SPOOL WITH THREADABLY MOUNTED END MEMBERS

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Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

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This invention generally relates to the broad category of spools and analogous art, such as bobbins, warp beams, loom beams, tractor beams, wire spools, winding cores, shipping pins or any other type of bobbin or spool, regardless of size, of the character having a barrel or tube of either straight or substantially conical configuration about which any form of strand material may be wound. Hereinafter, many different types of bobbins, spools and the like have been devised which comprised a tubular body, barrel or shell and wherein various means have been utilized for attaching flanged heads or plugs to opposite ends of the barrel. The most facile method used heretofore for attaching heads having a plug portion or the plugs to either or both ends of the barrel or body of a spool has been carried out by internally threading the barrel and providing the plugs with threads on the periphery thereof which were tightened into either or both ends of the barrel or tubular member. However, this has required that the wall of the tubular member or barrel be relatively thick in order to accommodate the threads formed therein or it has been necessary to form at least the end portions of the barrel or tubular member with a thickened wall to accommodate the internal threads formed therein with the result that the bobbin or spool has been too heavy for practical purposes, and difficult to handle. When the threads are formed in the barrel this also decreases the compressive and tensile strength of the barrel at this point.

On the other hand, attempts have been made to fabricate bobbins having a relatively thin wall which was internally threaded for reception of an externally threaded plug at either or both ends thereof in order that the spool would be light in weight. A felt or fibrous washer has also been utilized between the enlarged ends or flanges of the plugs and corresponding ends of the bobbin wall. However, when synthetic yarns such as are currently in use are wound on spools of the character last described, the yarns subsequently shrink and cause the portions of the barrel or tubular member of the spools disposed between the plugs or heads to collapse, at least to the extent that opposite ends of the barrel would be of greater diameter than the central portion thereof, with the result that the relatively fine monofilament or multifilament synthetic strands could not be readily withdrawn or unwound from the spool because adjacent convolutions of the strands would become overlapped at the central portions of the body or barrel of the spool. This has also caused the spool to become entangled between the ends of the barrel and the flanges because of the felt washers shrinking below the outside diameter of the barrel surface.

It is therefore an object of this invention to provide a spool or analogous article which is very light in weight, but is sufficiently strong in construction to insure that the barrel thereof will not collapse under the extreme pressures to which it is subjected by strand material being wound thereon, the barrel, body or tubular member of the spool being formed with circularly spaced, longitudinally extending, inwardly projecting ribs thereon and wherein threads are formed in the ribs, which threads are preferably of lesser depth than the thickness of the ribs, for accommodating an externally threaded plug, head or the like at either or both ends of the barrel.

It is another object of this invention to provide a groove or notch forming a shoulder on the outer end of each of said ribs which notches form a race generated concentrically with the axis of the barrel and are collectively of the same or slightly greater diameter than the diameter of the threaded portions of the ribs. Also, an annular unthreaded portion is provided on the corresponding plug or head which is adapted to slidably fit in the race defined by the shoulders on the ribs with a minimum of clearance between the periphery of the annular portion of the plug or head and the race defined by the shoulders on the ribs. Here again, the depth of the notches or grooves formed in the ribs for accommodating the annular portion of the corresponding plug or head are each of less depth than the thickness of the rib or, in other words, are collectively of less diameter than the internal diameter of the barrel, tubular member or shell.

Some of the objects of the invention having been stated, other objects will appear as the description proceeds, when taken in connection with the accompanying drawings, in which—

Figure 1 is an elevation of one form of spool commonly known as a steaming bobbin and which is used on upwinders and the like and which embodies the principles of the present invention;

Figure 2 is a view looking at the right-hand side of Figure 1;

Figure 3 is an enlarged longitudinal sectional view taken along line 3—3 in Figure 2;

Figure 4 is an end view of the barrel, shell or tubular member with the leads or plugs removed;

Figure 5 is a longitudinal vertical sectional view through the barrel or tubular member with the heads or plugs of the bobbin or spool removed;

Figure 6 shows another or second form of spool embodying the principles of the present invention, this spool being of a type from which yarn or strand material is withdrawn on an upwinder, a winder or spinning frame;

Figure 7 is a view looking at the right-hand end of Figure 6;

Figure 8 is an enlarged longitudinal sectional view through the second form of spool taken along line 8—8 in Figure 7;

Figure 9 is a transverse sectional view taken along line 9—9 in Figure 8;

Figure 10 is a longitudinal sectional view through the barrel of the bobbin or spool shown in Figure 8, on a reduced scale, omitting the plastic cover, the head members, the tubular core and the inserts therefrom;

Figure 11 is an isometric view of one of the inserts or bushings mounted in the inner portions of the plugs or heads shown in Figure 8;

Figure 12 is a view of still another or third form of spool embodying the principles of the present invention, which spool is shown in the form of a ring twister bobbin;

Figure 13 is a view looking at the left-hand end of the spool shown in Figure 12;

Figure 14 is an enlarged longitudinal sectional view through the third form of spool taken substantially along line 14—14 in Figure 13;

Figure 15 is a transverse vertical sectional view taken substantially along line 15—15 in Figure 14;

Figure 16 is an enlarged view looking at the right-hand end of the spool shown in Figure 12;

Figure 17 is a longitudinal vertical sectional view through the barrel of the spool disassociated from the rest of the parts thereof shown in Figure 14;
Figure 18 is a view of still another or fourth form of spool embodying the principles of the present invention, which spool is shown in the form of a pinn;

Figure 19 is a longitudinal vertical sectional view, with parts broken away, through still another or fifth form of spool embodying the principles of the present invention, which spool is shown in the form of a warp beam, loom beam or tricot beam;

Figure 20 is a longitudinal sectional view through still another or sixth form of spool wherein two axially aligned tubular members or barrels are connected together by a plug and wherein the connection between the barrels embodies the principles of the present invention;

Figures 21, 22 and 23 are transverse sectional views taken along lines 21—21, 22—22 and 23—23 in Figures 18, 19 and 20, respectively.

Referring more specifically to the drawings, one form of the invention is shown in Figures 1 to 5, inclusive, which shall be considered as the first form of the invention. The spool shown in Figure 1 is in the form of a steaming bobbin and comprises a barrel or tubular body broadly designated at 10 and which has a relatively thin circular wall 11 provided with a plurality of circumferentially spaced inwardly projecting ribs 12 which extend substantially throughout the length of the shell or wall 11. Opposite end portions of each rib 12 are each provided with spirally formed grooves 13 therein, the grooves 13 on corresponding ends of all of the ribs 12 defining internal bearing surfaces 14 less than the inside diameter of the shell or wall 11. In other words, the grooves 13 are of less depth than the thickness of the projections 12. The threads thus formed are preferably, but not necessarily, of the Acme type for receiving mating externally threaded portions 15 on corresponding plugs 16 or hobbedly designated at 16.

The barrel or body 10 is preferably made from a light weight metal, such as aluminum alloy. If it is made from aluminum alloy, the outer periphery thereof should have a smooth, hard finish and should be anodized to prevent the aluminum oxide from discoloring the strand material wound thereon.

It should be noted that, although the grooves 13 form relatively short segmental thread portions in the corresponding ribs 12, the threads 15 on the plugs 16 extend about the entire periphery of the plugs 16. As best shown in Figure 5, it will be observed that the distal ends of each of the ribs 12 are each also formed with corresponding grooves or notches 20 on the inner portions thereof which are also of substantially less depth than the thickness of the corresponding ribs 12. The notches or grooves 20 formed in each end of the groups of ribs collectively form segments of an annular seat, groove or raceway for receiving an annular portion 21 on the corresponding plug 16.

The diameter of the segmental annular seat formed at each end of the tubular body 11 by the grooves or notches 20 in corresponding ends of the ribs 12 shall have a minimum diameter equal to or substantially greater than that of the outside diameter of the externally threaded portions 15 of the corresponding plugs 16 and the shoulders or annular portions 21 on the plugs 16 shall snugly fit in the races formed by the notches 20 with a minimum of clearance therebetween in order that the plugs are absolutely concentric with the axis of the tubular body 10.

The structure heretofore described is common to all the various forms of the invention and, in order to avoid repetitive description, elements shown in the second form of the invention (Figures 6 to 11, inclusive) corresponding to the elements thus far described in the first form of the invention (Figures 1 to 5, inclusive) shall bear the same reference characters with the small letter "a" affixed thereto. Corresponding elements shown in the third form of the invention (Figures 12 to 16) shall bear the same reference characters with the small letter "b" affixed thereto, corresponding elements shown in the fourth form of the invention (Figure 18) shall bear the same reference characters with the small letter "c" affixed thereto, and corresponding elements shown in the fifth and sixth forms of the invention (Figures 19, 22 and 20, 23, respectively) shall bear the same reference characters with the small letter "d" affixed thereto.

In the form of the invention shown in Figures 1 to 5, inclusive, each of the plugs 16 has a relatively large annular flange 23 thereon of substantially greater diameter than the tubular body 10 and a suitable gasket made from plastic, felt or any other desired material is preferably provided between each end of the tubular body 10 and the corresponding flange 23 and against which the flange is tightly seated, the washers or gaskets 24 assisting in binding the corresponding plugs 16 in engagement with opposite ends of the tubular body 10. It is also preferable that one or more screws 26 are employed to lock each plug against rotation relative to the tubular body 10.

In this instance, two such screws 26 are shown penetrating substantially diametrically opposed portions of each of the flanges 23 and the inner ends of these screws are embedded in threaded bores or holes 27 provided in the ends of the corresponding ribs 12. As shown in Figure 3, it is preferable that the outer ends of the heads of the screws 26 are flush or slightly below flush with the outer surfaces of the corresponding flange 23.

Each of the plugs 16 has a bore 30 in its outer end which is penetrated by a flanged bushing 31, the head or flange of which is disposed in a countersbore 32 formed in each of the plugs 16. The proximal ends of the flanged bushings 31 are engaged by opposite ends of a tubular guide or core 33. A tubular core or guide 33 is provided for the purpose of aligning a guide bushing 31 when the spool shown in Figures 1, 2 and 3 is positioned on a spindle or shaft in the usual manner.

Second form of spool

The second form of spool is shown in the form of a spool or bobbin of the type used on an upwinder, a winding machine or spinnin...
rounded at 48 to provide a smooth surface against which yarn or other strand material may pass as it is withdrawn from the spool shown in Figures 6, 7, 8 and 9.

It follows that, since the flanges 33c fits on the shoulder or annular portion 31c of each corresponding plug 16a, the corresponding washers 24a are disposed between the annular facings 36 and opposite ends of the tubular body 10a. The periphery of the tubular body 10a is covered with a suitable non-metallic material 41, such as plastic, compressed fibrous material and this tubular plastic covering 41 is preferably made from Bakelite.

The facing 36 on each of the flanges 23a may be made from stainless steel or from the same material as that of the tubular covering 41 and the tubular covering 41 may fit snugly on the tubular body 10a or it may be bonded to the periphery of the tubular body 10a by molding the same thereon.

The facings 36 are preferably loosely mounted on the hubs 16a and flanges 23a so they may be easily replaced with facings of different diameters and different materials, if desired. Also, the plugs 16a can then be tightened without disturbing the felt washers 24a, since the hubs 16a and flanges 23a may rotate independently of the facings 36 and then the screws 26a can be inserted through the flanges 23a and facings 36 and tightened in the threaded bores 27a.

Third form of spool

The third form of spool shown in Figures 12 to 16, inclusive, is in the form of a ring twister bobbin and those parts thereof which are substantially the same as those shown in the original or first form of the invention shown in Figures 1 to 5, inclusive, shall bear the same reference characters with the small letter "c" affixed thereto, as heretofore stated. It will be noted that the flange 25b on the left-hand plug 16b in Figure 14 is of only slightly greater diameter than that of the tubular body 10b and the outer portion thereof is rounded at 40 to provide a smooth surface against which the yarn or other strand material passes as it is withdrawn from the bobbin or spool.

The outer end of the left-hand plug 16b in Figure 14 has a knop portion 46 integral therewith and the bore 30b extends axially through the knop portion 46. The enlarged bore or counterbore 32b in each of the plugs 16b has a tubular bushing or bearing 31b therein which is preferably slidable mounted therein. The bushings 31b may be made from laminated or molded nylon, Bakelite, bronze, wood or any other desired non-ferrous or bearing material.

It will be noted that the bushing guide 33b is also preferably substantially the same external and internal diameter as that of the bushings 31b and opposite ends of the tubular guide 33b fit in the proximal ends of the counterbores 32b in the plugs 16b.

It will be noted that the periphery of the tubular body 10b also has a suitable plastic tubular member, such as Bakelite or the like, 41b extending longitudinally thereof and molded thereto as being molded thereto and the outer periphery of the gasket 24b is of the same diameter as the outer periphery of the plastic covering 41b.

Referring now to the right-hand plug 16b in Figure 14, it will be observed that the flange 25b thereof is also of only slightly greater diameter than that of the barrel of body 10b and is provided with shoulders 47c thereon about which an annular base 36b is mounted. The annular base 36b is preferably made from a plastic material and molded integral with the metallic plug 16b. The plastic plug 16b and the inner flange member 56 are non-metallic outer flange member 56 and the plastic inner flange member 57 are mounted. The flange members 56 and 57 are preferably of substantially the same diameter and may be rounded at the outer edges thereof. As shown in Figure 19, each inner flange member 57 bears against the corresponding end of the enlarged annular portion 21d and the outer periphery of the tubular body 10d and is held thereagainst by means of screws 26d which are threadably embedded in corresponding threaded bores 27d and which also serve to secure the corresponding outer flange members 56 against the outer surfaces of the inner flange members 57.

Fourth form of spool

In Figures 18 and 21 there is shown a fourth form of spool which is shown in the form of a shipping pivot 44 and a type about which synthetic yarn or the like may be wound prior to shipping the same to the various consumers and from which the yarn is withdrawn on a winding machine, upwister or the like. As heretofore stated, those parts shown in Figures 18 and 21 which are substantially the same as the first form of spool shown in Figures 1 to 5, inclusive, shall bear the same reference characters with the small letter "c" affixed thereto.

It will be noted that the hubs or plugs 16c differ from those heretofore described in that they are devoid of any flanges thereon of greater diameter than that of the tubular body 10c and they are also devoid of bushings such as the bushings 31b shown in Figure 3, the bushings 31b shown in Figure 8 or the bushings 31b shown in Figure 14. However, each of the plugs 16c is provided with a bore 30c, an inner counterbore 32c and an outer counterbore 35c and opposite ends of a tubular guide 33c snugly fit in the inner counterbores 32c in the inner portions of the plugs 16c.

Also, the outer ends of the annular portions 21c of the plugs 16c are substantially flush with opposite ends of the tubular body 10c and the periphery of the tubular body 10c has a non-ferrous or plastic tubular covering 41c thereon similar to the tubular covering 41b in Figure 14. It will be noted that opposite ends of the tubular covering 41c in Figure 18 terminate substantially flush with opposite ends of the tubular body 10c and are preferably rounded, as at 31. The tubular covering may be omitted from the barrel or body 10c. However, in this instance, if the barrel is made from aluminum alloy, it should be anodized to prevent discoloration of the material wound thereon.

Another or fifth form of spool is shown in Figures 19 and 22, wherein the spool is shown in the form of a warp beam, loom beam or tricot beam and, as heretofore stated, those parts shown in Figures 19 and 22 which are substantially the same as those shown in the original or first form of spool (Figures 1 to 5, inclusive) shall bear the same reference characters with the small letter "d" affixed thereto. It will be noted that the spool shown in Figures 19 and 22 differs from those heretofore described in that it is devoid of a tubular guide extending between the proximal portions of the plugs 16d and, although each of the plugs 16d is provided with a bore 32d therein, it will be noted that they are counterbore in the outer ends thereof at 35d for the reception of the usual trunnions used on warpers. Of course, the usual shafts or shafts may be mounted in the bores 32d for supporting the beam on a loom, tricot knitting machine or like.

The plugs 16d are also devoid of flanges integral therewith and, instead, the plugs 16d are each provided with a reduced portion 59 on the outer end thereof on which a non-metallic outer flange member 56 and a non-metallic inner flange member 57 are mounted. The flange members 56 and 57 are preferably of substantially the same diameter and may be rounded at the outer edges thereof. As shown in Figure 19, each inner flange member 57 bears against the corresponding end of the enlarged annular portion 21d and the outer periphery of the tubular body 10d and is held thereagainst by means of screws 26d which are threadably embedded in corresponding threaded bores 27d and which also serve to secure the corresponding outer flange members 56 against the outer surfaces of the inner flange members 57.
As in the original form of the invention, it is preferable that the heads or outer ends of the screws 26d are flush or below flush with the outer surfaces of the outer flange members 56. The outer periphery of the beam in Figure 19 also has a thin plastic or non-ferrous tubular covering 41d which is preferably molded integral therewith and may be substantially the same as the plastic tubular member 41 heretofore described with respect to Figure 8. The sixth form of spool shown in Figures 20 and 23 is substantially of the same type as that shown in Figures 19 and 22 with the exception that the spool shown in Figure 20 is made up of at least two tubular body sections disposed in axial alignment and wherein the distal ends of the body portions have plugs therein to which flanges are attached in the identical manner to that shown in Figure 19, the feature of the form shown in Figure 20 residing in the manner in which the proximal ends of adjacent tubular body sections are interconnected and wherein the principles of the present invention are applied. Therefore, those parts in Figure 20 which are substantially the same as those shown in Figure 19 will bear the same reference characters as those shown in Figure 19.

It will be observed in Figure 20 that the proximal ends of adjacent tubular bodies 10d are interconnected by a coupling block or plug 63 which is preferably provided with an axially extending bore 64 therethrough in order to minimize the weight thereof.

The medial portion of the coupling or plug 63 is provided with an enlarged annular portion or ridge 65 thereon which is adapted to fit in the corresponding notches or grooves 20d in the proximal ends of the ribs 12d and each end of the coupling 63 is provided with threads 67 thereon which are adapted to mate with the threads 13d in the ribs 12d in Figure 20 at the proximal ends of the adjacent tubular bodies 10d. Any desired means may be provided for locking the proximal ends of adjacent tubular bodies 10d in engagement with the plug or coupling 63 and, in the present instance, one or more of the ribs 12d is penetrated by one or more screws 68 which screws are threadably embedded in the coupling 63. Since the peripheries of the tubular bodies 10d are each provided with the plastic or non-ferrous covering 41d, it is preferable that the heads of the screws 68 are substantially below flush with the periphery of the corresponding tubular coverings 41d and a suitable plastic material, indicated at 70, is then placed in each of the bores formed by the heads of the screws 68 and polished flush with the outer surface of the corresponding tubular covering 41d.

It is thus seen that I have provided an improved means for attaching heads or plugs to opposite ends of the tubular bodies of spools which minimizes the weight thereof and greatly increases the strength thereof so that a plastic covering may be applied to the periphery of the tubular body of each type of spool illustrated, among others, without substantially increasing the weight of the spool. It is contemplated that the barrel in each form of the invention can be made from extruded aluminum or any other type of material, such as plastic or other synthetic material. Also, the flanges of the spools may be made from many different types of materials or combinations of materials, such as aluminum, stainless steel, plastic, nylon, etc.

In the drawings and specification there have been set forth preferred embodiments of the invention and, although specific terms are employed, they are used in a generic and descriptive sense only, and not for purposes of limitation, the scope of the invention being defined in the claims.

I claim:

1. An improved spool construction comprising an elongated barrel having a relatively thin wall, a plurality of circumferentially spaced inwardly projecting ribs integral with said wall, at least one end of each of said ribs having a series of notches in the inner surface thereof, the notches in all of the ribs collectively defining internal threads in the ribs, the outer end of each rib also having a groove therein, and an externally threaded relatively short plug fitting in the threads collectively formed in the ribs, and said plug having an annular portion thereon adapted to snugly fit in the annular groove formed by said grooves in the ends of the ribs.

2. A spool construction comprising a barrel having a relatively thin wall, a plurality of inwardly projecting ribs integral with said wall, each end portion of each rib having a plurality of transverse grooves therein, the grooves in adjacent ends of said ribs collectively defining an annular groove in said ribs, all the grooves in said ribs being of less depth than the distance from the inner surface of each rib to the wall of said barrel, a relatively short plug adapted to fit in each opposite end of the barrel and having external threads thereon engageable with the threads formed in said ribs, and the outer portion of each said plug having an annular portion thereon adapted to snugly fit in the annular groove formed by said additional grooves in corresponding ends of the ribs.

3. A spool construction comprising a tubular body having a relatively thin wall, a plurality of inwardly projecting ribs integral with and extending throughout the length of said wall, each end portion of each rib having a plurality of spirally formed transverse grooves therein, the grooves in adjacent ends of said ribs collectively defining internal threads, the outer end of each rib also having an additional groove therein, the additional grooves in the outer ends of all the ribs collectively defining a concentric raceway in each end of said ribs, all the grooves in said ribs being of less depth than the distance from the inner surface of each rib to the wall of said barrel, an externally threaded relatively short plug adapted to fit in each of the ends of the barrel, and the outer portion of each plug having a concentric annular portion thereon adapted to snugly fit in the concentric raceway formed collectively in corresponding ends of the ribs.

4. An improved spool construction comprising an elongated barrel having a relatively thin wall, a plurality of circumferentially spaced inwardly projecting ribs integral with said wall, at least one end of each of said ribs having a series of notches in the inner surface thereof, the notches in all of the ribs collectively defining internal threads in the ribs of less outside diameter than the inside diameter of said barrel, an externally threaded relatively short plug fitting in the threads formed in the ribs, a flange integral with the plug and adapted to bear against the corresponding end of said barrel, a concentric annular shoulder on the plug adjacent the flange, and the corresponding outer ends of said ribs having other notches therein forming a concentric raceway for slidably receiving the annular shoulder on the plug.

5. A spool construction comprising a barrel having a relatively thin wall, a plurality of inwardly projecting ribs integral with said wall, each end portion of each rib having a plurality of transverse grooves therein, the grooves in adjacent ends of said ribs collectively defining internal threads, the outer end of each rib also having an additional groove therein, the additional grooves in the outer ends of all the ribs collectively defining an annular groove in said ribs, all the grooves in said ribs being of less depth than the distance from the inner surface of each rib to the wall of said barrel, a relatively short plug adapted to fit in opposite ends of the barrel and having threads thereon engageable with the
threads formed in said ribs, the outer portion of each of said plugs having an annular portion thereon adapted to snugly fit in the annular groove formed in corresponding ends of the ribs, said plugs having axially aligned bores therethrough, a tubular core of substantially less outside dimension than the distance between opposed ribs, and opposite ends of the core being mounted in said bores.

6. A spool construction comprising a barrel having a relatively thin wall, a plurality of inwardly projecting ribs integral with said wall, each end portion of each rib having a plurality of transverse grooves therein, the grooves in adjacent ends of said ribs collectively defining internal threads, the outer end of each rib also having an additional groove therein, the additional grooves in corresponding outer ends of all the ribs collectively defining an annular groove in said ribs, all the grooves in said ribs being of less depth than the distance from the inner surface of each rib to the wall of said barrel, a relatively short plug adapted to fit in each opposite end of the barrel and having external threads thereon engageable with the threads formed in said ribs, the outer portion of each of said plugs having an annular portion thereon adapted to snugly fit in the annular groove formed by said additional grooves in corresponding ends of the ribs, a relatively thin sleeve of material fixed on the outer periphery of and extending throughout the length of said barrel, a flange formed integral with the outer end of each plug and being of greater diameter than the external diameter of the barrel, said plugs having axially aligned bores therethrough, a bushing positioned in the bore of each plug, a tubular core positioned between the bushings, and opposite ends of the core being mounted in said bores.

7. A spool construction comprising a barrel having a relatively thin wall, a plurality of inwardly projecting ribs integral with said wall, each end portion of each rib having a plurality of transverse grooves therein, the grooves in adjacent ends of said ribs collectively defining internal threads, the outer end of each rib also having an additional groove therein, the additional grooves in corresponding outer ends of all the ribs collectively defining an annular groove in said ribs, all the grooves in said ribs being of less depth than the distance from the inner surface of each rib to the wall of said barrel, a relatively short plug adapted to fit in each opposite end of the barrel and having external threads thereon engageable with the threads formed in said ribs, the outer portion of each of said plugs having an annular portion thereon adapted to snugly fit in the annular groove formed by said additional grooves in corresponding ends of the ribs, a relatively thin sleeve of material fixed on the outer periphery of and extending throughout the length of said barrel, a flange formed integral with the outer end of each plug and being of greater diameter than the external diameter of the barrel, said plugs having axially aligned bores therethrough, a bushing positioned in the bore of each plug, a tubular core positioned between the bushings, and opposite ends of the core being mounted in said bores.

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