# United States Patent [19]

**Pfarrwaller**

[11] **3,759,300**

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[54] **INTERMEDIATE WEFT THREAD SUPPLY APPARATUS FOR LOOMS**


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[30] **Foreign Application Priority Data**

Mar. 4, 1971 Switzerland ..... 3174/71

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[51] **Int. Cl.** ..... **D03d 47/36**

[58] **Field of Search** ..... 139/122 R; 66/132 R; 318/6; 242/47.01, 47.12



[56] **References Cited**

UNITED STATES PATENTS

3,411,548 11/1968 Pfarrwaller ..... 139/122

FOREIGN PATENTS OR APPLICATIONS

15,579 6/1956 Germany ..... 242/47.12

123,403 6/1967 Czechoslovakia ..... 139/122



*Primary Examiner*—Henry S. Jaudon

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[57] **ABSTRACT**

In a thread storage and supply device including a drum supported at one end from a shaft and including means to wind a thread onto the drum for subsequent pull-off over the free end of the drum, an annular member surrounds the drum with close clearance therefrom at the end from which the drum is supported, thereby preventing the thread from becoming entangled or wound up upon the shaft.


**7 Claims, 6 Drawing Figures**

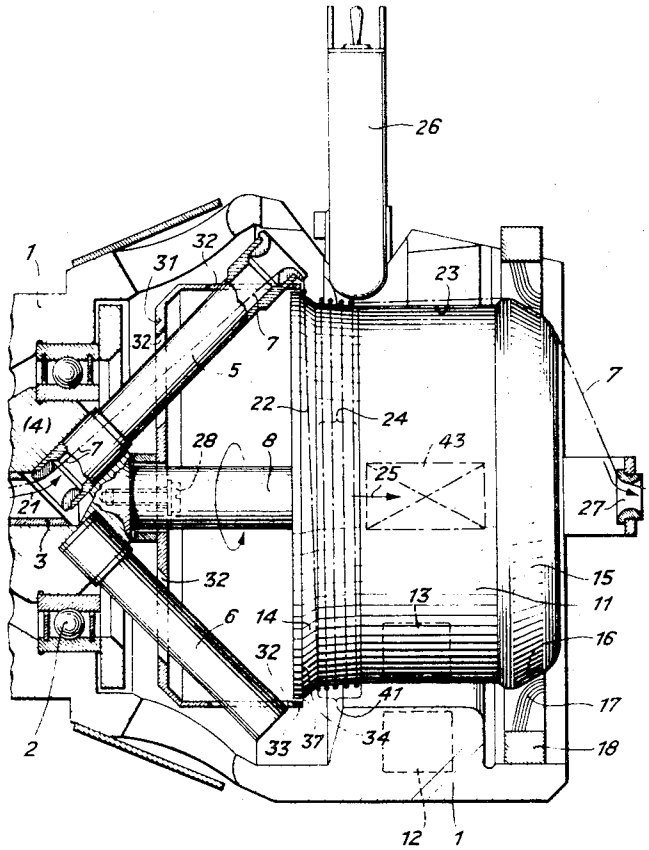
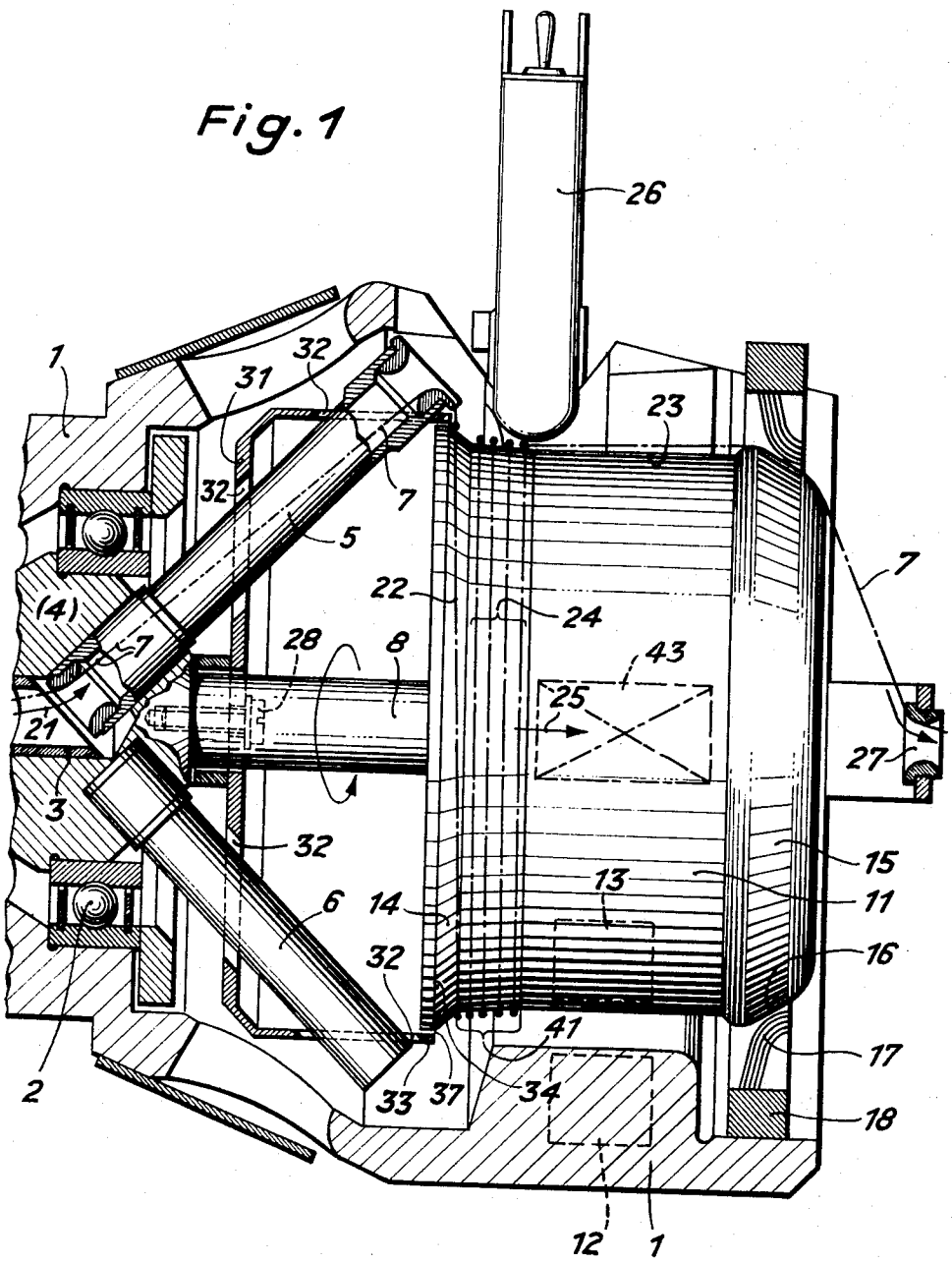


Fig. 1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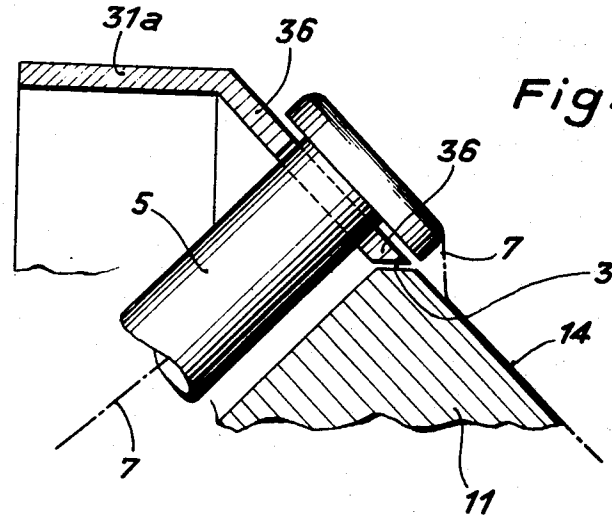


Fig. 2

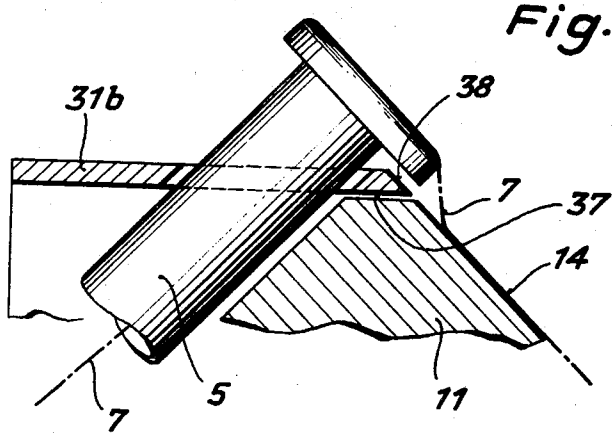


Fig. 3

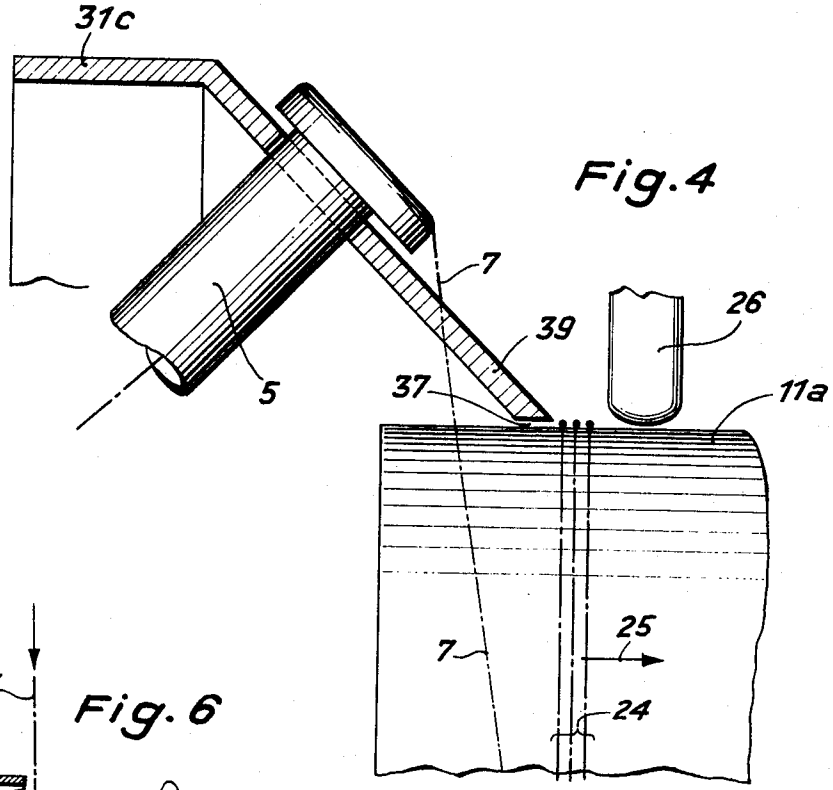


Fig. 4

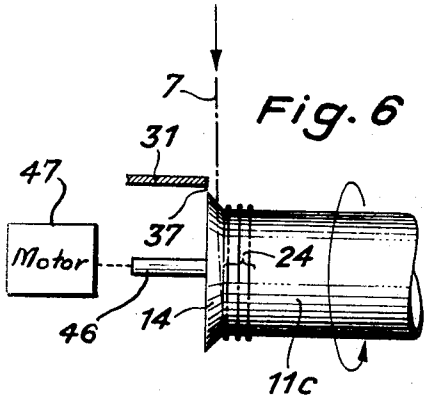


Fig. 6

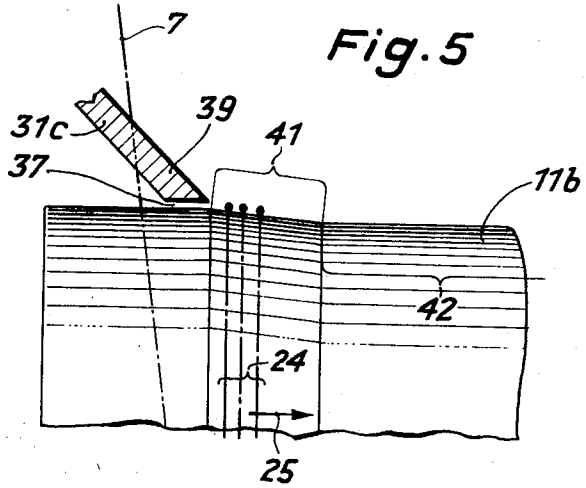


Fig. 5

# INTERMEDIATE WEFT THREAD SUPPLY APPARATUS FOR LOOMS

The present invention pertains to thread storage and supply apparatus, for example for the temporary storage of the length of weft thread required to make one or more picks in the operation of a loom of the type employing shuttles without pirns. The invention thus relates to apparatus of the type disclosed and claimed in U. S. Pat. Nos. 3,411,548 and 3,455,341 which are assigned to the assignee hereof.

In the apparatus disclosed in these patents, a drum is rotatably mounted, via bearings, on a free end of a hollow rotating shaft with a thread guide or flyer affixed to the shaft inboard of the drum and extending radially outward beyond the drum and extending axially just over the adjacent end of the drum in order to permit winding onto the drum of a thread passing through the shaft, the drum being held against rotation with the shaft by the action of weights or of magnets which couple it to a stationary frame without preventing pull-off of the thread from the drum.

In these previously proposed constructions one end of the drum is substantially aligned axially with the thread guide, or, equivalently stated, the thread guide or flyer extends axially of the drum only a short distance past the adjacent end of the drum. The guide has moreover a large clearance form the drum. It is therefore possible, in these previously proposed constructions, for the thread to slip off the drum at the end thereof adjacent the flyer, and to become entangled or wound up on the shaft.

The same difficulty can occur if too much thread is pulled off the drum in the course of a pick, producing slack or spacing between the turns remaining on the drum. Such slack, or alternatively a breakage of the thread on the drum, can prevent proper operation of the photoelectric mechanism by which the rotation of the shaft is controlled to hold the number of turns of thread on the drum between desired maximum and minimum values.

It is an object of the invention to provide a thread storage device improved in these respects. In accordance with the invention there is provided, coaxially of the drum at the end of the drum from which it is supported, an annular member which surrounds the drum with close clearance. The clearance may be between 0.1 and 1.0 Millimeter but is preferably between 0.2 and 0.3 Millimeter and will seldom be greater than 0.5 Millimeter. The construction is such that the arriving thread passes onto a conical surface, whether of the drum or of the annular member. In either case undesired backward passage of the thread is prevented. The thread passing onto the conical surface immediately slips toward the small end of this surface, with the following coils serving to push the prior ones further in the same direction toward the free end of the drum from which they are pulled off for use.

## BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be further described in terms of a number of presently preferred exemplary embodiments and with reference to the accompanying drawings in which:

FIG. 1 is an axial sectional view of a thread storage device in accordance with the invention, certain elements of structure being omitted for clarity; and



FIGS. 2-6 are fragmentary axial sectional views of other thread storage devices in accordance with the invention.

## DESCRIPTION OF PREFERRED EMBODIMENTS

Referring to FIG. 1, a stationary frame or housing 1 supports a hollow shaft 3 at bearings 3 via a hub 4. Another similar set of bearings may be provided elsewhere along the length of the shaft, to the left of FIG. 1. The shaft 3 may be driven in any suitable manner, for example by means of a belt, as shown in U. S. Pat. No. 3,411,548. Two tubes 5 and 6 are mounted on the hub 4, advantageously with their axes lying in a common plane containing the axis of rotation of the shaft 3, so that the tubes are 180° apart about the axis of the shaft. The thread, coming from a supply not shown but positioned at the left of FIG. 1, passes through the hollow shaft 3 in the direction of the arrow 21, as indicated at 7. The thread may for example be the thread to be incorporated as the weft in a cloth being woven on a loom. The tube 6 serves only as a balance or counterweight to the weight of the tube 5. The thread, after being wound onto the drum 11 as presently to be set forth, is pulled off for use and passes through an eye 27 at the right of FIG. 1, i.e., beyond the free end of the drum, to the picking mechanism of the loom from where it is picked into the shed.

The hollow shaft 3 extends beyond its junction with the tube 5 as a stub shaft 8 which rotates with the shaft 3. A substantially cylindrical winding body or drum 11 is rotatably supported coaxially to the shaft 3 from the stub shaft 8 by means of bearings 43. The drum is however restrained from rotating, for example by means of magnets 12 and 13 disposed in the housing and in the drum, as shown and described in the issued patents hereinabove cited. The drum includes a cylindrical portion 23 which connects to a first conical portion 14 by means of an intermediate conical portion 41 of smaller cone angle. At the right end the drum is provided with a flange 15 of larger maximum diameter than the portion 23 but which is also conical in shape. A braking ring 18 is disposed in the housing 1 coaxially of the drum and is provided with bristles or similar flexible filamentary elements 17 for engagement with the flange, as also described in the cited patents.

In operation, the thread passes through the hollow shaft 3, as indicated at the arrow 21 and the flyer tube or arm 5 onto the conical portion 14 of the stationary drum 11. Something like a half turn or a whole turn of the thread will exist on the conical portion 14, the previously wound thread slipping continuously to the right, in FIG. 1, onto the flatly conical portion 41 and thence onto the cylindrical portion 23.

As the process continues the turns or coils 24 are continuously shifted to the right. As soon as enough turns accumulate to cause them to enter the beam of the photoelectric detector 26, the drive of the flyer 5 is slowed or stopped. Upon the next pick of the thread into the shed of the loom, the quantity of thread stored on the drum will be reduced, the light beam will again reach the photocell, and the drive to the shaft 3 will be restored likewise.

The photoelectric detector 26 may be of the type described in U.S. Pat. No. 3,411,548 in which a beam of light directed at a portion of the surface of the drum is reflected into a photocell, provided that portion is not wholly or partly covered by coils of thread. It may alter-

natively be of the type disclosed in U.S. Pat. No. 3,455,341, wherein the drum includes an opening or a transparent portion or portions through which, in the absence of turns of thread obscuring it, light can pass from a lamp to a photocell so as to effect continued rotation of the flyer.

An annular member 31, which may have the shape of a cup and which is provided with holes 32 for accommodation of the tubes 5 and 6, is fastened to the stub shaft 8 coaxially thereof and hence of the shaft 3 and drum. The cup 31 thus rotates with the shaft 3 and stub shaft 8. At its right-hand end 33, the cup surrounds the end of the drum 11 adjacent the shaft 3, and more particularly the end or limit 34 of the conical portion 14 of the drum, with however a small clearance indicated at 37 which may amount to a few tenths of a millimeter, according to the diameter of the yarn 7 being wound.

If for any reason the photoelectric mechanism 26 should fail to slow or stop the shaft 3 despite an accumulation of turns of thread on the drum sufficient, according to the intended adjustment of the apparatus, to obstruct sufficiently the passage of light to the photocell so as to actuate the drive to the shaft to a reduced or zero speed, further coils of thread will tend to accumulate on the conical portion 14 of the drum in the immediate vicinity of the drum end 34. The thread is however prevented by the annular member 31 from passing to the left of the drum, in FIG. 1, and hence from forming coils on the shaft 8. The malfunction can therefore be readily corrected.

In the embodiment of FIG. 2 the cup or annular member, indicated at 31*a*, itself includes adjacent the drum 11 a conical portion 36 matching the conical portion 14 of the drum. Between the rotating conical portion 36 of the cup and the stationary conical portion 14 of the drum, there is provided a small clearance 37 which again may be of a few millimeters.

In the embodiment of FIG. 3 the cup, shown at 31*b*, is cylindrical in shape, at the portion thereof adjacent the drum, except that it is provided at its end with a conical bevel as indicated at 38, matching the conical portion 14 of the drum and constituting a continuation thereof, as in the embodiment of FIG. 2.

In the embodiment of FIG. 4 the drum, indicated at 11*a*, is cylindrical, and the cup, 31*c*, includes a conical portion 39 which extends down to the immediate vicinity of the cylindrical surface of the drum. In this embodiment, the drum possesses neither of the conical portions indicated at 14 and 41 in FIG. 1, and the thread is deposited from the flyer tube 5 on the portion 39 of the rotating cup, slipping from that portion directly onto the cylindrical surface of the drum 11*a*. On this cylindrical surface, the turns are shifted to the right by the arrival of new turns.

In the embodiment illustrated in FIG. 5 the drum, indicated at 11*b*, includes a conical portion 41 which however does not serve the function of the conical portion 14 in the embodiments of FIGS. 1–3. Rather, it has a very small cone angle, of the order of 1 to 3°, being shown exaggerated in FIG. 5 for clarity. In the embodiment of FIG. 5 as in that of FIG. 4, the thread emerging from the flyer tube 5 passes first to the conical portion 39 of the cup or annular member 31c. The thread in the turn or partial turn so laid on the surface 39 immediately slips however to the right onto the weakly conical portion 41 of the drum, where succeeding turns shift it to the right as indicated by the arrow 25. The portion 41 constitutes a relaxation cone which reduces the friction involved in slippage of the turns to the right.

FIG. 6 illustrates still another embodiment, in which the drum itself, supported at one end on a shaft 46 to which it is affixed, is caused to rotate by a motor 47 whereas the thread is delivered tangentially to the drum from a location fixed in the housing. A stationary cup 31 is provided at the end of the drum from which it is supported, and fits about the drum with close clearance as in the embodiments previously described.

The invention can be employed with all types of yarn including metallic wires and finds application with other machines in addition to looms.

It will thus be seen that the invention provides thread storage apparatus comprising a body, as indicated at 11 in FIGS. 1–3 and at 11*a*, 11*b* and 11*c* in FIGS. 4, 5 and 6 respectively, having an exterior surface conforming substantially to a surface of revolution. The body is supported from one end thereof, by the shaft 8 and by bearings 43 between it and the shaft 8 in the embodiment of FIG. 1, and by a shaft 46 in FIG. 6 fixed to the body 11*c* of that figure. The apparatus further comprises means to wind a thread onto that body. These means comprise, in the embodiment of FIG. 1 and similarly in the embodiments of FIGS. 2–5, the rotating shaft 3 and thread guide or flyer 5. In the embodiment of FIG. 6 the winding means comprise the motor 47 coupled to the shaft 46 to rotate it. The thread storage apparatus further comprises an annular member surrounding the body with close clearance therefrom as indicated at 31 in FIGS. 1 and 6, at 31*a* and 31*b* in FIGS. 2 and 3, and at 31*c* in FIGS. 4 and 5.

In certain preferred embodiments of the invention the body includes a conical enlargement as indicated for example at 14 in FIGS. 1, 2, 3 and 6, the large end of which is surrounded by the annular member. In the embodiments of the invention illustrated in FIGS. 2 and 3, the annular member includes as indicated at 36 and 38 in those figures respectively, a conical portion adjacent the body which matches the conical enlargement of the body. The conical portion of the annular member, when provided, is advantageously aligned with the winding means as indicated in FIGS. 4 and 5.

In a preferred embodiment as illustrated in FIG. 1, the thread storage apparatus of the invention comprises a frame as there indicated at 1. It further comprises a means such as the shaft 3 and bearings 43 rotatable with respect to that frame and which support the body 11 for rotation with respect to those supporting means. Tube 5, constituting in that embodiment the winding means, and cup 31, constituting in that embodiment the annular member, are both supported on the shaft 3 from which the body 11 is supported via bearings 43, and means such as the magnets 12 and 13 shown in FIG. 1 are provided to restrain the body against rotation with respect to the frame.

While the body has been described hereinabove as having a surface made up of a succession of cylindrical and conical portions, it need not conform geometrically to these requirements. Preferably however it will have an exterior surface conforming substantially to a surface of revolution. More generally, the invention comprehends all modifications of and departures from the embodiments hereinabove described properly falling within the spirit and scope of the appended claims.

I claim:

1. Thread storage apparatus comprising a hollow rotatable shaft, a bearing supporting the shaft for rotation, a body having an exterior surface conforming substantially to a surface of revolution, means supporting said body from one end of said shaft for rotation with respect to said shaft, a flyer arm affixed to said shaft and extending radially and axially thereof into exterior overlapping relation with the surface of said body, means restraining said body against rotation whereby a thread passed through said shaft and out onto said arm will be wound up on said body upon rotation of said shaft and may be pulled off the end of said body remote from said arm, and an annular member affixed to said shaft and surrounding with close clearance the end of said body adjacent the shaft.

2. Apparatus according to claim 1 wherein said clearance is of the same order of magnitude as the diameter of said thread.



3. Apparatus according to claim 1 wherein the close clearance is between 0.1 and 1.0 Millimeter.

4. Apparatus according to claim 1 wherein said body includes a conical enlargement and wherein said annular member surrounds the large end of said enlargement.

5. Apparatus according to claim 1 wherein said body includes a conical enlargement and wherein said member includes adjacent said body a conical portion matching the conical enlargement of said body.

6. Apparatus according to claim 1 wherein said annular member includes adjacent said body a conical portion aligned with said flyer arm.

7. Apparatus according to claim 6 wherein said body includes a conical enlargement with the large end thereof adjacent the small end of said conical portion.

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