

June 25, 1968

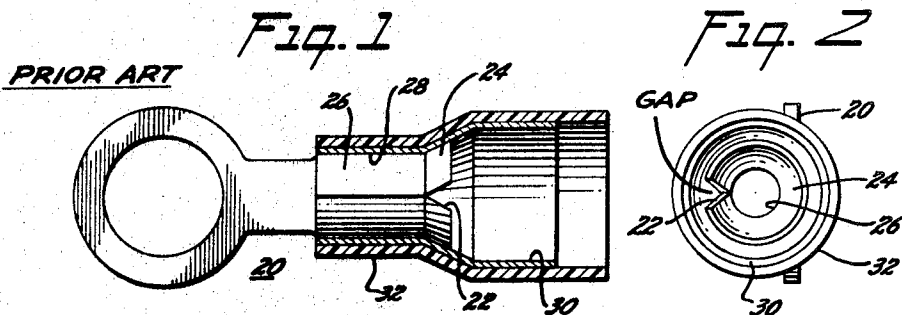
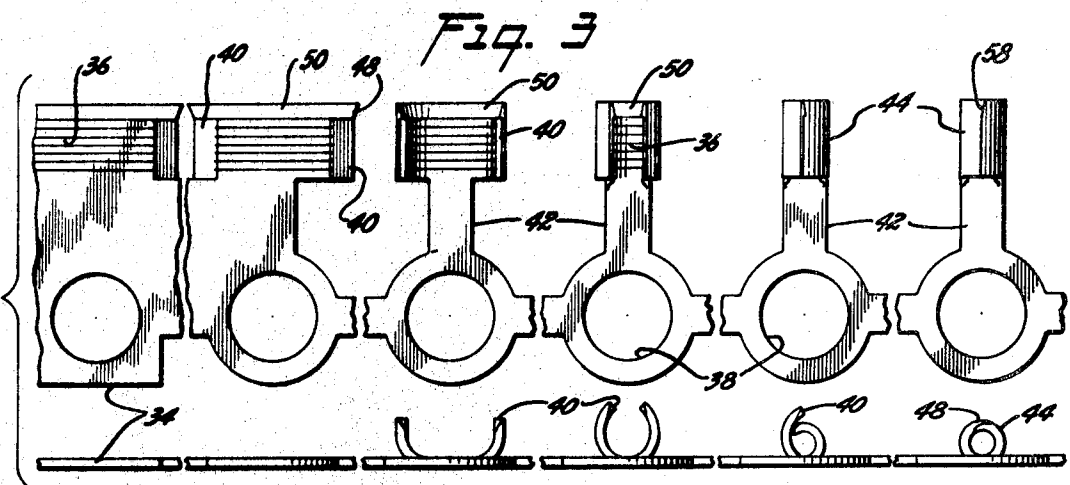
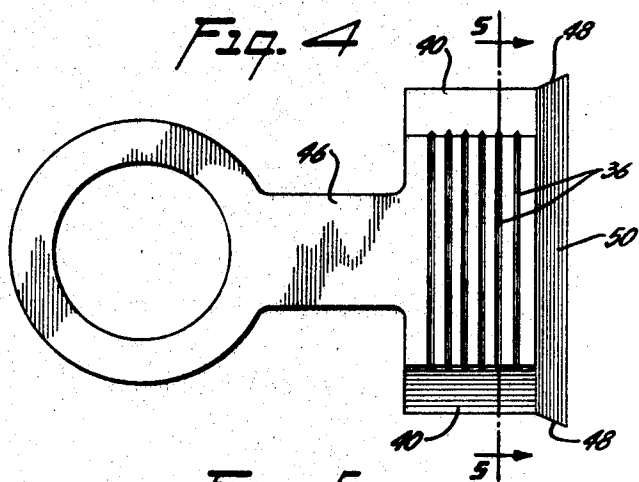
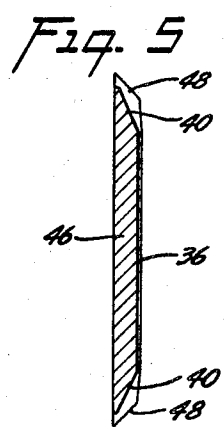
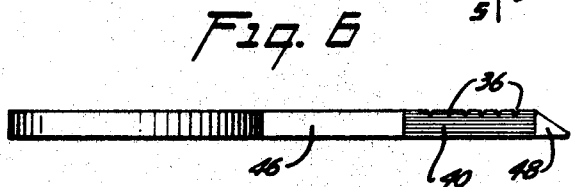
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3,390,370

TERMINAL CONNECTOR AND METHOD OF MAKING SAME

Filed May 2, 1966

2 Sheets-Sheet 1



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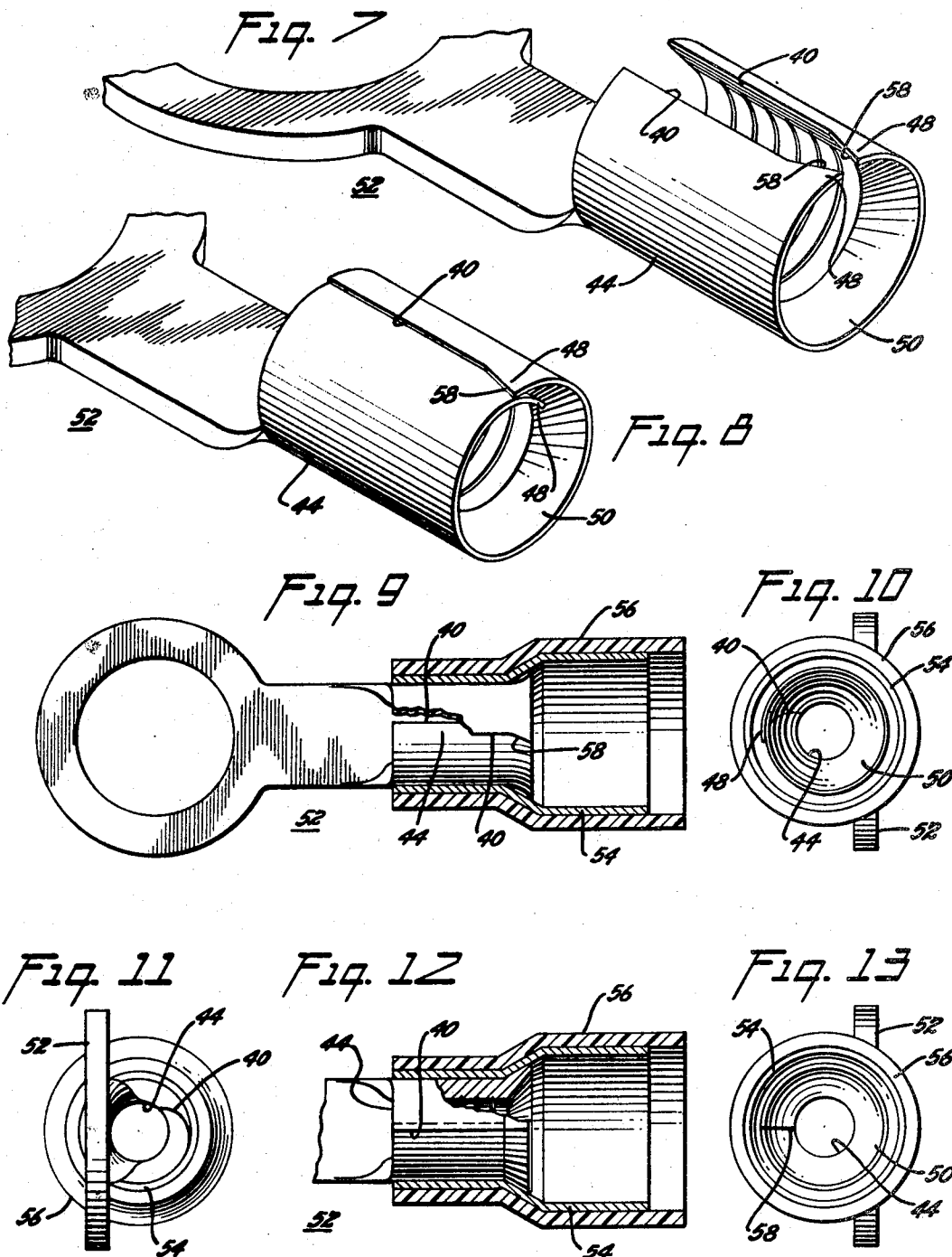
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TERMINAL CONNECTOR AND METHOD OF MAKING SAME

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2 Sheets-Sheet 2



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1

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TERMINAL CONNECTOR AND METHOD OF MAKING SAME

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7 Claims. (Cl. 339—95)

ABSTRACT OF THE DISCLOSURE

The invention is directed to an improved electrical terminal connector of the type which is mechanically crimped to the stripped portion of an electrical conductor. The inner stripped conductor receiving ferrule is formed from a strip of sheet metal into a cylindrical ferrule. The longitudinal margins and one transverse margin of the sheet metal blank are beveled, so that when the metal is rolled up to form the ferrule, the seam of a portion of the cylindrical ferrule has an overlapped, feathered seam of substantially normal wall thickness. The seam of the remaining portion of the ferrule is an overlapped seam of double wall thickness. When the latter portion of the ferrule is subjected to a flaring operation, as during assembly of the ferrule to an outer barrel, the seam of the latter portion is altered to an overlapped feathered seam to present a continuous circular frusto-conical surface to conductors placed within the connector.

The present invention relates to electric terminal connectors generally and more particularly to self-insulated terminal connectors of the character exemplified in Frey Patent No. 2,769,965. More specifically, the invention resides in an improved terminal connector of the character herein illustrated and described and the method of producing the same.

Heretofore, electric terminal connectors, as exemplified in Frey Patent No. 2,769,965 were formed from a sheet metal stamping defining a flat, apertured tongue portion and a rectangular wire barrel forming portion having parallel shear margins and a beveled marginal free end portion normal thereto. The rectangular portion of the stamping was folded about a suitable mandrel into a tube or sleeve with its shear edges in contacting relation forming a butt seam throughout its length with its free end portion presenting an internally tapered, annular free end portion, the entire tube or sleeve portion so formed having a substantially uniform diameter throughout. The wire barrel portion of the connector so formed was then inserted in force fitting telescopic relation within a reduced diametral end portion of a substantially longer, intermediate thin metal sleeve having a relatively longer and thicker insulating sleeve of nylon snugly telescoped on its outer periphery, the reduced end portion of the intermediate sleeve forming an inclined annular shoulder midway of its length to permit flaring of the inserted free end of the wire barrel therewithin against the inclined shoulder whereby the wire barrel portion of the connector was secured within the intermediate sleeve.

The above described terminal connector construction was subject to a fault or deficiency which occurred after its assembly as a result of the flaring of the free end of its wire barrel portion against the inclined shoulder of the intermediate thin metal sleeve, the defect or deficiency being that in the completion of the aforesaid flaring operation, the butt seam in the wire barrel portion of the connector, at least at its internally tapered free end portion, was opened by the increase in its diameter producing a triangular-like void or V gap in the flared face thereof

2

as exemplified in the herein "prior art" drawing figures.

From the foregoing it will be readily apparent that in the use of such electric terminal connectors, the insertion of the bare end portion of multi-strand insulated conductors into the flared end of the wire barrel portion was often impeded or not completely inserted by reason of one or more strands of the conductor having entered the gap in its flared end, thus giving rise to a partial connection, a high resistance connection and a connection of low "pull-out" strength.

The present invention overcomes the aforesaid prior art defect or deficiency by providing an electric terminal connector which is not subject to the above noted deficiency defect or disadvantage.

Accordingly, it is an object of the invention to provide an electric terminal connector of the two-piece telescoped type wherein the entrance to its wire receiving barrel or sleeve insures the complete, unimpeded passage thereto of every strand in the bare end portion of a multi-strand wire conductor.

Another object of the invention to provide an electric terminal connector of the two-piece telescoped type wherein the flared entrance to its inner wire receiving barrel or sleeve does not present a gap or opening in its overlapped or butt seamed margins.

A further object of the invention is to provide a terminal connector of the character described wherein its inner element is formed from a sheet-metal blank of such area and configuration that it is adapted to form a wire-barrel end portion with an angular overlapping seam whereby to compensate for the spreading of the seam during a flaring operation on the free end portion of its wire-barrel whereby the formation of a gap or opening in the seam at its flared end portion is obviated.

Another object of the invention is to provide a terminal connector of the character described wherein its wire receiving barrel or sleeve may be spread or flared more or less outwardly, to secure the wire-barrel portion within an intermediate complementary metal sleeve, without producing a gap or opening in an overlapped, feathered seam in the flared end of said wire barrel as well as throughout the remaining portion of the feathered seam.

A further object of the invention is to provide a terminal connector of the character described wherein the feathered marginal edge portions of an overlapping seam extending throughout the length of the wire-barrel portion of the terminal connector present overlapped angular corner extensions projecting beyond said marginal edge portions whereby in the flaring of the free end of said wire barrel, said angular corner extensions recede substantially to a butt seam position.

With the above and other objects in view, the invention resides in the article and the method of producing the same, the novel features thereof being set forth with particularity in the appended claims, the invention itself, however, both as to its organization and method of operation, together with additional objects and advantages thereof, being best understood from the following description of a specific embodiment thereof when considered in conjunction with the accompanying drawings in which:

FIGURE 1 is an enlarged plan view partly in section of a prior art electric terminal connector;

FIGURE 2 is an end view of the same;

FIGURE 3 is intended to illustrate a sheet metal strip as successively worked upon by a progressive die set in a suitable multi-punch press showing the initial stamping, piercing, scoring, edge beveling (coining), final stamping and wire barrel forming operation performed thereon in sequence as the metal strip moves from left to right. The edge view of the metal strip, at the extreme right of FIGURE 3 illustrates the feather edged seam as

formed in the wire-barrel portion of the terminal connector in accordance with the present invention.

FIGURE 4 is an enlarged plan view of the improved terminal connector blank prior to the formation of its wire-barrel, illustrating the transverse, parallel score lines, the parallel beveled marginal edge portions, the transverse beveled marginal edge portion and, the extended angular opposite corner portions of the transverse marginal edge of the improved sheet metal blank;

FIGURE 5 is an enlarged sectional view of the blank taken on the line 5-5 of FIGURE 4;

FIGURE 6 is a longitudinal edge view of FIGURE 4;

FIGURE 7 is an enlarged fragmentary perspective view showing the rectangular portion of the blank partly rolled into a wire receiving barrel or sleeve illustrating the extended corner portions of its transverse beveled edge portion, which are formed at an acute angle to the parallel marginal edge portions;

FIGURE 8 is a similar enlarged view showing the complete formation of the wire-barrel with its parallel beveled edge portions and the extended corner portions thereof in overlapped feathered relation;

FIGURE 9 is an enlarged plan view partly in section showing the wire-barrel element of FIGURE 8 inserted in an insulated thin metal sleeve and its free end partially flared, expanded, spun or turned outwardly at its peripheral edge sufficiently to secure the same against withdrawal from the said intermediate sleeve;

FIGURE 10 is an end view of FIGURE 9 showing the parallel beveled marginal edges substantially overlapped, and the extended angular corner portions of its transverse marginal edge partially overlapped;

FIGURE 11 is an enlarged plan view of the connector end opposite to that shown in FIGURE 10 with the parallel, feathered edge portions of the wire-barrel in partially overlapped relation;

FIGURE 12 is a side view of the same partly in section showing the transverse feathered edge or free end portion of the wire-barrel flared outwardly at its peripheral edge into full flared engagement with the inclined shoulder within an insulated, thin-metal intermediate or outer sleeve; and

FIGURE 13 is an end view of FIGURE 12 showing the opposite, angular corner portions of the transverse feathered edge of the wire-barrel end portion of the connector, as shown in FIGURES 7 and 8, flared or angularly expanded to an extent where said corner portions compensate for the partial separation of the overlapped margins, resulting from the flaring operation, to form a butt seam at an angle to the overlapped seam of the wire-barrel proper.

Referring to the drawings, FIGURES 1 and 2 exemplify an enlarged sectional view and an end view respectively of a prior art terminal connector 20 having a gap or seam opening 22, within its free end, as formed in a flaring operation on the free end portion 24 of a butt seamed wire-barrel 26 of the terminal connector 20 to secure the same in assembled relation within a reduced end portion 28 of a longer intermediate thin-metal sleeve 30 having a longer insulating sleeve 32 of nylon for example, frictionally fitted thereon.

In accordance with the present invention and as exemplified in FIGURE 3, a suitable metal strip 34 is passed through a series of cooperatively related progressive dies in known manner adapted to score one marginal portion thereof as at 36, pierce the opposite marginal portion thereof at spaced points therealong as at 38, strike out spaced portions along both margins of the strip 34, coin, bevel or feather the parallel edges 40 normal to the scored margin 36, and wrap or fold the rectangular end portion of each of the partially separated connector blanks 42 about a mandrel to form a wire-barrel 44 thereon, and separate the interconnected terminal connectors from each other in sequence.

Further in accordance with the invention, FIGURES

4, 5 and 6 illustrate an enlarged terminal connector blank 46, prior to the formation of its substantially rectangular end portion into a tubular wire-barrel to more specifically point out the present invention. As shown, the invention resides in a wire-barrel forming portion, of a blank of substantially rectangular configuration having a precise, predetermined area, configuration or pattern adapted for the purpose described. Thus, the wire-barrel forming portion of the connector blank 46, in addition to having its parallel seam forming margins 40 feathered, beveled or coined to a relatively thin edge to form an overlapped seam without substantially increasing the normal wall thickness thereof, is also of a precise configuration or outline which includes extended opposite corner portions 48 at the opposite ends of its transverse marginal edge portion 50 which is also feathered, beveled or coined to a relatively thin edge including its corner extensions, said corner portions 48 extending at an acute angle to the parallel margins 40 as well as to the transverse margin 50 for a purpose now to be described.

As will be noted in connection with FIGURES 1 and 2, when the free end of a conventional wire-barrel having a butt seam throughout its length and an internally tapered, beveled or chamfered free end is flared, spread or expanded outwardly to a larger diameter at its free peripheral edge within an intermediate, externally insulated metal sleeve 30, the butt seam at its free end portion is opened or separated substantially in response to the flaring operation thereon which may also stress and separate the remainder of the butting margins thereof to some extent, depending upon the degree of the flaring operation, and thus produce a gap or crevice into which one or more strands in the bare end portion of a multi-strand conductor may enter in the insertion of said bare end portion into the wire-barrel 26 of the connector 20.

With respect to the present invention, the aforesaid gap or crevice is obviated by the provision of a sheet metal stamping having an area and predetermined configuration, as in FIGURE 4, wherein the parallel, longitudinal margins 40 are feathered so that they may be overlapped in the wrapping or folding thereof about a suitable mandrel including the feathered transverse margin 50 and the additional or extra marginal overlap provided by the extended angular corner portions 48 thereof, into a wire-barrel 44 of substantially uniform diameter and normal wall thickness as exemplified in FIGURES 7 and 8. Thus, when the wire-barrel 48 of the improved terminal connector 52 is inserted with a force fit into the reduced end portion of an intermediate thin metal sleeve 54 of substantially greater length which in turn is frictionally disposed within a relatively longer sleeve 56 of insulation material such as nylon for example, and a flaring operation performed on the free end of the wire-barrel 44 to the minimum extent shown in FIGURES 9 and 10, partial overlap of the feathered corner portions 48 will remain and thus provide a continuous or full circular surface within the flared seamed end of the wire-barrel portion 44 with its feathered peripheral edge portion set against the inclined annular shoulder of the intermediate thin metal sleeve 54 as shown in FIGURES 12 and 13.

Inasmuch as the herein mentioned flaring, expanding or spinning operation is usually effected by special automatic machinery, the degree of flare is apt to and does vary in a range between a minimum flare exemplified in FIGURES 9 and 10, to a maximum flare exemplified in FIGURES 11, 12 and 13. Thus, the surface, area or feathered overlap compensating feature embraced in the improved sheet metal blank 46 of FIGURE 4, is predetermined for the maximum flare in which the extended angular corner portions 48 thereof are spread in the fully flared free end portion of the wire-barrel 44 of the connector to the point where the margin 58 of each of the extended corner portions 48 of the blank 46 are brought together and form a butt seam in the flared end

5

or "bell" of the wire-barrel 44 while the remaining portion of the overlapped, feathered seam in the wire-barrel remains substantially overlapped thus providing an internal peripheral surface within the entire wire-barrel 44 which presents a substantially continuous or uninterrupted peripheral surface to the strands in a bare end portion of a multistrand conductor when protruded into the wire-barrel 44 of the improved terminal connector 52.

While the invention has been illustrated and described with respect to a preferred embodiment thereof, it is to be expressly understood that various changes and modifications may be made therein without departing from the inventive concept underlying the same. Therefore, the invention is not to be limited except as is necessitated by the prior art and the scope of the appended claims.

What is claimed is:

1. An electrical connector adapted to be crimped into conductive and connective relation to a stripped portion of an insulated conductor, said connector comprising a substantially closed cylindrical ferrule into which the stripped conductor may be inserted, said ferrule being formed of a rolled-up strip of sheet metal having its longitudinal margins beveled to meet along a portion of its longitudinal dimension in a feathered overlapping relationship to form a seam having substantially normal wall thickness along its longitudinal dimension, each of said longitudinal margins including angular extensions at a first end thereof, said angular extensions forming, when said ferrule is rolled-up, a substantially, full cylindrical surface having an overlapped seam.

2. An electrical connector as defined in claim 1, wherein said angular extensions extend at an acute angle to the remaining portion of said ferrule.

3. An electrical connector as defined in claim 1, wherein the inner surface of said cylindrical ferrule has a plurality of ridges formed therein to facilitate the mechanical and electrical connection of said connector to a conductor placed therein.

4. An electrical connector as defined in claim 1, wherein a transverse margin of said ferrule is beveled to present an inwardly inclined surface when said ferrule

6

is rolled up, to permit the unimpeded entrance of a conductor into said cylindrical ferrule.

5. An electrical connector as defined in claim 1, wherein the longitudinal margins of said angular extensions are beveled, said angular extensions forming a frusto-conical surface with said longitudinal margins meeting in a closed, overlapped, feathered seam of substantially normal wall thickness when said cylindrical surface is subjected to a flaring operation.

6. An electrical connector as defined in claim 5, further including an outer barrel having a first portion of a first predetermined diameter to receive therein the cylindrical ferrule, a second portion of a second predetermined diameter, and an intermediate inclined section coupling said first and second portions, said frusto-conical surface of said ferrule being in intimate contact with said intermediate inclined section whereby a continuous, full circular frusto-conical surface is presented to a conductor inserted into said connector from the second portion of said outer barrel.

7. An electrical connector as defined in claim 5, wherein the inner surface of said cylindrical portion of said cylindrical ferrule has a plurality of ridges formed thereon to facilitate the mechanical and electrical connection of said connector to a conductor placed therein.

References Cited

UNITED STATES PATENTS

2,681,440	6/1954	Swengel	339—276 X
2,763,849	9/1956	Betts	339—276
2,769,695	11/1956	Frey	339—276
2,789,279	4/1957	Gebel	339—276
3,048,650	8/1962	Allen et al.	339—276 X
3,140,142	7/1964	Marquis	339—276
3,286,223	11/1966	Narozny et al.	339—276

FOREIGN PATENTS

1,042,268 6/1953 France.

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