June 30, 1942. N. E. DAVIS ET AL 2,288,516

INDUCTANCE

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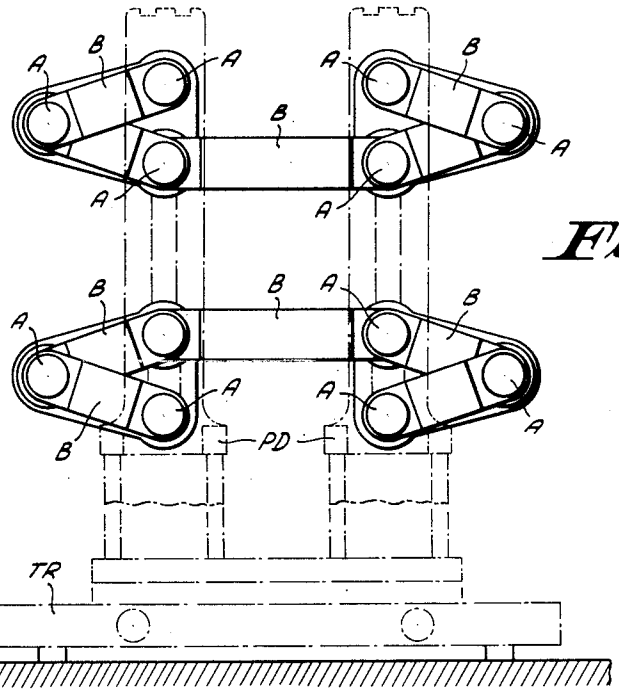



Fig. 1

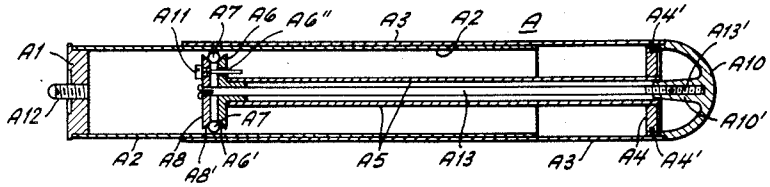



Fig. 3

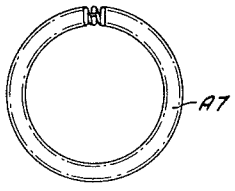



Fig 5

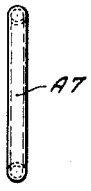



Fig. 6

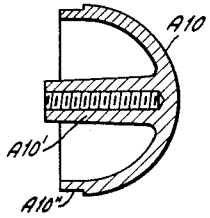



Fig. 7

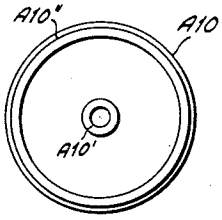



Fig. 8

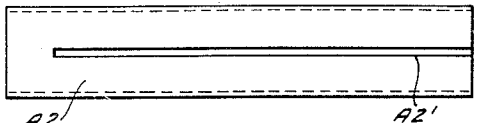



Fig. 4

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INDUCTANCE

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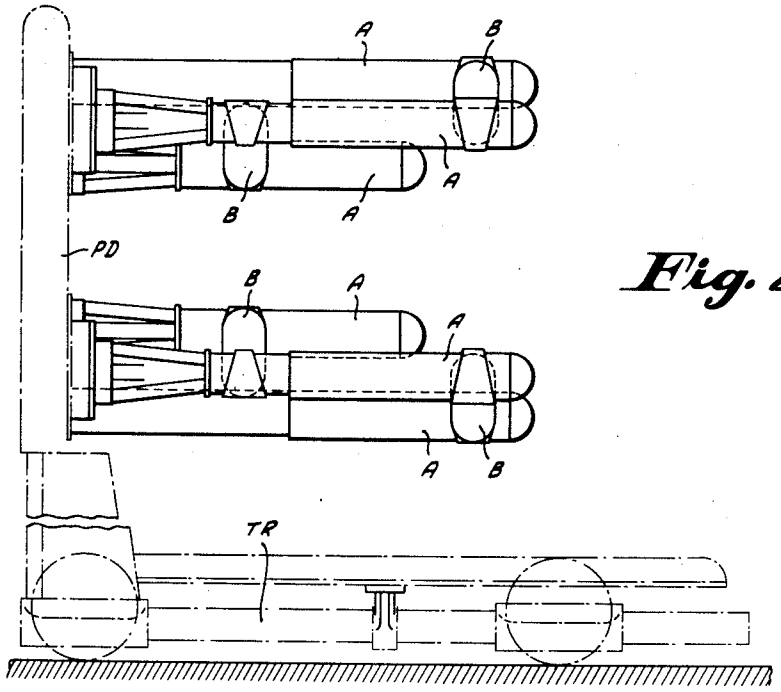



Fig. 2

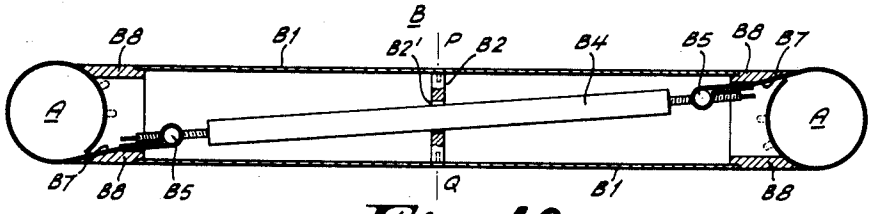



Fig. 10

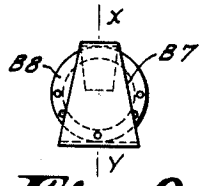



Fig. 9

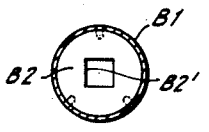



Fig. 11

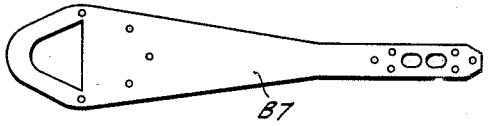



Fig. 12

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2,288,516

# UNITED STATES PATENT OFFICE

2,288,516

## INDUCTANCE

Norman Eustace Davis, Frederick Gawn Robb, and Henry James Craymer, Chelmsford, England, assignors to Radio Corporation of America, a corporation of Delaware

Application June 22, 1939, Serial No. 280,468
In Great Britain July 29, 1938

6 Claims. (Cl. 178—44)

This invention relates to inductances and more particularly to adjustable inductances suitable for use in high power short wave radio transmitters and for similar purposes.

The invention seeks to provide improved inductances of such construction as to be easily and quickly variable, and easily and quickly connectable in a variety of different ways (series, parallel or series-parallel) without requiring the use of special tools such as spanners or indeed of tools of any kind; in which the contact surfaces through which connection is made are smooth, capable of carrying large currents, and firmly held together under high pressure without the use of ordinary clamping bolts and nuts and without requiring the use of spanners; and in which sharp edges, such as are provided by ordinary nuts and bolts, are avoided so that the flash-over voltages between different members follow a substantially true law of radius and spacing.

According to this invention, an adjustable inductance element comprises a plurality of metallic tubes adapted to telescope into one another, an expansible member inside the innermost tube, and means, manually operable externally of the telescoping tubes, for expanding said expansible member to abut against the inside of said innermost tube thereby to cause the tubes to bind against one another and prevent telescoping action.

The invention is illustrated in the accompanying drawings which show one embodiment of the invention. This embodiment was designed for use as the adjustable anode inductance of the final power amplifier of a 100 kw. short wave transmitter. The figures are to different scales but all are drawn in true proportion.

In the drawings:

Fig. 1 is a front view of the general arrangement;

Fig. 2 is a side view of the general arrangement;

Fig. 3 is a sectional elevation of one of the telescopic tube inductances A of Figs. 1 and 2;

Fig. 4 is an elevation of the inner cylinder of one of the inductances A.

Figs. 5 and 6 are respectively face and side elevations of the expansion ring of Fig. 3;

Figs. 7 and 8 are respectively a sectional elevation and an end view of the cylinder head of Fig. 3;

Fig. 9 is an end view of one of the fittings B of Figs. 1 and 2;

Fig. 10 is a sectional elevation on the line XY of Fig. 9;

Fig. 11 is a section on the line PQ of Fig. 10; and

Fig. 12 is a developed view of the clasp of Fig. 9.

Referring now to the drawings, the construction therein shown is for a short wave transmitter in which the high frequency circuits are mounted on trucks which can be run into the set after adjustment for wave length. In Figs. 1 and 2, the broken lines indicated by TR represents a truck having pedestals PD (which in the example in question correspond electrically to the anodes of the valves in a push-pull circuit) on which the inductance members are mounted either directly or through insulators as may be desired. The inductance assembly consists of a plurality of telescopic tube inductances A, each of which is individually adjusted, connected in series, parallel, or series-parallel by tubular fittings B of adjustable position. The number and positions of the fittings B are chosen to suit the connections required and may be changed quickly and easily to give different connections for different inductance values.

Each telescopic tube inductance A comprises a brass base A1 in which is soldered a brass connection stud A12 and on which is fixed an inner cylinder A2 of copper having a longitudinal saw cut A2' with chamfered edges. Fitted over the cylinder A2 is an outer cylinder A3 also of copper, with a brass disc A4 fitted into it near one end. The disc A4 is fixed by locating pegs A4' and is also soldered to the tube A3. Fixed, as by soldering, in a central aperture in the disc A4 is a copper tubular support A5 to the other end of which is fixed, as by soldering, a brass expansion disc A6 formed with a bevelled edge A6' as shown, and with a central aperture and an offset aperture A6''. The letter aperture A6'' is for receiving a brass dowel pin A11 which is carried by a brass expansion head A8 which is bevelled at A8' to correspond with the bevelling at A6'. The head A8 is fixed on the end of an expansion rod A13 which is screw threaded at the other end A13' to fit into the internally screw threaded central boss A10' of a brass hollow cylinder head A10. The head A10 is formed with a peripheral step A10'' as best shown in Fig. 7 adapted rotatably to fit into the outer end of the cylinder A3. Fitted into the V-like space between the beveled edges A8', A6' is an expansion ring A7 consisting of a helically wound phosphor bronze wire of 18 S. W. G. The member A7 is

thus a spring ring capable of being increased in diameter against its springiness.

To adjust the length of and therefore the inductance of a member A the head A10 is rotated in a direction to separate the parts A6, A8 thus allowing the ring A7 to contract and is then pushed or pulled longitudinally until the overall length of the whole telescopic member A is that required. The head A10 is then rotated in the opposite direction to force the parts A6, A8 towards each other, thus expanding the ring A7 and locking the telescoping parts A2, A3 firmly in the adjusted position, the ring A7 pressing against the part A2 and forcing it to expand inside of and grip the part A3.

Adjustable connections between the parts A are made by tubular fittings B, as shown in Figs. 9 to 12. Each of these fittings comprises a rotatable copper tube B1 centrally of which is fixed a brass turning plate B2 with a central square aperture B2' adapted to fit fairly freely over a square sectioned brass turnbuckle B4. In each end of the tube B1 is rotatably fitted a brass clamp B8, the outer end of which is formed to act as a seat for a member A. On each of the threaded ends of the turnbuckle is a brass nut member B5 of cylindrical shape with the threaded orifice at right angles to the axis of the cylinder. On each nut member B5 is fitted one end of a phosphor bronze clasp B7, the other end of which is fixed to the seating face of the appropriate clamp B8. As will be obvious from Figs. 9 to 12, by rotating the tube B1 in the appropriate direction relative to the clamps B8, the clasps B7 may be drawn in tight so as to firmly grip members A between them and the clamps B8. Thus, the members B can be quickly and easily released from the members A, moved to any required positions along them, and then equally quickly firmly clamped in the new positions.

As will be obvious, all the members B, in any one inductance assembly, need not be of the same length, nor, for the matter of that, need be all the members A. The drawings, therefore, although drawn in different scales for different figures, are intended to show the manner of construction rather than the actual sizes.

What is claimed is:

1. An adjustable inductance element comprising a plurality of metallic tubes adapted to telescope into one another, an expansible member located inside the innermost tube, and means manually operable externally of the telescoping tubes for expanding said expansible member to abut against the inside of said innermost tube thereby to cause the tubes to bind against one another and prevent telescoping action.

2. An inductance element comprising two tubes adapted to telescope into one another, the inner tube having a longitudinal cut therein, an expansible spring ring inside said inner tube and carried by a structure supported from the outer tube, said structure comprising an expander for said ring, and a rotatable member fitted at one end of the outer tube and operatively connected to the expander for causing the same to expand the ring to cause it to abut against the inside of the inner tube and expand it to grip the outer tube.

3. An element as claimed in claim 2 wherein the expander comprises two disc-like members with bevelled edges together defining a V-line space in which the ring is seated, so that when said members are drawn towards one another the ring is expanded, means including a longitudinally movable rod being provided for drawing the said members towards one another.

4. An inductance element comprising a pair of metallic tubes adapted to telescope into one another, a base member and a rounded over head, said base member secured to the innermost tube and the rounded head rotatably mounted in the outermost tube, an expandable ring member located within the innermost tube which includes two disc-like members having beveled edges facing each other to define a V line space for seating said expandable ring, said ring arranged within the innermost tube so that when said disc-like members are drawn toward each other the ring expands, means for drawing said disc-like members together including a longitudinal rod threaded at one end thereof to engage threads in said rounded-over head member, the other end of said rod secured to one of said discs and arranged to slide through the other disc.

5. In combination in an adjustable inductance assembly a plurality of inductance elements as claimed in claim 1 with a plurality of connectors between said elements and adjustable with respect thereto, each connector comprising a tubular member with clasp and clamp members at the ends, each clamp in co-operation with its clasp, being adapted to embrace an inductance element, said clasp and clamp members being arranged to be simultaneously tightened upon the elements embraced thereby by rotating said tubular member relative to the clasp and clamp members.

6. In combination in an adjustable inductance assembly a plurality of inductance elements as claimed in claim 1 with a plurality of connectors between said elements and adjustable with respect thereto, each connector comprising a tubular member having a turnbuckle with nut members at the threaded ends thereof, each nut member being fixed to one end, with clasp and metal strap clamp members at the ends, each clamp in co-operation with its clasp, being adapted to embrace an inductance element, said clasp and clamp members being arranged to be simultaneously tightened upon the elements embraced thereby by rotating said tubular member relative to the clasp and clamp members.

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