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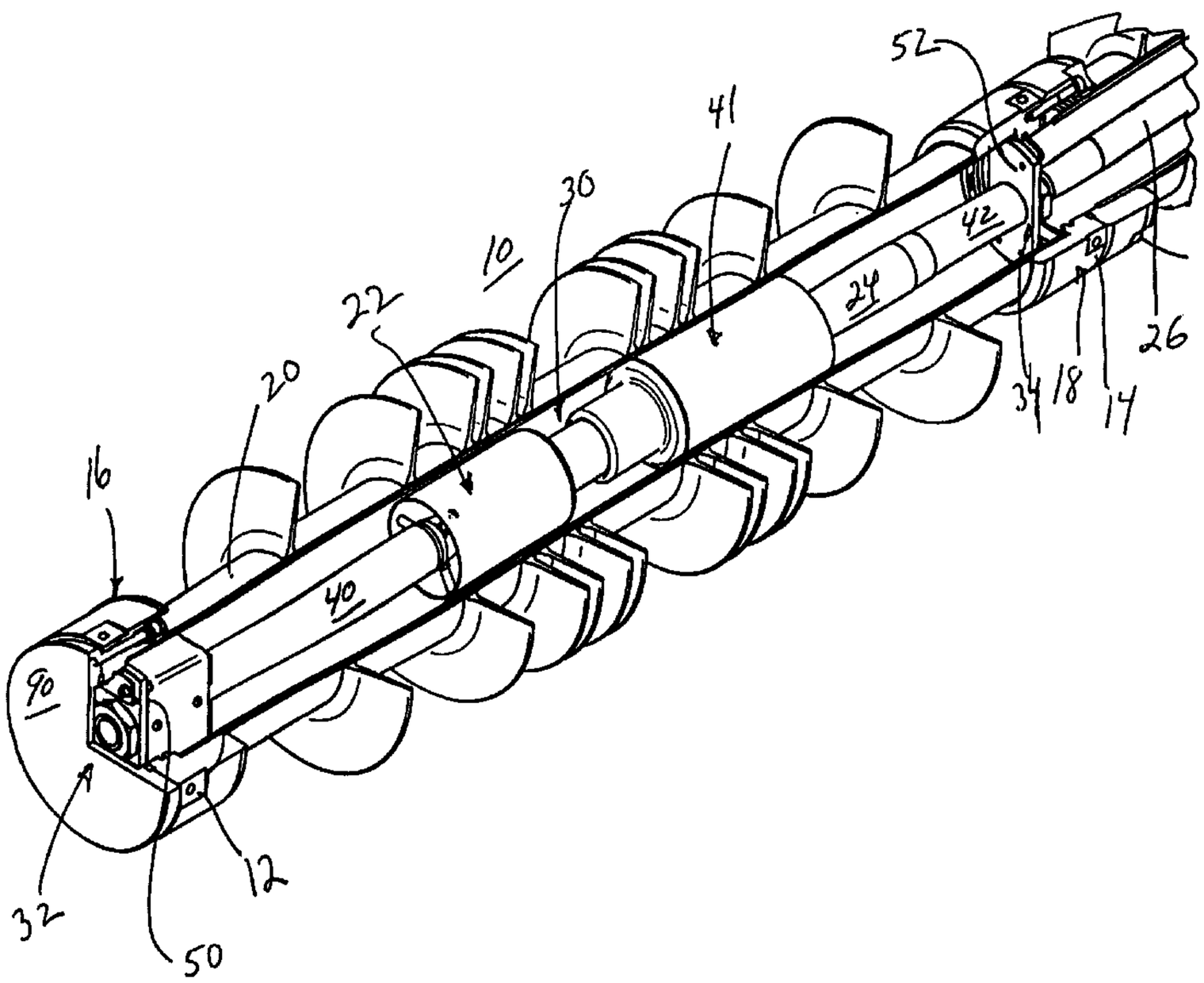
(54) Titre : METHODE ET AGENCEMENT POUR LA FOURNITURE D'UN JOINT DE BOITIER ETANCHE AUX GAZ
(54) Title: METHOD AND ARRANGEMENT FOR PROVIDING A GAS-TIGHT HOUSING JOINT



(57) Abrégé/Abstract:
A a method and arrangement is provided to form a gas-tight joint between two housing portions, e.g. between an end flange and a tubular pole-unit housing for a circuit interrupter or an insulating support column. The joint is formed via a heat-shrink process to provide an interference fit. The housing is provided with grooves to retrain adhesive during the assembly process.

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ABSTRACT

A a method and arrangement is provided to form a gas-tight joint between two housing portions, e.g. between an end flange and a tubular pole-unit housing for a circuit interrupter or an insulating support column. The joint is formed via a heat-shrink process to provide an interference fit. The housing is provided with grooves to retrain adhesive during the assembly process.

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METHOD AND ARRANGEMENT FOR PROVIDING A GAS-TIGHT HOUSING JOINT

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates generally to the field of gas-tight housings for protective devices and systems for electrical power transmission and distribution systems, and more particularly to a method and arrangement for providing a gas-tight joint between two housing portions, e.g. between an end flange and a tubular pole-unit housing for a circuit interrupter or an insulating support column.

Description of the Related Art

Various methods are know for providing a gas-tight joint between a flange/end fitting and a tubular housing, e.g. especially for arrangements involving the end closures of gas-tight enclosures. One method utilizes a heat-shrink process whereby a metallic end flange is heated and assembled onto a tubular housing to which adhesive has been applied. Another method utilizes a flange having internal grooves that is assembled onto a tubular housing.

While the prior art arrangements may be useful to provide housing joints, these prior arrangements do not provide a desirable interference fit and the advantage of a grooved assembly.

SUMMARY OF THE INVENTION

Accordingly, it is a principal object of the present invention to provide a gas-tight joint between a housing and an end flange.

These and other objects of the present invention are efficiently achieved by the provision of a method and arrangement for providing a gas-tight joint between two housing portions, e.g. between an end flange and a tubular pole-unit housing for a circuit interrupter or an insulating support column. The joint is formed via a heat-shrink process to provide an interference fit. The housing is provided with grooves to retrain adhesive during the assembly process.

BRIEF DESCRIPTION OF THE DRAWING

The invention, both as to its organization and method of operation, together with further objects and advantages thereof, will best be understood by reference to the specification taken in conjunction with the accompanying drawing in which:

FIG. 1 is a perspective view of a circuit interrupter with parts cut away for clarity that utilizes the joint method and arrangement of the present invention;

FIG. 2 is a partial sectional view of the circuit interrupter of FIG. 1;

FIG. 3 is an elevational view of a portion of the housing of the circuit interrupter of FIGS. 1 and 2; and

FIG. 4 is an enlarged partial view of the housing of FIG. 3.

DETAILED DESCRIPTION

Referring now to an illustrative application of the present invention as shown in FIGS. 1 and 2, a circuit interrupter 10 utilizing the method and arrangement of the present invention provides electrical connection to power system circuit terminals at connection points 12, 14, at the top and bottom respectively of the circuit interrupter 10. In an illustrative embodiment, a housing 20 of the operating mechanism 10 provides a sealed environment containing a gas, e.g. an insulating gas such as SF_6. This is advantageous in implementations where the interrupter 10 contains a pressurized gas such as SF_6. The connection points 12, 14 are provided on respective end flanges 16, 18 carried by the housing 20 of the circuit interrupter 10. The end flanges 16, 18 are affixed to the housing 20 during fabrication thereof to provide gas-tight joints as will be explained in more detail hereinafter.

The circuit interrupter 10 includes upper and lower current carrying contact structures 22, 24 respectively that are relatively movable to open and close the circuit interrupter and thus make and break the electrical connection between the connection points 12, 14. In the illustrative circuit interrupter 10 of FIG. 1, the lower contact structure 24 is movable via an operating rod 26 so as to define an open gap at 30 when the circuit interrupter 10 is open. At the upper end of the circuit interrupter 10, an end plate 90 is secured to the upper end flange 16 along with an appropriate sealing element 94 (FIG. 2).

Considering now important aspects of the present invention and as best seen in FIG. 2, a gas-tight joint is provided between an inner tube 21 of the housing 20 and the end flanges 16 and 18. However, it should be understood that the invention can be practiced with either a composite housing, e.g. the housing 20 with an inner tube 21, or with a single tubular housing member with the features of the inner tube 21 as described hereinafter. In a preferred embodiment, the assembly is accomplished via a heat-shrink process whereby the end flanges 16, 18 are heated and assembled onto the tubular inner tube 21 to which adhesive has been applied. Referring now additionally to FIGS. 3-4, the inner tube 21 at each end portion includes a pattern 50 of grooves 52, e.g. five grooves 52 in an illustrative specific embodiment. The grooves 52 are formed or

machined so as to define reduced outer diameter bands or regions on the external circumference of the inner tube 21, e.g. grooves 50 alternating between the larger outer diameter portions 54 of the inner tube 21, the portions 54 also may be characterized as bands or regions 54. During assembly, adhesive is applied over the pattern 50. The inner diameter 60 (FIG. 2) of the end flanges 16, 18 is dimensioned at normal temperatures to be a predetermined dimension less than the outer diameter of the tubular inner tube 21 at the regions or bands 54, e.g. .010 of an inch for a inner tube 21 of approximately 5 inches outer diameter. Thus, an interference fit is established between the portions 54 and the end flanges 16, 18, the end flanges 16, 18 being heated to afford clearance between the housing and the flange for assembly, e.g. heating to a temperature in the range of 150-200 degrees Centigrade, e.g. for end flanges 16, 18 fabricated from aluminum and a inner tube 21 fabricated from fiberglass. This results in an appropriate interference fit when the parts are cooled, e.g. a gas-tight joint over a temperature range of –40C to +85C with a gas pressure of 75 psi. In a specific implementation, the grooves 52 are approximately .005 of an inch deep and the bands or regions defined thereby are approximately .250 of an inch wide. These dimensions have been found to provide a suitable gas-tight joint using epoxy adhesive in the grooves 52, i.e. the grooves 52 retain sufficient adhesive during and after assembly.

The relative dimensions including the depth of the grooves 52 are chosen to ensure that a desirable and appropriate amount of adhesive is retained therein during the heat-shrink assembly process and even if some wiping action occurs at the high points at 54. These dimensions have also been sound suitable to avoid excessive adhesive that might result from grooves 52 of excessive depth that might result in any significant degradation of the joint between the end flanges 16, 18 and the inner tube 21 during thermal extremes. Thus, the grooves 52 maintain the appropriate amount of adhesive to ensure a gas-tight joint and the intermediate portions 54 provide a desirable mechanical shrink fit over a desired range of temperatures, i.e. in a specific example, the gas-tight interference joint is maintained at 85C and no damage is done to the inner tube 21 as a result of the added compressive forces at –40C. Additionally, the gas-tight joint is maintained when the inner tube 21 is loaded with a resultant moment at the joint of 20-30,000 in-lb.

While there have been illustrated and described various embodiments of the present invention, it will be apparent that various changes and modifications will occur to those skilled in the art. Accordingly, it is intended in the appended claims to cover all such changes and modifications that fall within the true spirit and scope of the present invention.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A tubular member with end flange being assembled to provide an interference fit therebetween via a heat-shrink assembly process, the housing including a plurality of grooves formed therein and adhesive being applied to the tubular member in the vicinity of the grooves.

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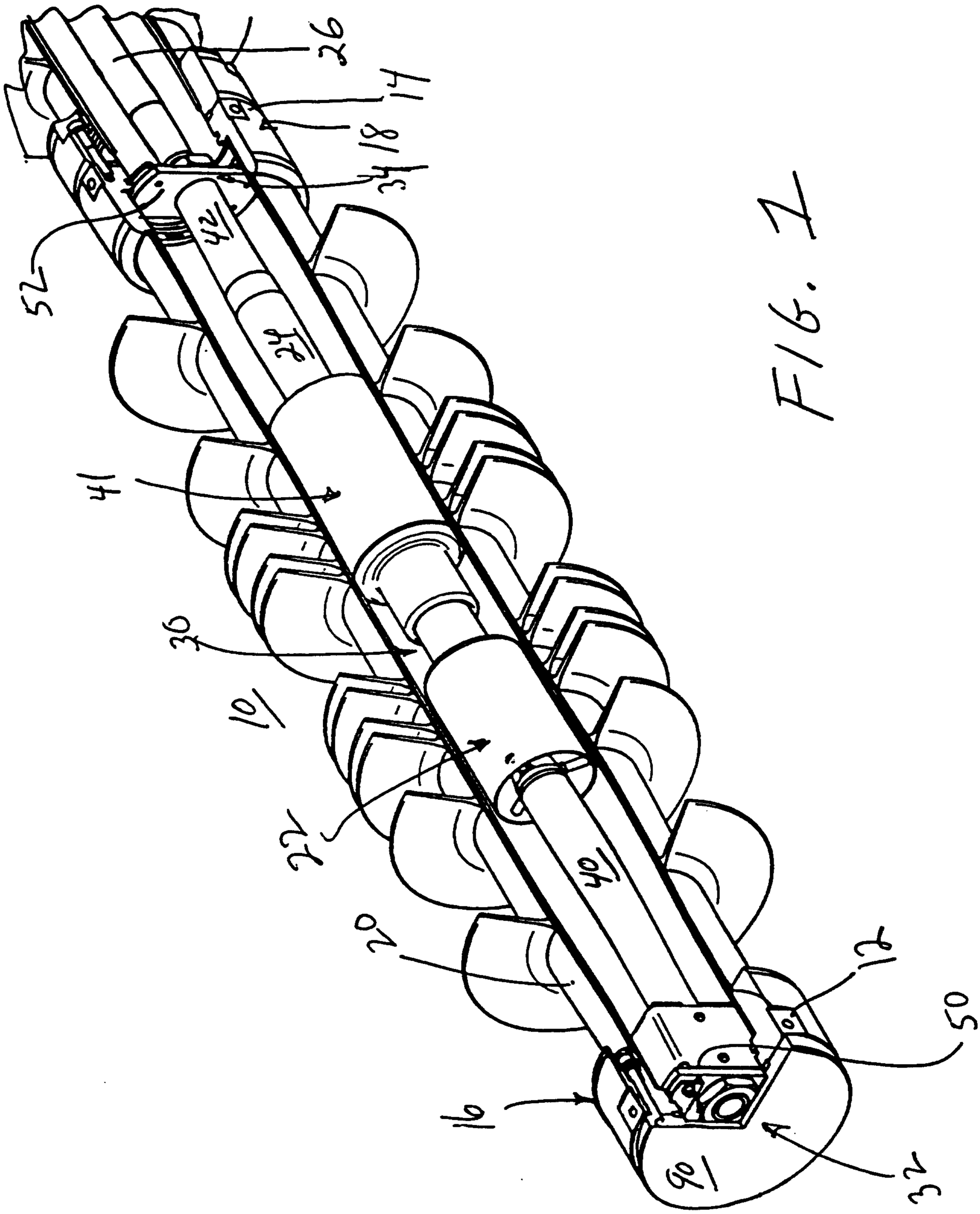

FIG. 1

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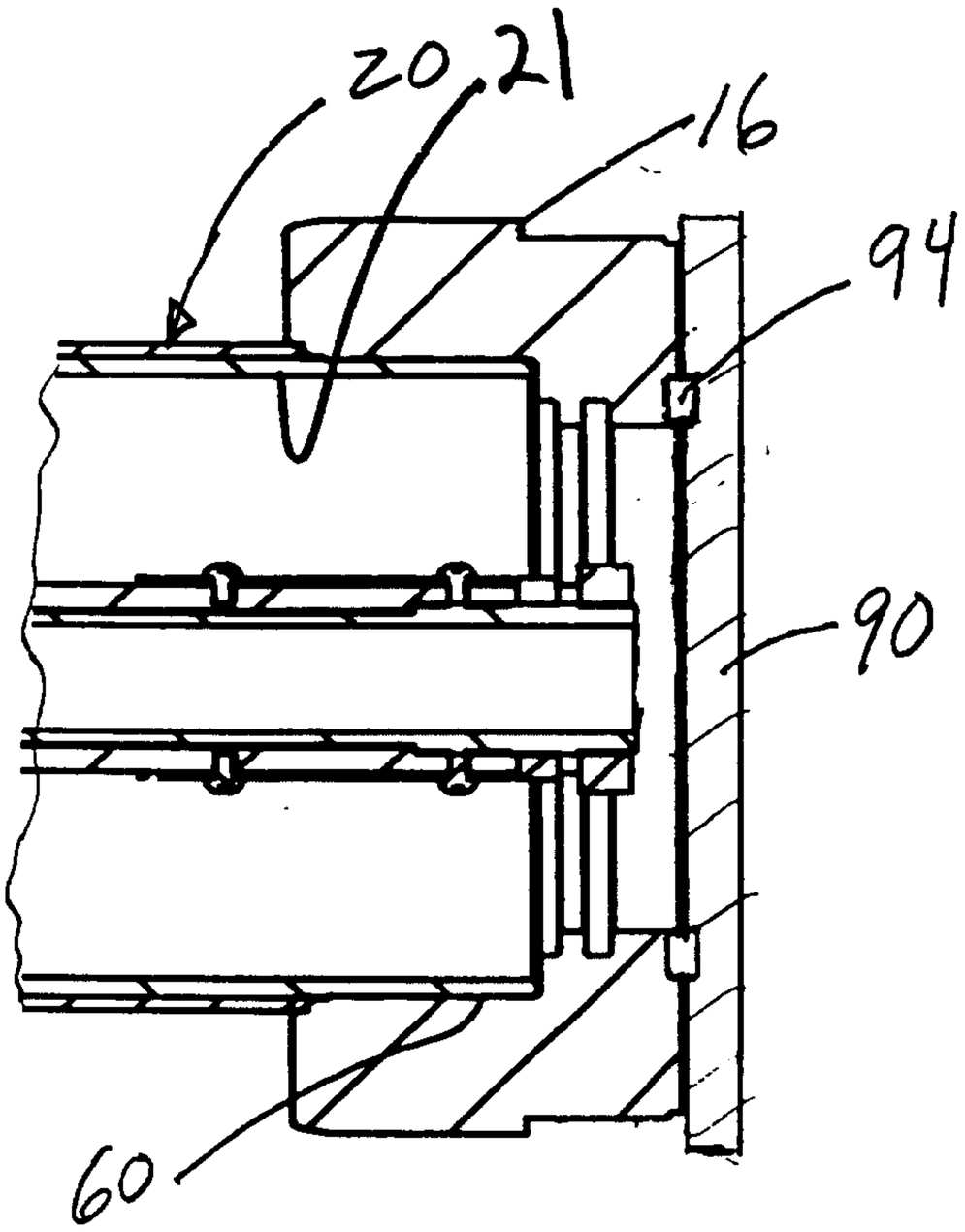


FIG. 2

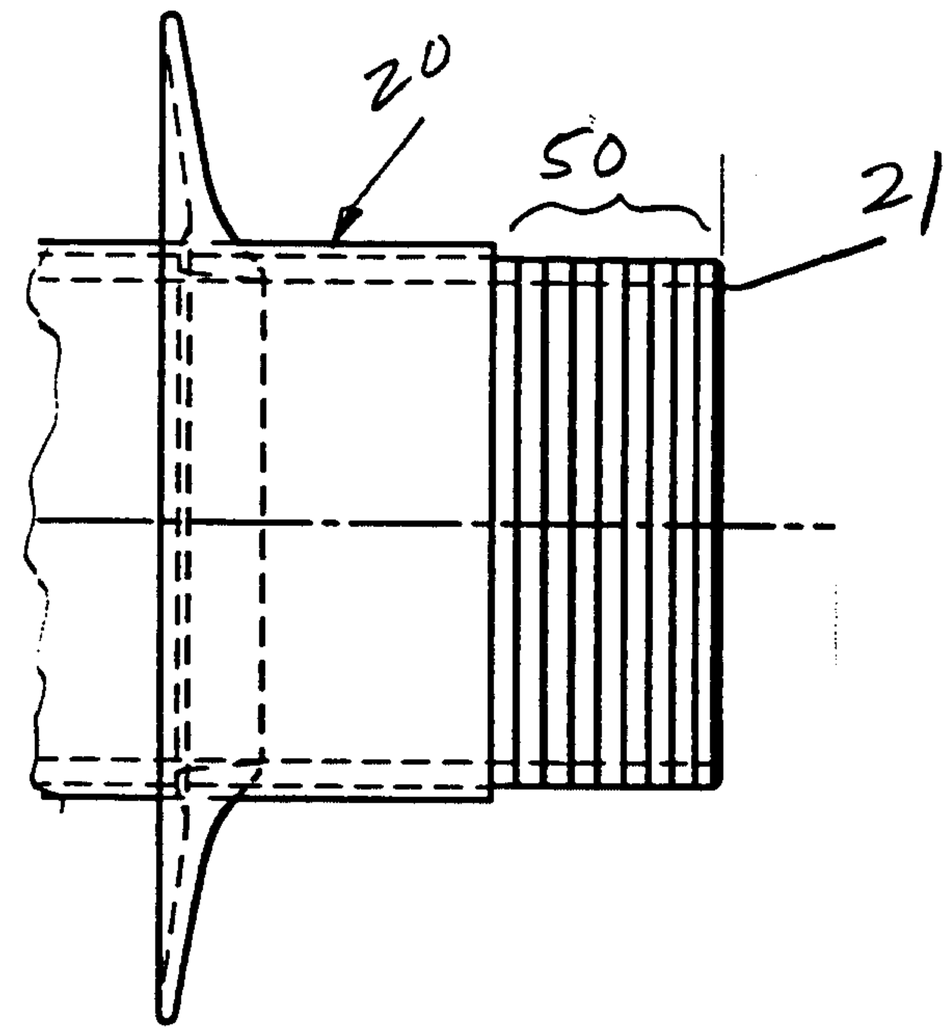


FIG. 3

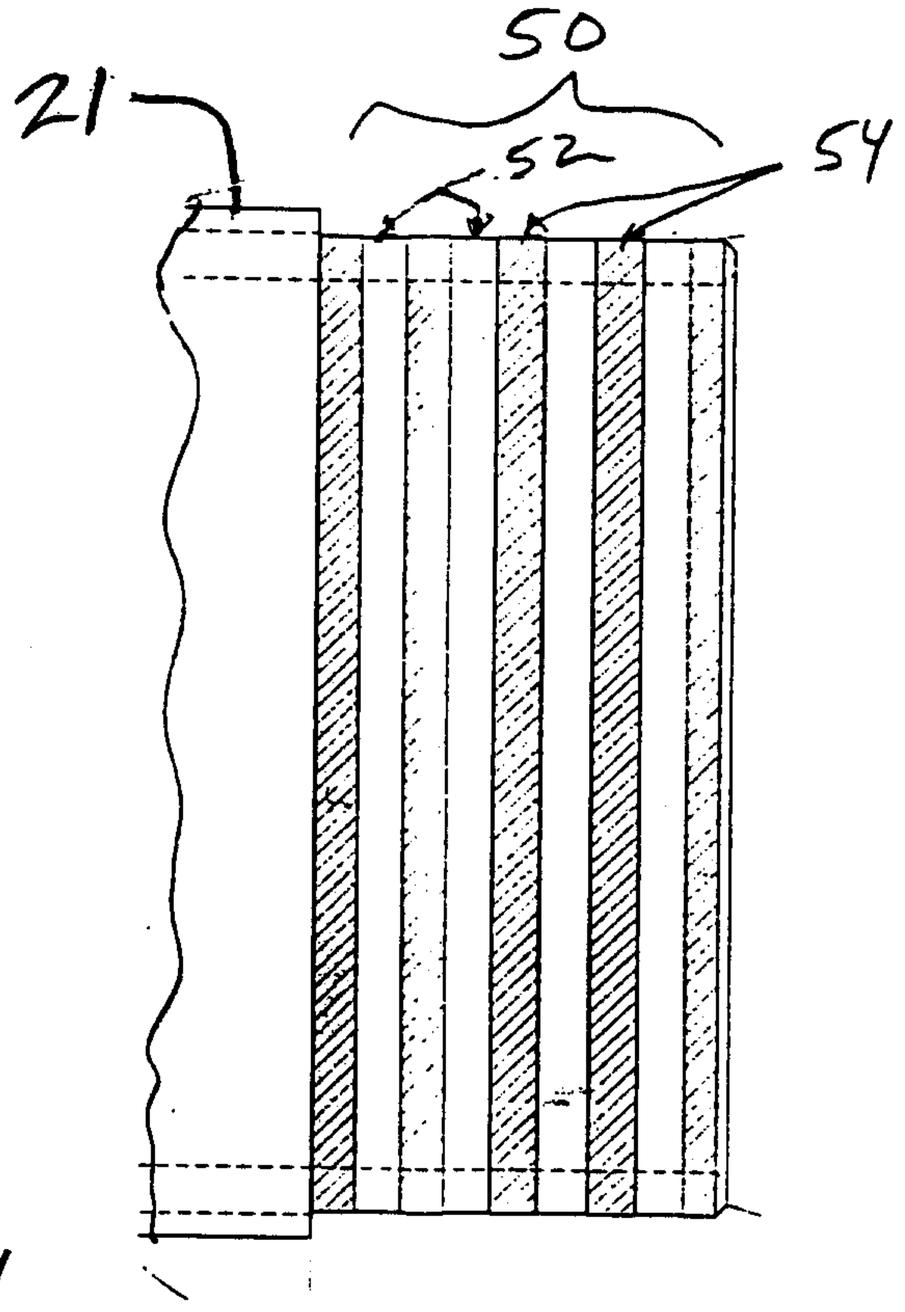
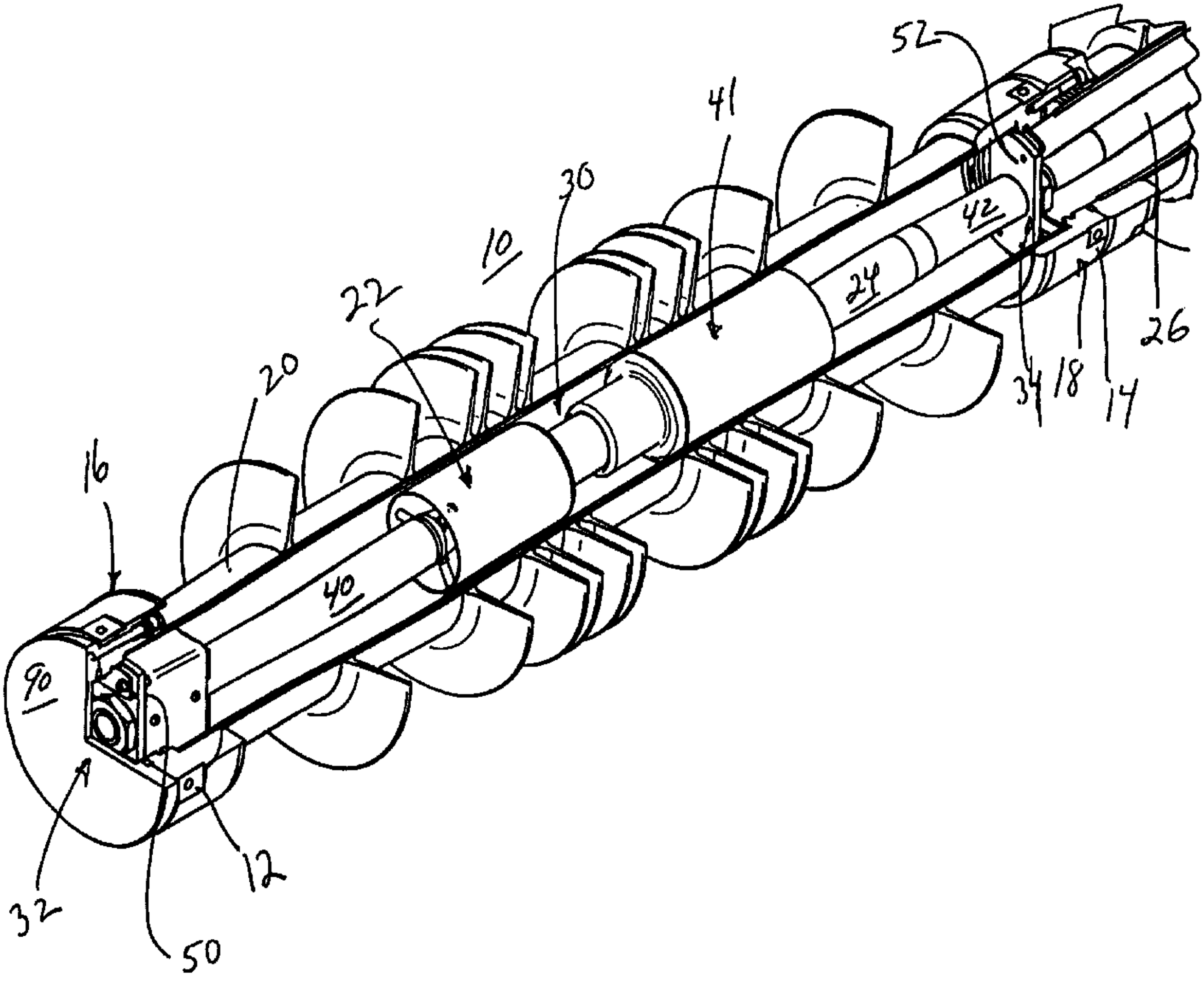


FIG. 4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