexible contacting laminae, each in the form of a helix with its plane transverse to its axis, said contacting laminae being stacked together, and successively angularly spaced around their common axis, and each having both its ends bent outwardly, and a supporting base including a surface with a post projecting outwardly therefrom, said contacting laminae being arranged around said post with their ends at one end making edge contact with said surface, the ends of said contacting laminae at the other end being adapted to make edge contact with a complementary butt contact.

4. A butt contact for an electric circuit breaker or the like, comprising a plurality of flexible contacting laminae, each in the form of a helix with its plane transverse to its axis and extending rather less than one turn, said contacting laminae being stacked together, and successively angularly spaced around their common axis and having their ends bent outwardly whereby edges are formed which make contact with a complementary butt contact.

5. A butt contact for an electric circuit breaker or the like, comprising a plurality of flexible contacting laminae, each in the form of a helix with its plane transverse to its axis, said contacting laminae being stacked together, and successively angularly spaced around their common axis, and having their ends bent outwardly whereby edges are formed which make contact with a complementary butt contact, and stiffening and spacing laminae interleaved alternately with said contacting laminae and operating to space said outwardly bent ends of said contacting laminae.

6. A butt contact for an electric circuit breaker

or the like, comprising a plurality of flexible contacting laminae, each in the form of a helix with its plane transverse to its axis, said contacting laminae being stacked together, and successively angularly spaced around their common axis, and each having both its ends bent outwardly, a supporting base with which the ends of said contacting laminae at one end make edge contact, the ends of said contacting laminae at the other end being adapted to make edge contact with a complementary butt contact, and stiffening and spacing laminae interleaved alternately with said contacting laminae and operating to space said outwardly bent ends of said contacting laminae at both ends.

7. A butt contact for an electric circuit breaker or the like, comprising a plurality of flexible contacting laminae, each in the form of a helix with its plane transverse to its axis, said contacting laminae being stacked together, and successively angularly spaced around their common axis, and each having both its ends bent outwardly, a supporting base with which the ends of said contacting laminae at one end make edge contact, the ends of said contacting laminae at the other end being adapted to make edge contact with a complementary butt contact, and stiffening and spacing laminae interleaved alternately with said contacting laminae, said stiffening and spacing laminae being of the same general helical form as, but of slightly greater circumferential extent than, said contacting laminae so that their ends abut against the remote outwardly bent ends of adjacent contacting laminae and thereby space said outwardly bent ends of said contacting laminae at both ends.

8. A butt contact for an electric circuit breaker or the like, comprising a plurality of flexible contacting laminae, each in the form of a helix with its plane transverse to its axis, said contacting laminae being stacked together, and successively angularly spaced around their common axis, and each having both its ends bent outwardly, a supporting base with which the ends of said contacting laminae at one end make edge contact, the ends of said contacting laminae at the other end being adapted to make edge contact with a complementary butt contact, and stiffening and spacing laminae interleaved alternately with said contacting laminae, said stiffening and spacing laminae being of the same general helical form as said contacting laminae, and being formed at both ends with spacing portions which lie directly between outwardly bent ends of adjacent contacting laminae to thereby space said outwardly bent ends.

9. A butt contact for an electric circuit breaker or the like, comprising a plurality of flexible contacting laminae, each in the form of a helix with its plane transverse to its axis, said contacting laminae being stacked together, and successively angularly spaced around their common axis, and having their ends bent outwardly whereby edges are formed which make contact with a complementary butt contact, and stiffening and spacing laminae interleaved alternately with said contacting laminae and formed so as to exert a resilient separating pressure on the contacting laminae between which they lie and to space said outwardly bent ends of said contacting laminae.

10. A butt contact for an electric circuit breaker or the like, comprising a plurality of flexible contacting laminae, each in the form of a helix with its plane transverse to its axis, said contacting laminae being stacked together, and successively angularly spaced around their common axis, and each having both its ends bent outwardly, a supporting base with which the ends of said contacting laminae at one end make edge contact, the ends of said contacting laminae at the other end being adapted to make edge contact with a complementary butt contact, and stiffening and spacing laminae interleaved alternatively with said contacting laminae, said stiffening and placing laminae being of the same general helical form as, but of slightly greater circumferential extent than, said contacting laminae so that their ends abut against the remote outwardly bent ends of adjacent contacting laminae and thereby space said outwardly bent ends of said contacting laminae at both ends, and said stiffening and spacing laminae being formed so as to exert a resilient separating pressure on the contacting laminae between which they lie.

11. A butt contact for an electric circuit breaker or the like, comprising a plurality of flexible contacting laminae, each in the form of a helix with its plane transverse to its axis, said contacting laminae being stacked together, and successively angularly spaced around their common axis, and each having both its ends bent outwardly, a supporting base with which the ends of said contacting laminae at one end make edge contact, the ends of said contacting laminae at the other end being adapted to make edge contact with a complementary butt contact, and stiffening and spacing laminae interleaved alternately with said contacting laminae, said stiffening and spacing laminae being of the same general helical form as said contacting laminae, and being formed at both ends with spacing portions which lie directly between outwardly bent ends of adjacent contacting laminae to thereby space said outwardly bent ends, and said stiffening and spacing laminae being also formed so as to exert a resilient separating pressure on the contacting laminae between which they lie.

12. An electric circuit breaker or the like comprising a laminated butt contact, a complementary butt contact, and auxiliary contacts which make contact before, and break contact after, said butt contacts, said laminated butt contact comprising a plurality of flexible contacting laminae, each in the form of a helix with its plane transverse to its axis, said contacting laminae being stacked together and successively angularly spaced around their common axis and each having both its ends bent outwardly, and a supporting base including a surface with a post projecting outwardly therefrom, said contacting laminae being arranged around said post with their ends at one end making edge contact with said surface, the ends of said contacting laminae at the other end being adapted to make edge contact with said complementary butt contact, said complementary butt contact taking the form of an annulus and one of said auxiliary contacts being formed on a continuation of said post and being adapted to extend through said annulus to engage the other auxiliary contact.

GEORGE ETHELBERT WHITEHEAD.