Sept. 3, 1929. M. C. BERSTED 1,726,641

AUTOMATICALLY CONTROLLED ELECTRIC CONNECTION PLUG

Filed Dec. 17, 1923 3 Sheets-Sheet 1

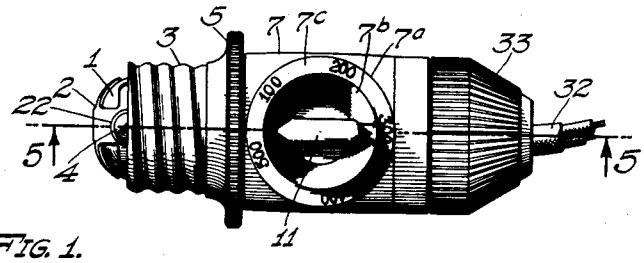



FIG. 1.

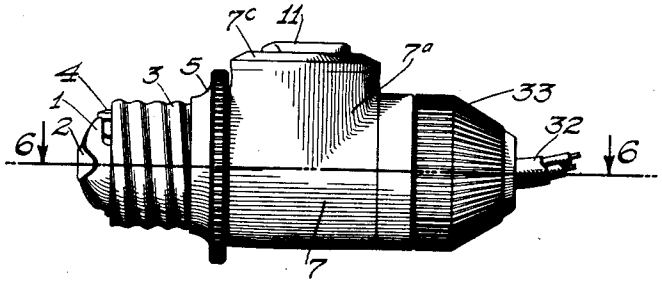



FIG. 2.

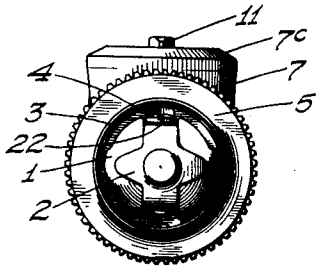



FIG. 3.

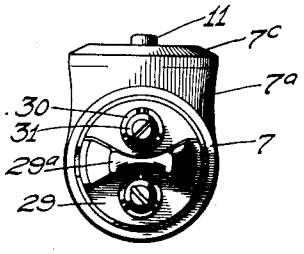



FIG. 4.

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AUTOMATICALLY CONTROLLED ELECTRIC CONNECTION PLUG

Filed Dec. 17, 1923 3 Sheets-Sheet 2

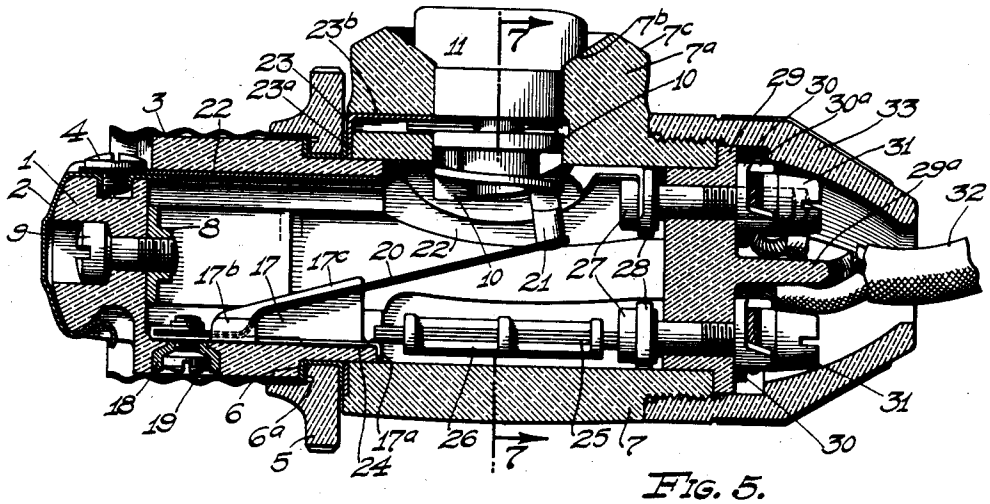



FIG. 5.

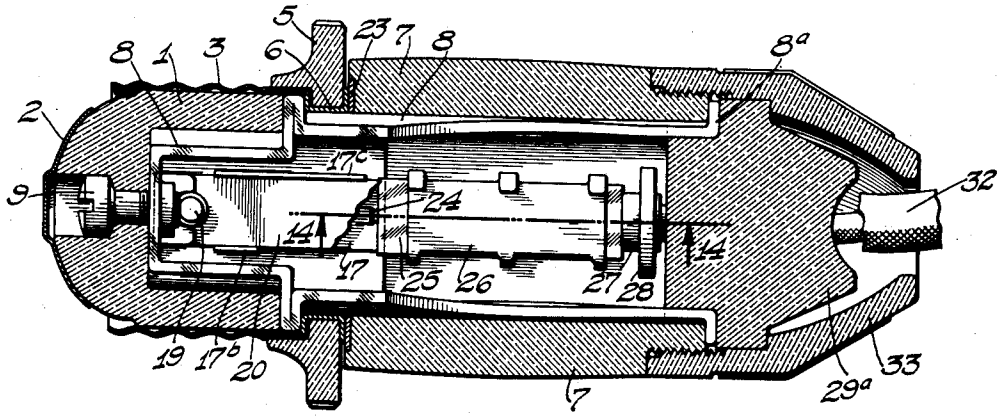



FIG. 6.

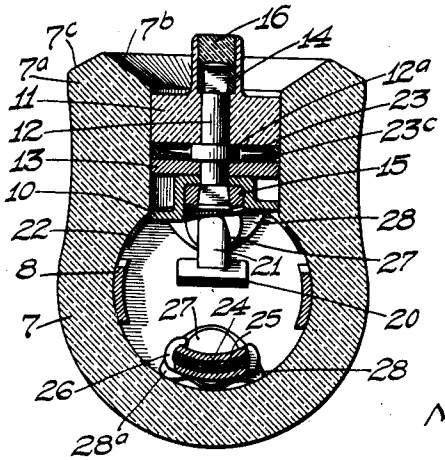



FIG. 7.

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AUTOMATICALLY CONTROLLED ELECTRIC CONNECTION PLUG

Filed Dec. 17, 1923 3 Sheets-Sheet 3

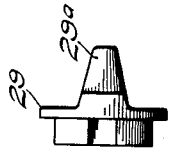



FIG. 12.

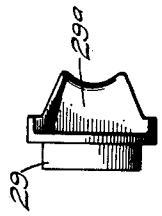



FIG. 13.

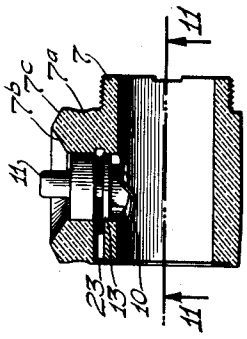



FIG. 10.

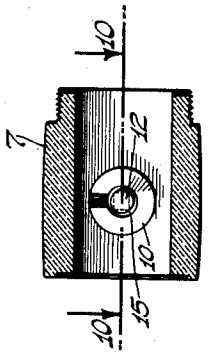



FIG. 11.

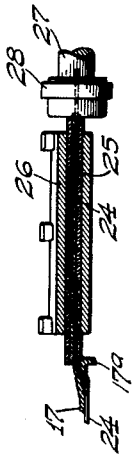



FIG. 14.

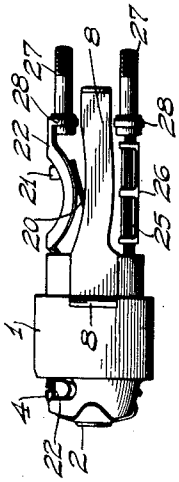



FIG. 8.

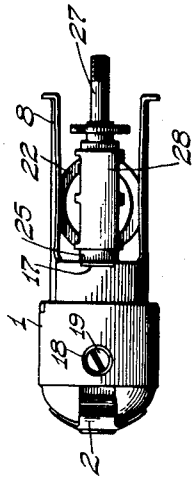



FIG. 9.

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# UNITED STATES PATENT OFFICE.

MARTIN C. BERSTED, OF SAN DIEGO, CALIFORNIA.

## AUTOMATICALLY-CONTROLLED ELECTRIC CONNECTION PLUG.

Application filed December 17, 1923. Serial No. 681,124.

My invention relates to an automatic electric connection plug for electric apparatus, particularly for controlling the electric currents to electric heating apparatus, and the primary object of this invention is to provide improvements over my previous invention for automatically controlled electric connection plugs for which I filed application for Letters Patent in the United States Patent Office, October 13, 1923, under Serial No. 668,317, and the objects of said improvements are: first, to provide a plug of this class in which the heating unit thereof is so constructed and arranged relatively to the switch mechanism as to conduct the heat more uniformly to the thermostat member of the switch mechanism whereby an electric current is more uniformly and constantly conducted to the heating elements of the heating apparatus to which it is connected; second, to provide a novelly constructed rotating switch and heat regulating member; third, to provide a novelly constructed casing for a plug of this class whereby the interior or the mechanism thereof is or need not be disturbed when connecting an electric cable therewith; fourth, to provide a plug of this class in which a good electrical connection is made at all times between the electric cable connected thereto and the terminal members adapted to be connected with the terminal members of a conventional electrical outlet; fifth, to provide a novelly constructed heating unit for a plug of this class and one which may be readily removed and replaced by another; sixth, to provide as a whole a novelly constructed, automatically controlled electric connection plug, and seventh, to provide such a plug which is very simple and economical of construction proportionate to its functions, durable, efficient, reliable, easy to adjust and operate, and which will not readily deteriorate or get out of order.

With these and other objects in view, as will appear hereinafter, my invention consists of certain novel features of construction, combination and arrangement of parts and portions, as will be hereinafter described in detail and particularly set forth in the appended claims, reference being had to the accompanying drawings and to the characters of reference thereon, which form a part of this application, in which:

Figure 1 is a side view of my automatically controlled electric connection plug connected to one end of an electric cable; Fig. 2 is another side view thereof taken at a right angle to that of Fig. 1; Fig. 3 is an end view of my plug taken from the plug end thereof; Fig. 4 is a view taken from the other end of the plug with the cap thereof removed; Fig. 5 is an enlarged longitudinal sectional view thereof taken through 5—5 of Fig. 1, showing certain parts and portions thereof in elevation to facilitate the illustration; Fig. 6 is another enlarged longitudinal sectional view thereof taken through 6—6 of Fig. 2, showing certain parts broken away and others in elevation to facilitate the illustration; Fig. 7 is an enlarged transverse sectional view thereof taken through 7—7 of Fig. 5; Fig. 8 is a side view of the plug member to which the plug terminal or contact members are secured, also showing the heating unit, the thermostat member and the casing connecting member secured thereto; Fig. 9 is another side view thereof taken at a right angle to that of Fig. 8; Fig. 10 is a longitudinal sectional view of the main casing member supporting the rotating switch and heat regulating member, with the section taken through 10—10 of Fig. 11, showing certain parts and portions thereof in elevation to facilitate the illustration; Fig. 11 is another longitudinal sectional view of the casing member taken through 11—11 of Fig. 10; Fig. 12 is a side view of the terminal supporting and conductor spacing member; Fig. 13 is another view thereof taken at a right angle to that of Fig. 12, and Fig. 14 is an enlarged longitudinal sectional view of the heating unit with the section taken through 14—14 of Fig. 6.

Like characters of reference refer to similar parts and portions throughout the several views of the drawings.

The plug terminal member support 1, plug terminal members 2 and 3, screw 4, screw terminal rotating member 5, annular securing member 6, casing member 7, casing retaining member 8, screw 9, adjustable contact member 10, heat regulating member 11, connecting member 12, contact member 13, retaining members 14 and 15, plastic filler 16, thermostat member support 17, bushing 18, screw 19, thermostat member 20, contact member 21, plate conductor 22, resilient conductor 23, heating element 24, insulating members 25, casing 26, terminal bolts 27, anti-rotating members 28, terminal supporting and conduc-

tor spacing member 29, nuts 30 and 31, cable 32, and the cap 33, constitute the principal parts and portions of my automatically controlled electric connection plug.

The plug terminal member support 1 of my electric connection plug for supporting the conventional terminal members is made of insulating material and is hollow at its inner end. Said member is provided, at the end adapted to be inserted into a socket of a conventional outlet, with a terminal or contact member 2, which is secured at its one end to the plate conductor 22, extending longitudinally through the casing, by means of a screw 4, and is resiliently secured to the member 1 at its opposite end, from which member it may be readily detached. Said terminal member 2 is secured to the member 1 in such a manner as to yield when inserted into the socket of the conventional outlet. Said support 1 is also provided around the side thereof with a revoluble screw terminal member 3 of conventional construction, which terminal member is secured at its inner end to an insulating, annular rotating member 5 by means of an annular securing member 6 of a substantially channel-shaped cross-section. Said channel-shaped annular securing member 6 is provided on one of its outwardly extending annular flanges with a plurality of inwardly extending pointed lugs $6^a$, which extend through an inwardly extending flange at the inner end of the screw terminal member 3 and into the rotating member 5, the other flange of said member 6 being positioned on the opposite side of said rotating member 5, thus securing the screw member 3 and the member 5, for rotating the same, relatively to each other.

The terminal member 2 is connected by means of the plate conductor 22 with one conductor of the electric cable 32 adapted to be connected with a heating apparatus. Said conductor 22 is provided at the end opposite the terminal member 2 with a terminal bolt 27, which extends through the terminal supporting and conductor spacing member 29 and is provided at the end extending through said member 29 with nuts 30 and 31 between which is secured the conductor of said cable. The nut 30 is provided with a plurality of outwardly extending lugs $30^a$ for retaining the bared end of said conductor in position around said bolt and between which lugs the cap-shaped nut 31 is adapted to be screwed. The screw terminal member 3 is connected by means of the resilient conductor 23, mounted at one end of and within the casing member 7, with the rotating contact member 10, revolubly mounted within the casing member 7 at a right angle with the axis thereof. The annular portion $23^a$ of the resilient conductor 23 is preferably distorted longitudinally so as to produce a good electrical contact with the one flange of the terminal securing member 6 against which it is positioned. The portion $23^b$, of the conductor 23, extending inwardly into the casing member 7, is provided with a bifurcated portion adapted to straddle the connecting member 12 and is provided on each of the arms of the bifurcated portion with a backwardly and inwardly bent portion $23^c$, positioned in frictional engagement with the disc-shaped contact member 13 mounted on the connecting member 12, as shown best in Figs. 5 and 7 of the drawings, whereby a good electrical contact is made therewith. The regulating member 11, extending through the casing, and the contact disc member 13 are positioned on either side of the bifurcated portion $23^b$ of the member 23 and are spaced apart by means of an enlarged portion $12^a$ intermediate the ends of the connecting member 12. The members 10, 11 and 13 are secured together by means of the connecting member 12, which extends centrally through the same and through retaining members 14 and 15 positioned respectively in recesses in the members 10 and 11. Said retaining members 14 and 15 are provided with inwardly tapered square recesses in which the ends of the connecting member 12 are upset and riveted over. The recess made by the insertion of the retaining member 14 in the handle portion of the regulating member 11 is filled with a plastic material 16 to protect the operator from the charged member 12. The inner, contact face of the contact member 10, preferably made of pure silver, is helically shaped so that the point of engagement with the contact member 21 secured at the end of the thermostat member 20 may be easily changed as desired by rotating the regulating member 11. The rotating of the member 11 increases or decreases the tension on the thermostat member 20 depending on the direction in which said member is rotated.

The casing member 7 is provided on one side with a laterally extending portion $7^a$ in which the regulating member and contact member 10 are revolubly mounted. Said extended portion is provided at its outer end with an inwardly beveled face $7^b$ at its inner portion and with an outwardly beveled face $7^c$ at its outer portion. On the inwardly beveled face $7^b$ are stamped the letters "L", "M" and "H", indicating respectively, "low", "medium" and "high" temperatures to indicate to the operator the approximate position that the regulating member 11 is to be turned to obtain such heat by the heating apparatus. The outwardly beveled face $7^c$ is provided with numbers 100, 200 and the like to indicate more specifically the temperature. The casing member 7 is retained in position on the reduced inner end of the plug terminal member support 1 by means of the resilient, bifurcated casing retaining member 8 secured at its one end within the hollow portion of the member 1 by means of the screw 9. Said

retaining member 8 is provided at its outwardly extended ends with outwardly projecting portions $8^a$, which are adapted to be positioned in slots at the opposite end of the casing member 7. It will be noted that in order to remove the casing member the free ends of the retaining member 8 are contracted relatively to each other, disengaging the portions $8^a$ thereof from the slotted portion of the casing member. The retaining member 8 being resilient aids in the electrical connection between the annular securing member 6 and the resilient conductor 23, previously described.

The thermostat member 20, consisting of two plates of metal of different coefficients of expansion, is removably supported at the end opposite the contact member 21 by the thermostat member support 17, which is secured at its one end by means of a screw 19 extending through a bushing 18 positioned in the side wall of the support 1, said screw 19 being screwed into the thermostat member 20. Said thermostat member support 17 is positioned against movement at its opposite end by means of an outwardly extended portion $17^a$ positioned in a slot at the inner end of the support 1. Said member 17 is provided on each side with inwardly extending portions $17^b$ and $17^c$, which retain the thermostat member 20 in position and alinement when rotating the contact member 10 about its axis and also when said thermostat member is distorted by heat.

The heating unit of my plug consists of a metallic casing 26 in which is positioned a plurality of layers of insulating material, preferably mica, 25, and a heating element 24, preferably a band of electrical resistance material. Said heating element 24 is preferably woven between the several layers of mica, substantially as shown in Fig. 14 of the drawings. The casing 26 consists of a plate bent over itself, the open portions thereof being secured together by lugs at one edge thereof bent over the opposite edge. It will be here noted that by encasing the heating element as shown and described, the same will not heat up the compartment within the plug instantaneously and therefore will not cool the compartment instantaneously, the heat being conducted through the layers of mica and the metallic casing; therefore the circuit will not be broken as often as when the thermostat member is directly exposed to the heating element. The one end of the heating element is secured to the thermostat member support 17, preferably by clamping the same thereto, substantially as shown in Fig. 14 of the drawings. The other end of the heating element extends into the head end of another bolt 27 and is preferably soldered thereto. Said last mentioned bolt 27 also extends through the member 29 and is adapted to be connected with the other conductor of the cable 32, as described in connection with the other conductor of said cable. Each of the bolts 27 are provided near their head ends with anti-rotating members 28, which are preferably integrally secured thereto and which are provided at their outer portions with lugs $28^a$, which are adapted to engage the inner surface of the casing member 7, substantially as shown in Fig. 7 of the drawings, to prevent the bolts 27 from turning when screwing the nuts 30 and 31 on the threaded ends thereof. The terminal supporting and conductor separating member 29 is provided at its middle portion with an outwardly extending portion $29^a$, which is adapted to separate the separate conductors of the cable 32 at their bared ends, thus reducing the danger of a short circuit to a minimum.

The casing member 7 is externally threaded at the end opposite the plug terminal member support and is adapted to receive thereon the knurled cap 33, which cap encases the charged bolt terminal members and also secures the member 29 in position within the casing member 7.

It is obvious from this construction, as illustrated in the drawings and described in the foregoing specification, that there is provided an automatically controlled electric connection plug as aimed at and set forth in the objects of the invention, and though I have shown and described a particular construction, combination and arrangement of parts and portions, I do not wish to be limited to this particular construction, combination and arrangement, but desire to include within the scope of my invention the construction, combination and arrangement substantially as set forth in the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. An automatically controlled electric connection plug including a substantially cylindrical end member having a chamber extending from the inner end axially therewith, a central terminal member on the outer end thereof and an enveloping revoluble terminal screw member having an annular insulating flange portion secured to its inner end and revoluble in a reduced annular end portion of said end member, a substantially tubular central casing for enclosing thermostatic cutout means adapted to fit over the reduced end portion of said end member and to form an extension of said chamber, a substantially U-shaped resilient retaining member secured to the end wall of said chamber, the legs of said retaining member extending lengthwise with said chamber and having outwardly extending end portions adapted to snap into slots at the outer end of said casing, a terminal supporting member secured to the outer end of said casing having terminal bolt holes extending parallel with the axis thereof and

parallel extending connection members secured to said end member and connected to said central and terminal screw members and having terminal bolts at their outer ends, said bolts adapted to pass through said bolt holes in said casing enclosing said thermostatic cut-out means.

2. An automatically controlled electric connection plug including a substantially cylindrical end member having a chamber extending from the inner end axially therewith, a central terminal member on the outer end thereof and an enveloping revoluble terminal screw member having an annular insulating flange portion secured to its inner end, a central casing adapted to fit over the reduced end portion of said end member and to form an extension of said chamber, resilient retaining means secured to the said end member for detachably holding said casing in position, a terminal supporting member secured to the other end of said casing, said terminal supporting member having apertures for receiving terminal bolts, said terminal bolts being held in parallel alignment by means of connecting members secured to said end member, and thermostatic cut-out means enclosed within said casing and supported on said connection members.

3. An automatically controlled electric connection plug including a substantially cylindrical end member having a chamber extending from the inner end axially therewith, a central terminal member on the outer end thereof and an enveloping revoluble screw member supported thereon, means for revolving said screw terminal member and preventing axial displacement thereof with respect to said end member, a substantially tubular casing member forming an extension of said chamber and detachably secured at its one end to said end member, thermostatic cut-out means supported on said end member and enclosed within said casing, a terminal supporting member at the other end of said casing, terminal bolts secured to said thermostatic cut-out means and extending to said terminal support member and terminal nuts adapted to cooperate with said terminal bolts and to hold said support member in position.

In testimony whereof, I have hereunto set my hand at San Diego, California, this 8th day of December, 1923.

MARTIN C. BERSTED.