Sept. 8, 1953 | L. HORNBOSTEL | 2,651,114

DRIER DRUM

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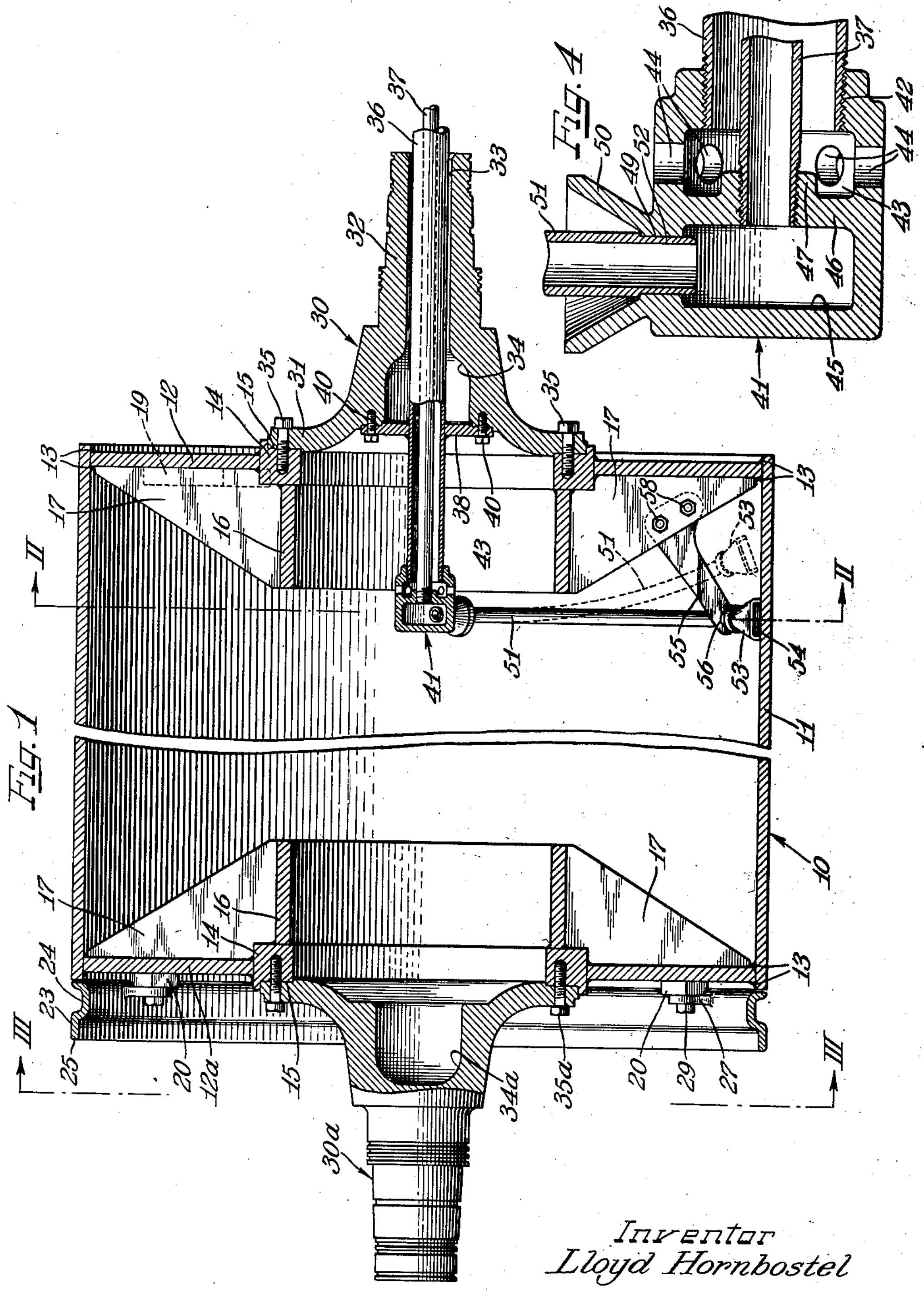

Fig. 1

Fig. 4

Inventor
Lloyd Hornbostel

by [illegible] Attys

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Fig. 2

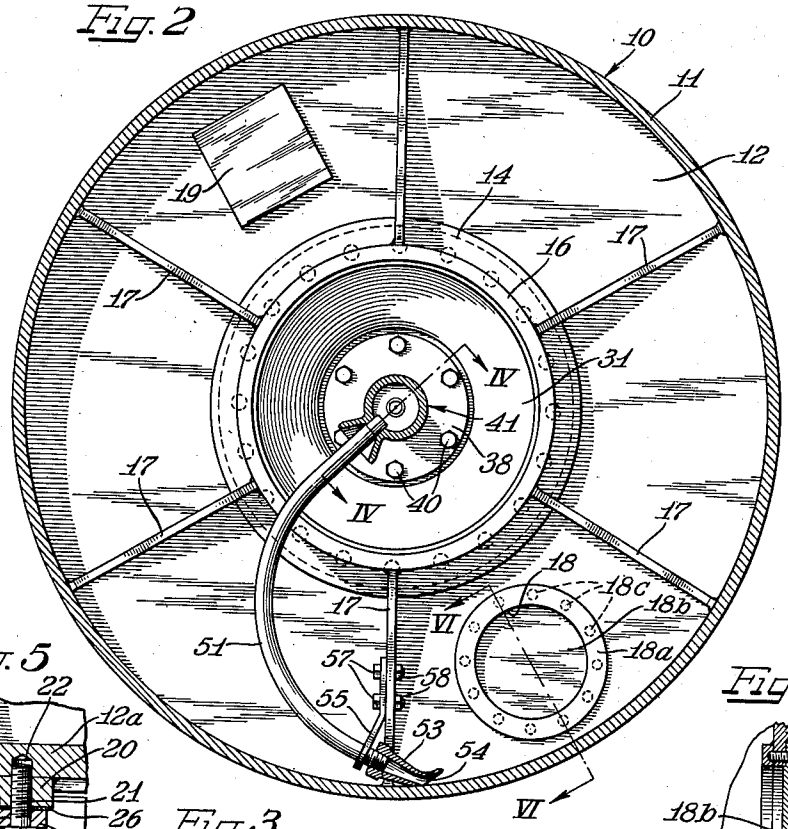


Fig. 5

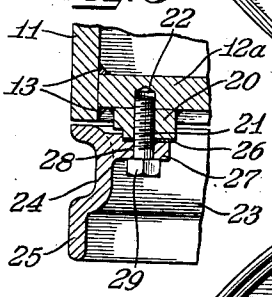


Fig. 6

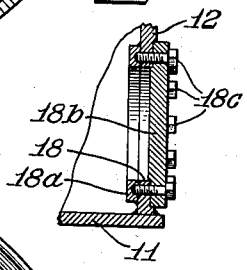
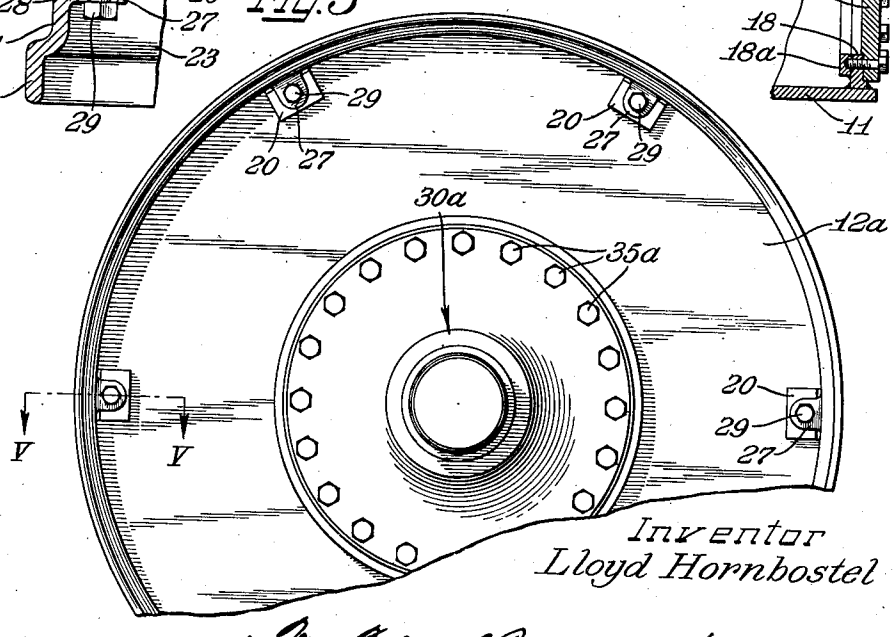


Fig. 3



Inventor
Lloyd Hornbostel

by The firm of Charles Hobbs Attys

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UNITED STATES PATENT OFFICE

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DRIER DRUM

Lloyd Hornbostel, Beloit, Wis., assignor to Beloit Iron Works, Beloit, Wis., a corporation of Wisconsin

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4 Claims. (Cl. 34—124)

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The present invention relates to a drier drum and more particularly to a welded drier drum having removable journals.

As conventionally employed in the art, drier drums for paper machine drying sections generally consist of a cylindrical shell, spaced heads extending radially across the shell to close the open end thereof and carrying means for journaling the shell for rotation, and means for introducing a heat exchange fluid into the interior of the shell. Since steam is the heat exchange fluid normally employed, means are also provided for removing the aqueous condensate from the interior of the drum during use. In driers heretofore employed, the shell heads are attached to the shell either by being pressed fitted therein or by being attached thereto by screws or bolts.

The present invention now provides an improved form of drier drum in which the shell heads are welded to the shell to form a permanent shell and head assembly. Each head is provided with an enlarged central aperture which is closed by means of a removable journal. The relatively large head apertures permit the entry of the workmen to the interior of the shell during assembly of the drum to weld the heads to the shell in the interior thereof to form a secure shell-head joint. In addition, the removable journals are replaceable in case of damage during use by merely securing the replacement journal to the appropriate head.

The shell, heads, and head reinforcing means form an integral, welded unit which is of simple construction to allow for easy calculation of stresses and, by virtue of the movable journal, it is not necessary to provide a hand hole or port large enough to admit a workman for inspection of the unit or assembly of the same. In addition, all of the welded together parts, with the exception of journal rings which are tapped to receive the journal fastening means, are of the same thickness, thereby facilitating stress relief of these welded parts. The drum is axle free and is mounted for rotation by means of the separate journals, which also relieves the weld joints from the stress of thermal axle expansion.

In the present invention, one of the removable journals carries concentric steam inlet and condensate outlet lines which are secured to the journal to extend through an axial bore thereof in spaced, insulated relation to the journal itself. Thus, heat transfer from the steam inlet line to the journal is materially lessened.

The concentric steam inlet and condensate outlet lines terminate in a conduit block located in-

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teriorly of the shell, the block being divided in separated steam and condensate chambers. The steam chamber permits admission of steam into the interior of the shell through the steam inlet line and the condensate chamber communicates with a drain line connected to a dipper which is rotatable with the shell to remove condensate therefrom.

In addition, a Sheahan sheave is carried by the shell adjacent one head thereof and in spaced, insulated relation to the shell and the head. In this manner, the guide rope may be lapped about the sheave out of heat transfer relation with the drier drum itself, thus promoting the life of the rope.

It is, therefore, an important object of the present invention to provide improved, simple, readily fabricated drier drum.

Another important object of the present invention is to provide an improved drier drum in which a shell carries a pair of spaced heads welded thereto and a pair of removable journals providing a means of ingress into the interior of the shell.

It is a further important object of the present invention to provide an improved drier drum comprising a cylindrical shell, end heads closing the shell, journals carried by the end heads and concentric steam inlet and condensate outlet lines extending through and carried by one of the journals into the interior of the shell in efficient insulated relation to the journal.

Still another important object of the present invention is to provide an improved drier drum including a shell, fixed heads closing the shell, journals removably carried by the heads, steam inlet and condensate outlet conduits, and means located interiorly of the shell for separately introducing steam therein and removing condensate therefrom.

Yet a further important object of the present invention is to provide a drier drum including a cylindrical shell, heads welded to the shells to close the ends thereof, and a Sheahan sheave carried by one of the heads and extending about the periphery of the shell closely spaced, thermally insulated relation thereto to prolong the life of a Sheahan guide rope lapped thereabout.

It is an additional object of the present invention to provide an axle free drier drum, in which the drier shell, end heads, and head reinforcing means are of the same thickness and welded into an integral assembly to permit easy relief of stress in all the welded parts.

Other and further important objects of this

invention will be apparent from the disclosures in the specification and the accompanying drawings.

On the drawings:

Figure 1 is a sectional view with parts shown in elevation, taken along the longitudinal axis of rotation of a drier drum of the present invention;

Figure 2 is a sectional view, with parts shown in elevation, taken along the plane II—II of Figure 1;

Figure 3 is an end elevational view taken along the plane III—III of Figure 1;

Figure 4 is a sectional view taken along the plane IV—IV of Figure 2;

Figure 5 is a sectional view, with parts shown in elevation, taken along the plane V—V of Figure 3; and

Figure 6 is a sectional view, with parts shown in elevation, taken along the plane VI—VI of Figure 2.

As shown on the drawings:

In Figure 1, the reference numeral 10 refers generally to a drier drum of the present invention including a cylindrical shell 11 having open ends closed by annular heads 12 and 12*a* welded thereto as at 13 and extending radially thereacross.

Each of the annular heads 12 and 12*a*, respectively, has welded thereto about its inner periphery an annular journal ring 14 having outer annular recesses 15 formed therein for a purpose to be hereinafter more fully described. A generally cylindrical collar 16 is secured to the inner face of each of the rings 14, the collars 16 extending interiorly of and concentrically with the shell 11. A plurality of radially extending, generally triangular reinforcing ribs 17 are positioned between each of the collars 16 and the associated head 12 or 12*a* to reinforce the heads against those axial and radial loads imposed thereon. It is to be noted that the shell 11, the heads 12 and 12*a*, the collars 16, and the reinforcing ribs 17 are all of the same thickness and are all welded into a single assembly.

The head 12 is provided with a hand hole 18 (Figures 2 and 6) defined by an annular ring 18*a* secured to the inner face of the head between a pair of the radially extending ribs 17 and a closure plate 18*b* recessed into the outer surface of the head in registry with the ring 18*a* and closing the hand hole 18. A plurality of peripherally disposed screws 18*c* extend through registering apertures in the closure 18*b*, the head 12 and the ring 18*a* to secure the closure in position. A generally rectangular counterweight 19 is secured to the inner surface of the head 12 in radially opposed relation to the hand hole 18 to counterbalance the additional weight of the ring 18*a*, the closure plate 18*b* and the screws 18*c*.

The other head 12*a* is provided with a plurality of peripherally spaced sheave blocks 20 (Figures 3 and 5) having central threaded apertures 21 registering with correspondingly threaded recesses 22 formed in the head 12. A Sheahan sheave 23 is disposed adjacent the periphery of the shell 11, the sheave comprising an annular member having an outwardly opening peripheral groove 24 and an adjacent annular portion 25 in the peripheral plane of the shell. The sheave is integrally formed with radially inwardly extending ears 27 adapted to be positioned to overlie the block 20, the ears having central apertures 28 registering with the block screw holes 21 for receiving sheave screws 29. An insulating gasket 26, formed of suitable material, such as paper, is interposed between the ears 27 and the blocks 20, the gasket cooperating with the air gap between the sheave 23 and the shell 11 to prevent heat transfer from the shell to the sheave thus effectively lengthening the life of a Sheahan rope carrier lapped about the sheave and seated within the groove 24.

A journal 30, having a peripheral mounting flange 31 and an axially extending axle portion 32, is secured to the journal ring 14 of the head 12 carrying the hand hole 18 and the counterweight 19. The journal, secured to the head by means of screws 35, is provided with an axially extending bore 33 and an enlarged, countersunk core recess 34 concentric with the bore 33 and opening toward the interior spaced defined by the shell 11. A similar journal 33*a* is similarly secured to the opposing head 12*a* by bolts 35*a* in axial alignment with the first journal 30, the journal 30*a* having a core recess 34*a* but no axially extending bore.

The bore 33 of the journal 30 receives a pair of concentric conduits, namely, a steam inlet line 36 and a nesting condensate drain line 37 extending axially therethrough. The conduits are secured in the bore by a conduit centering plate 38 seated in a countersunk recess concentric with and surrounding the core 34, the plate 38 being secured to the journal 30 by means of screws 40 extending through the block into the journal.

A conduit terminal block 41 is mounted upon that terminal end of the concentric conduits 36 and 37 extending into the interior of the shell 11. The block 41 is generally cylindrical in outline and includes an interiorly threaded recess 42 receiving a correspondingly threaded end of the steam inlet line 36. The steam inlet line threaded into the opening 42 communicates with a steam chamber 43 having radially extending steam outlet apertures 44 communicating with the interior of the drier drum 10.

The block 41 also defines an interior condensate chamber 45 separated from the steam chamber 43 by means of interior wall 46 having a centrally apertured interiorly threaded boss 47 receiving the threaded terminal end of the condensate drain line 37. The condensate chamber 45 communicates with the interior of the drier drum through a restricted aperture 49 communicating with the interior of a frustoconical dipper conduit seat 50.

A dipper conduit 51 extends radially across the interior of the shell 11. The dipper conduit has a reduced end 52 seated in the aperture 49 and extends generally radially of the shell to terminate in a dipper 53 having an open intake mouth 54. The dipper 53 is wedged into engagement with the inner periphery of the shell 11 to maintain the reduced end 52 of the dipper conduit in seated relation in the seat 50 and the aperture 49. In addition, a bracket 55 having an aperture 56 adjacent one end thereof to receive the dipper conduit 51 is secured to an adjacent rib 17 by suitable means, as by bolts 57 and nuts 58.

The fabrication and assembly of the drier drum hereinbefore described is both simple and economical. First, the heads 12 and 12*a* are secured within the open ends of the shells 11 by welding, entry into the interior of the shell being provided by relatively large apertures defined by the journal ring 14 to permit welding of the heads to the shells from the interior of the shell. Next, the conduit assembly consisting of the steam inlet

line 36, the condensate drain line 37, the conduit centering plate 38, and the conduit terminal block 41 are secured within the journal 30 by means of the screw 40.

The curved condensate dipper pipe or conduit 51 and the dipper 53 are inserted into the shell through the hand hole 18, and the journal 30 is secured to the associated head by means of screws 35. The reduced end 52 of the dipper conduit is positioned within the aperture 49 and the condensate piping or conduit 51 is positioned off plumb as shown in dotted lines in Figure 1.

After the seating of the conduit in the aperture 49, the conduit 51 is moved downwardly and axially inwardly of the shell to its final position, as shown in full outline, thus wedging the dipper securely against the inside of the drier shell. After the dipper has been wedged into the desired position, the bracket 55 is secured to the associated rib 17 to maintain the conduit and dipper into the desired position. A reverse procedure may be employed to readily remove the dipper and conduit assembly through the hand hole 18.

The advantages residing in the present invention will be readily appreciated by those skilled in the art, including the simple, integral shell and head construction, the reinforcing of the heads by means of the collars 16 and the ribs 17, and the large fabrication and inspection openings provided by the removable journal 30. Also, the journal construction itself is simple and readily manufactured while at the same time efficiently insulating the journal itself from the heated shell and from the steam inlet line 36. If desired, the conduit centering plate 38 may be axially apertured to permit the circulation of air, as by blowing, about the steam inlet line to further aid it in insulating the journal, which of course would be journaled within suitable bearings. The conduit centering plate and the conduit terminal block cooperate to effectively position the steam inlet and the condensate drain line within the shell for efficient operation, while the dipper mounting bracket aids in maintaining the dipper in its wedge fitted engagement with the shell. Again, the Sheahan sheave is insulated from the shell to prolong the life of the Sheahan rope.

The facilitation of stress relief by the uniform thickness shell, end heads, collars, and head reinforcing ribs, will be appreciated, as will the elimination of an axle extending completely through the shell. Thus a uniform thermal expansion is possible upon the introduction of heat exchange fluid in the drum and the weld joints are substantially free of stress upon such expansion.

It will be understood that modifications and variations may be effected without departing from the scope of the novel concepts of the present invention.

I claim as my invention:

1. In a drier drum including a cylindrical shell and a head closing each open end of the shell, the improvements of concentric steam inlet and condensate drainage conduits projecting axially through one of said heads into the interior of said shell, a hollow conduit block carried by said conduits interiorly of said shell, said block having an interior wall defining a first interior chamber communicating with said steam inlet line and the interior of said shell and second interior chamber communicating with said condensate drainage conduit, a dipper engaging the inner periphery of said shell in substantial radial alignment with said second chamber, and a dipper conduit communicating with said dipper and with said second interior chamber to drain condensate from said shell through said drainage conduit said conduit being slidably seated in said block and pivotally movable in and out of its seat therein to swingably move said dipper into and out of wedged engagement with the inner periphery of the shell.

2. A paper machine drier drum which comprises a cylindrical shell, end heads on said shell, one of said end heads being centrally apertured, journals on said end heads, one of said journals being hollow and covering the central aperture of said one end head, concentric steam and condensate conduits extending through the hollow journal, a closure member at the inner end of the hollow journal carrying said conduits in spaced relation from the hollow interior of the journal, a conduit block on the inner end of said conduits having separate chambers communicating with each conduit, the chamber of said block communicating with said condensate conduit having an inlet with a diverging mouth, a condensate tube having one end detachably insertable in said inlet through said mouth, a dipper on the other end of said tube, a bracket detachably carried by the apertured end head holding said tube in fixed position relative to the drum, said apertured drum head having a hand hole therethrough adjacent said bracket, and a detachably mounted closure plate for said hand hole.

3. A paper machine drier drum which comprises a cylindrical shell, end heads on said shell, one of said end heads being centrally apertured and having an additional hand hole radially outwardly from said central aperture, a removable cover plate for said hand hole secured to said one head, journals on said end heads, one of said journals being axially bored and covering the central aperture in said one end head, a condensate drain conduit extending through the bore of said one journal, a closure member at the inner end of the hollow journal carrying said conduit in spaced relation from the bore of the journal, a conduit block on the inner end of said conduit having an interior chamber communicating with said conduit and a restricted inlet orifice, a condensate tube having a reduced end slidably received by and pivotally inserted in said inlet orifice to communicate with said chamber, and a dipper on the other end of said tube in wedged surface engagement with the inner periphery of said shell adjacent said hand hole in said one end head for removing condensate from said shell through said tube, said condensate chamber, and said condensate drain conduit, and the hand hole accommodating ingress to the interior of said shell to insert said tube end in said block orifice and to wedge said dipper into surface engagement with said shell.

4. A paper machine drier drum which comprises a cylindrical shell, annular end heads on said shell, removable journals detachably secured to said end heads to close the same, one of said journals having an axial bore therethrough communicating with the interior of said shell, concentric steam and condensate conduits extending through the bore of said one journal, a centering plate carried by said one journal and centrally receiving said concentric conduits in radially spaced relation from the bore of said journal, a conduit block on the inner end of said conduits having separate chambers communi-

cating with each conduit, the chamber of said block communicating with said steam inlet conduit being perforated to accommodate admission of steam into the interior of said shell and said chamber of said block communicating with said condensate drain conduit having an inlet orifice, a curved condensate tube extending generally radially of said shell and having a reduced end pivotally inserted in said orifice to be slidably received therein, and a dipper on the other end of said tube, pivoting movement of said condensate tube in said block orifice accommodating arcuate movement of said tube and said dipper into and out of wedged engagement with the inner periphery of the shell.

LLOYD HORNBOSTEL.

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