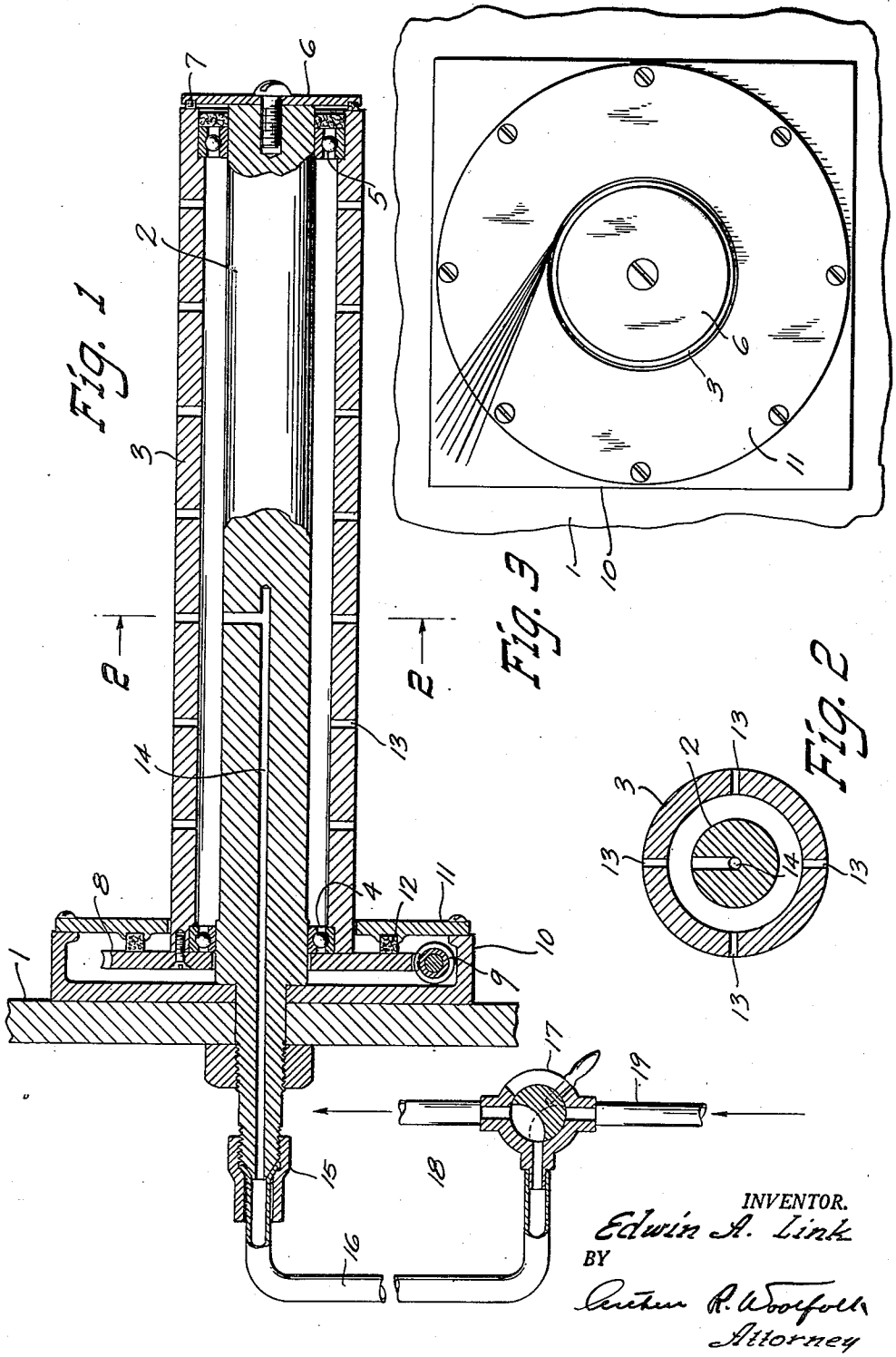
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VACUUM MANDREL

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Fig. 4

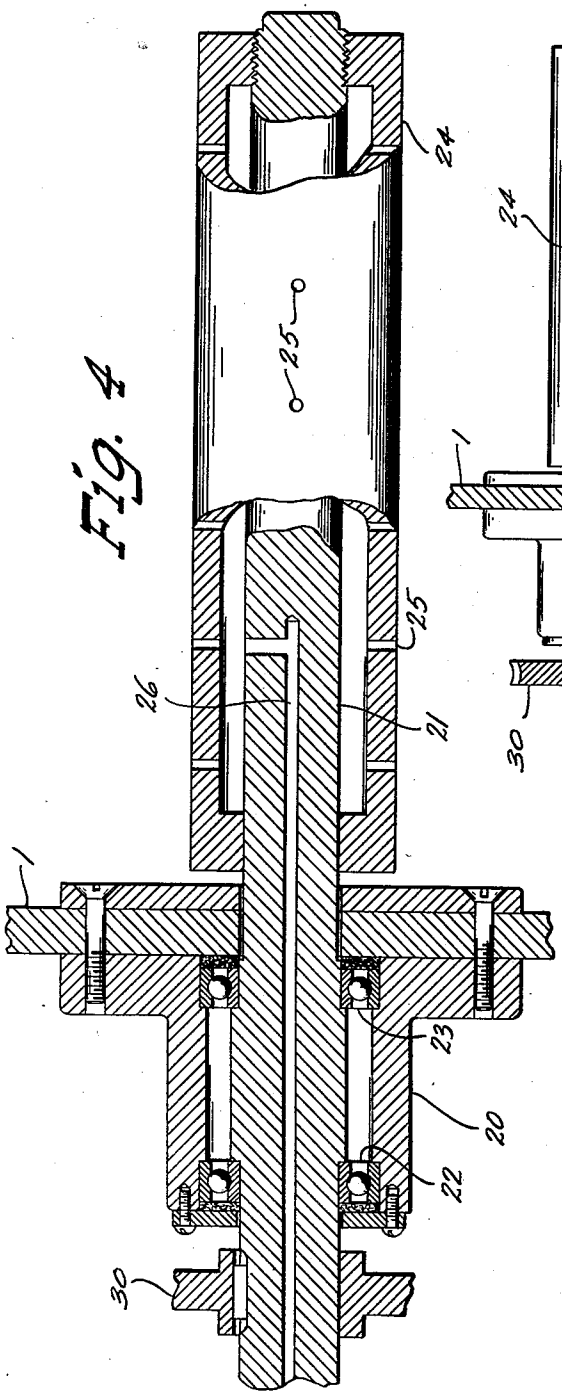
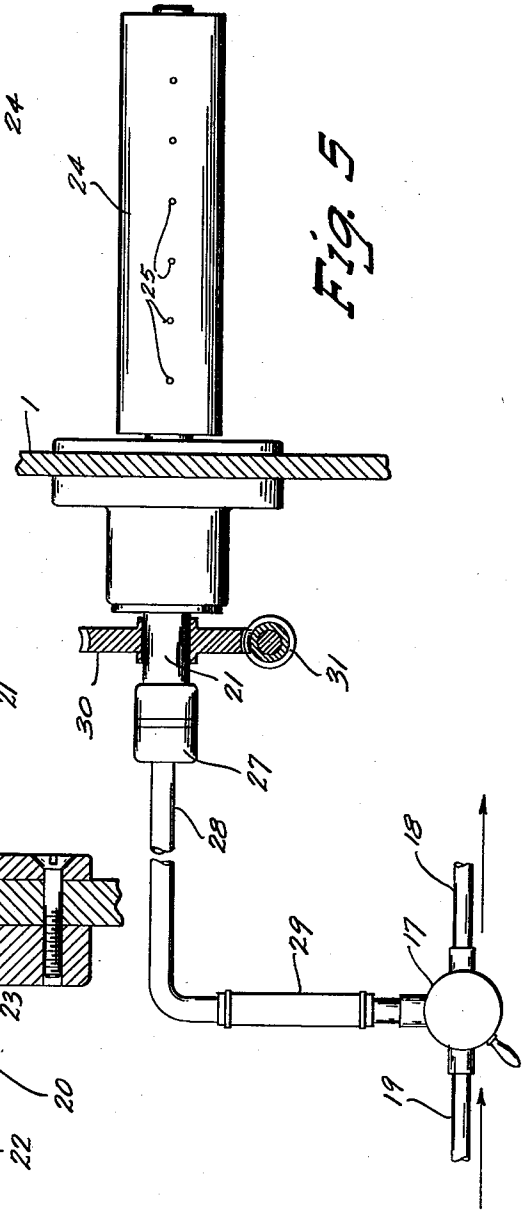


Fig. 5



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VACUUM MANDREL

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Application October 21, 1947, Serial No. 781,073

1 Claim. (Cl. 242—68)

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This invention relates to vacuum mandrels.

In making capacitors, long ribbons of metal foil and dielectric are wound into a cylindrical form and are then usually flattened. These ribbons are delicate and easily injured and it has been found difficult to start the winding and hold the ribbons to the mandrel and to remove the wound assembly without damage to the ribbons.

This invention is designed to overcome the above noted difficulties and objects of this invention are to provide a novel form of vacuum mandrel which will hold the ribbons to the mandrel and insure compact and uniform winding and which will provide means for readily detaching and freeing the wound assembly from the mandrel so that it may be freely slipped from the mandrel without any injury to the ribbons although the mandrel is not tapered but is a true cylinder throughout.

Embodiments of the invention are shown in the accompanying drawings, in which:

Figure 1 is a longitudinal sectional view showing one form of mandrel, such view being partly broken away.

Figure 2 is a section on the line 2—2 of Figure 1.

Figure 3 is a front end view of the structure shown in Figure 1.

Figure 4 is a longitudinal sectional view showing a further form of mandrel, such view being partly broken away.

Figure 5 is a side view of the structure shown in Figure 4 on a reduced scale and showing the manner in which the mandrel is connected to the three-way valve.

Referring to Figures 1, 2, and 3 of the drawings, it will be seen that the apparatus comprises a support or body portion 1 in the form of a plate to which is rigidly attached an axle or rod 2. This rod projects outwardly from the support 1 and the rotary mandrel 3 is mounted thereon preferably supported by means of ball bearings 4 and 5 adjacent its inner and outer ends. An end plate 6 is carried by the mandrel and is provided with a circular groove in which felt or other packing 7 is positioned. This felt may be cemented to the end plate 6 if desired.

Means are provided for rotating the mandrel and may comprise a worm wheel 8 and a driving worm 9 located within a casing 10 provided with front plate 11. This plate is provided with a circular groove within which a suitable packing, such as felt, is positioned and cemented in place. The packing 12 is arranged to bear

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against the worm wheel 8 and together with the packing 7 substantially cuts off the opposite ends of the mandrel from communication with the outside air. The mandrel it will be noted is rigidly attached to the worm wheel 8 and is hollow and is provided with a plurality of apertures 13 extending radially inwardly to its hollow interior.

The rod or stationary shaft 2 is provided with a passageway 14 which communicates with the hollow interior of the mandrel 3. The reduced end of the shaft or support 2 is threaded and receives a fitting 15 by means of which a pipe 16 is connected thereto. The pipe 16 is connected to a three-way valve indicated generally by the reference character 17. This three-way valve is arranged to connect the pipe 16 and consequently the hollow interior of the mandrel with a source of vacuum as indicated by the vacuum pipe 18 or with a source of compressed air as indicated by the compressed air pipe 19.

In using the apparatus the three-way valve is turned to the position shown to connect the interior of the mandrel with the vacuum source and thus produce suction at all of the openings 13 in the mandrel. The outermost sheet of dielectric ribbon is brought into contact with the mandrel and the mandrel is rotated. This sheet is held by suction to the mandrel and is wound thereon and the other sheets of dielectric ribbon and foil ribbon are led into the space between the first sheet and its partially wound portion. The winding is continued until the requisite number of layers has been formed. A suitable counting means not shown is usually provided. It is to be noted that the sheets are held tightly to the mandrel and there can be no slipping whatsoever. In addition to this, these sheets are entirely undamaged during this winding process.

When a sufficient number of layers has been formed the mandrel is stopped, the sheets are cut across, and the three-way valve 17 is turned to the compressed air source and air under pressure is thereby forced between the mandrel and the innermost sheet, thus producing a minute film of air between the wound assembly and the mandrel. This allows the wound assembly to be readily slipped off the mandrel.

In the form of the invention shown in Figures 4 and 5 the support or plate 1 is provided with a bearing supporting casing 20 on its rear side and revolubly carries the shaft 21, preferably ball bearings 22 and 23 being provided at spaced

points on the shaft 21 so as to secure the shaft against lateral motion. The shaft rigidly carries the mandrel 24. For instance, the mandrel may be screwed onto the outer end of the shaft 21 as shown in Figure 4 and may have a snug fit with the shaft at its inner end. The mandrel is provided with a plurality of apertures 25 and the shaft is provided with a passageway 26 communicating with the hollow interior of the mandrel and consequently with the apertures 25. The shaft 21 is connected by means of a rotary air coupling 27 with a pipe 28. This pipe is connected with the three-way valve 17 by means of a flexible hose or tubing 29 so that any jarring or slight motion of the pipe 28 will not be communicated to the three-way valve 17.

This form of the invention is used in identically the same manner as that previously described. The mandrel is rotated in any suitable manner as by means of the worm wheel 30 driven by the worm 31.

It will be seen that novel forms of vacuum mandrels have been provided by this invention which are particularly useful in the winding of the delicate dielectric and foil ribbons of capacitors.

It is to be noted particularly that there is no danger of damaging these delicate ribbons during the winding process or during the removal process.

Although this invention has been described in considerable detail, it is to be understood that such description is intended as illustrative rather than limiting, as the invention may be variously embodied and is to be interpreted as claimed.

I claim:

A vacuum mandrel construction comprising a support, a stationary rigid shaft projecting outwardly from and carried by said support and having a passageway from its inner end and opening through said shaft at a point in front of said support, a mandrel revolubly carried by said shaft and having a hollow interior communicating with said passageway and having a plurality of openings extending from its outer peripheral surface to its hollow interior, sealing means for opposite ends of said mandrel, a source of vacuum, a source of compressed air, and means for selectively connecting said passageway with said source of vacuum and said source of compressed air.

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