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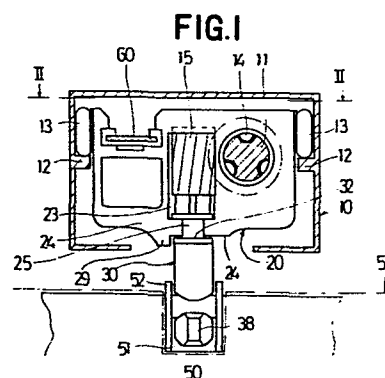
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(54) A vertical blind.

(57) In a vertical blind with a blind head (10), a spline shaft (11) rotatably supported on the head, a number of runners (20) supported for reciprocating movement in the head, holders (30) respectively supported in the runners for pivotal movement and adapted to support a number of slats (50) therefrom, and drive and driven gears (14, 15) each pair mounted in the respective runner for transmitting turning of the spline shaft to the holder, the runner is formed with side and bottom openings (23, 25) connected to each other in a manner that the holder can be mounted in and dismantled from the runner being in the head. The holder has the plug portion (31) thereof fitted in the driven gear, the plug portion being formed with a plurality of radial slots (35) and resiliently expansible as well as collapsible for frictional engagement with and disengagement from the bore in the driven gear.



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A vertical blind

The invention relates to a vertical blind of the type which has a blind head, a number of runners supported for reciprocating movement in the head and a number of holders respectively supported in the runners for pivotal movement and adapted to support a number of slats therefrom.

The vertical blind has a large number of runners serially connected with spacer links and moved along a channel shaped head. A spline shaft extends longitudinally of the head across all the runners and engages each drive gear in the respective runners. A holder is vertically and rotatably supported on each runner and fitted in a driven gear engaging the drive gear. A slat is hanged down from the runner for rotation therewith. The slats are simultaneously rotated with the intervention of the gears in response to turning of the spline shaft. The holder is limited to less than half a turn by stopper means for prevention interference of the adjacent slats.

In the known vertical blind, the holder can not be mounted in and dismounted from the runner unless the runner is removed from the head. This leads to a disadvantage that it is difficult to replace a broken holder for a new one. The holder has a conical plug portion frictionally coupled with a conical bore in the driven gear. Such non-positive coupling is incompetent to rotate the slats by the same angle at the same time and can not prevent diversification among the slats when the spline shaft is suddenly turned to the other direction from one direction in which the coupling is caused to separate by stopper means. The hook portion of the

holder is so shaped that the slat is easily hanged on but hardly taken off from the hook portion for precaution against dropping of the slat in use. However, it results in that replacement of the slat is inconvenient. The spacer link has a front curved end for hitching engagement with the preceeding runner. The front curved end is easy to break and somewhat difficult to be fitted in the preceeding runner, in the case of spacer link made of a synthetic resin material.

The invention as claimed is intended to provide an improved vertical blind, in which the holder with the driven gear is mounted in and dismounted from the runner through a side opening in one of both spaced side walls. The holder has a radially expansible and toothed plug portion adapted to positively engage the toothed bore in the driven gear. The holder has a hook portion with upper and lower jaws forming a mouth, so that a slat is easily put on and off from the hook portion while it is turned about its summit at the top of the mouth. The spacer link has a front solid end, a somewhat C-shaped tail end secured to the respective runner for hitching engagement with the front end of the following link, and a thin and longitudinally slitted intermediate portion, which is easy to narrow and fit in the tail end of the preceeding link.

The advantages offered by the invention are mainly that the holder can be mounted in and dismounted from the runner being in the head, resulting in that a broken holder is replaced with ease. Another advantage is that all the slats in the blind head turn to the same direction at the same time as one without diversification thereamong, even when the spline shaft is suddenly inverted. It is simple to replace the slat because the slat is hanged on as well as removed from the holder with ease. The runners are easily connected through the intermediary of spacer links made of a synthetic resin material.

One way of carrying out the invention is described in detail below with reference to drawings which illustrate only one specific embodiment, in which:-

FIG. 1 is a side elevation partly in section of the relevant part of a vertical blind in accordance with the invention;

FIG. 2 is a section taken along the line II-II of FIG. 1;

FIG. 3 is a section of the runner and the holder of FIG. 1 taken along the line passing through the stopper means;

FIG. 4 is a bottom plan view of the runner;

FIGS. 5 and 6 are vertical sectional and plan views of the worm wheel of FIG. 1;

FIG. 7 is a side elevation, partly in section, of the holder, showing a slat being turned to put on and off from the holder;

FIG. 8 is a section taken along the line VIII-VIII of FIG. 7; and

FIG. 9 is a side section of the spacer link.

The figures show the relevant portion of a vertical blind including a channel shaped head 10, a plurality of runners 20 mounted for movement along the head 10, with each runner having a holder 30 supported thereon for rotation about a vertical axis to rotate a slat 50, which is coaxially put on and vertically suspended from the holder 30. The runner 20 is provided with a pair of side wheels 13 for rolling engagement with side rails 12 in the head 10 and has a worm 14 horizontally rotatably mounted in the runner 20. A spline shaft 11 extends lengthwise of the head 10 across all the runners to insidely engage the worm 14 for rotation therewith. A worm wheel 15 is frictionally coupled with the holder 30 and in mesh with the worm 14 for rotating the respective holder or the slat 50 in response to turning of the spline shaft 11. The runners are connected one after another with the spacer links 60, which interconnect adjacent runners 20 to control spacing therebetween. The

slat 50 is covered with a cloth 53, from which an aperture 51 and both lateral guides 52 are left to view.

As seen in FIGS. 1 to 4, the runner 20 is molded of a synthetic resin material and formed with a top opening 21 in the top wall 22 thereof, a side opening 23 in one of the both spaced side walls 24, and a bottom opening 25 in the bottom wall 26. The top opening 21 is arranged to support the top of the worm wheel 15 and resiliently deformable to permit somewhat slanting insertion of the worm wheel. The side opening 23 is in length and width slightly larger than the worm wheel 15 and permits it to laterally enter the runner 20. The bottom opening 25 consists of an entrance portion 27 directly joined with the side opening 23 and a bearing portion 28 adapted to rotatably support the neck portion 32 of the holder 30. The entrance portion 27 is slightly smaller than the diameter of the neck portion 32 but resiliently expansible to allow it pass by. The bottom wall 26 is formed under the bottom opening 25 with a stopper projection 29 for abutting engagement with the lower collar 34 of the holder 30.

As seen in FIGS. 5 and 6, the worm wheel 15 is molded of a synthetic resin material and shaped in the form of a hollow cylinder with three-forked bottom portion 16. The worm wheel 15 has the outer teeth 17 extending to the top thereof and the inner teeth 18 provided on the surface of the axial bore 19.

As seen in FIGS. 7 and 8, the holder 30 is molded of a synthetic resin material and composed of three plug, neck, and hook portions 31, 32, 33. The plug portion 31 is formed with a long diametrical slot or two radial slots 35 and the outer peripheral teeth 36 so as to be resiliently expansible and positively engageable with the inner teeth 18 of the worm wheel 15 of FIG. 5. The neck portion 32 has an upper collar 43 adapted to receive the bottom portion 16 and a lower collar 34 for abutting engagement with the stopper projection 29 of FIG. 4. The hook portion

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33 includes upper and lower jaws 37, 38 forming a mouth 40 and a throat 39 extending below the lower jaw 38. The lower jaw 38 is formed at the front end thereof with top and bottom angular projections 41, 42, the former being in front of the latter. The thickness of the lower jaw 38, except the front end thereof, is smaller than the length of the aperture 51 in the slat 50 but the thickness of the front end is slightly larger than the length of the aperture. The aperture 51 quite separately rides across the both projections 41, 42 while the slat 50 is turned about the summit thereof touched on the top of the mouth 40.

As seen in FIGS. 1, 2 and 9, the spacer link 60 is molded of a synthetic resin material and shaped in the form of a thin narrow plate having a longitudinal slit 63 except the both ends. The link 60 is formed at the tail end with a somewhat C-shaped gate 61 secured to and protected by the runner 20, and at the front end with a solid knob 62 for hitching engagement with the tail date. The long slit 63 permits the intermediate portion of the link 60 to be narrowed by pinching and fitted in the gate 61 on the preceeding link. The runners 20 are placed in a row at relatively small intervals and serially connected with the spacer links 60, the intermediate portion of which is pinched and fitted in the preceeding gate one after another. The front end is not curved but solid with the knob 62, so that it is strong and endurable enough to hitch and move the runners 20 along the head 10.

During assembly of the blind, the worm wheel 15 is fitted on the plug portion 31 of the holder 30 in a manner that the bottom portion 16 touches the upper collar 43 and that the inner teeth 18 is in mesh with the outer teeth 36 of the plug portion. The worm wheel 15 on the holder 30 is laterally inserted through the side opening 23 into the

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runner 20 and slantingly fitted in the top opening 21. Thereafter, the neck portion 32 is laterally pushed into the bearing portion 28 through the resiliently expansible entrance portion 27 to cause the worm wheel 15 to engage the worm 14. The meshing engagement between worm 14 and worm wheel 15 is achieved with ease because of a combination among the teeth 17 extending to the top of worm wheel 15, the three-forked bottom portion 16 permitting the holder 30 to be bowed, and the resiliently deformable top opening 21. Thus the holder 30 is supported on the runner 20 and rotatable with the intervention of gears 14, 15 in response to turning of the spline shaft 11. It is fairly easy to mount the holder 30 with the driven gear 15 in the runner 20 being set up in the head 10 in the permanent position, even if not so easy as in the runner separated from the head. The holder 30 together with worm wheel 15 is easily removable from the runner 20 in the blind head 10, whenever the holder 30 is turned about the top opening 21 to slip the neck portion 32 out of the bottom opening 25 and then slantingly taken off through the side opening 23 from the runner 20. This means that worm wheel 15 and holder 30, if damaged, can be easily replaced for a new one.

After all the holders have been mounted in the respective runners, the spline shaft 11 is turned somewhat excessively to cause the lower collar 34 of each holder 30 to abut the stopper projection 29 of the runner 20, for the purpose of making all the holders 30 or slats 50 of uniform direction. The slats 50 on the holders 30, once aligned in direction, rotate simultaneously in accordance with turning of the spline shaft 11, since the plug portion 31 of the holder 30 has the outer teeth 36 resiliently pressed on and positively engaged with the inner teeth 18 of the worm wheel 15. While the spline shaft 11 continues to turn after the lower collar 34 has been stopped by the stopper projection 29, the plug portion 31 somewhat collapses and

has the outer teeth 36 disengaged from the inner teeth 18. But, the outer teeth 36 engages the inner teeth 18 immediately after the spline shaft 11 is inversely rotated, so that all the slats 50 always rotate to the uniform direction at the same time. The teeth 18, 36 may be eliminated, in the case of the plug portion of the holder formed with three or more radial slots.

The slat 50 is easily put on and off from the holder 30 by a simple operation, by which it is partly turned about its summit touched on the top or upper rear corner of the mouth 40 in the hook portion 33. As the slat 50 is turned down about the summit at the top of the mouth 40, the upper edge of the aperture 51 firstly rides across the top angular projection 41 and then the lower edge rides across the bottom angular projection 42, thus the slat being mounted on the holder. While it turned up about its summit touched on the top of the mouth 40, the upper edge of the aperture 51 rides across the top projection 41 after the lower edge has ridden across the bottom projection 42. A force required to resiliently ride across the projections 41, 42 is relieved by the help of leverage, so that it takes no difficult to replace the slat 50. The slat 50, once put in the hook portion 33, is prevented from slipping off by the both jaws 37, 38 and maintained in an upright position by the throat 39.

Claims:

1. A vertical blind comprising a blind head (10), a spline shaft (11) extending lengthwise of said head, a plurality of runners (20) mounted in said head for movement therealong and serially connected with spacer links (60), a holder (30) mounted on each of said runners for rotation about a vertical axis, a slat (50) suspended from said holder for rotation therewith, and a pair of drive and driven gears (14, 15) in each of said runners engaging said spline shaft and said holder for turning said slat about the lengthwise axis thereof in response to turning of said spline shaft, characterised in

that said runner (20) is made of a synthetic resin material and formed with a top opening (21) provided in the top wall thereof for bearing the top of said driven gear (15), a side opening (23) provided in one of the both side walls (24) for slanting insertion of said driven gear (15) into said runner, and a bottom opening (25) provided in the bottom wall (26) and joined to said side opening for bearing said holder (30),

that said top opening (21) is resiliently deformable to permit slanting insertion of said driven gear (15),

that said side opening (23) has the width and length thereof larger than those of said driven gear (15) to permit slanting insertion of said driven gear,

that said bottom opening (25) consists of a bearing portion (28) for rotatably supporting said holder (30) and a resiliently expansible entrance portion (27) for lateral insertion of said holder (30) into said bearing portion, and that said bottom wall (26) is formed under said bottom opening (25) with a stopper projection (29) for limiting rotation of said holder (30) to less than half a turn.

2. A vertical blind as claimed in claim 1, in which said driven gear (15) is made of a synthetic resin material and formed with a forked bottom portion to permit bowing of said holder (30) fitted in said driven gear.

3. A vertical blind as claimed in claim 1, in which said holder (30) is made of a synthetic resin material and composed of three plug, neck, and hook portions (31, 32, 33), said plug portion (31) being formed with a plurality of radial slots (35) to be resiliently expansible and collapsible for frictional engagement with and disengagement from said driven gear (15), said neck portion (32) engaging said bottom opening (25) and having upper and lower collars (43, 34), said lower collar (34) engaging said stopper projection (29), said hook portion (33) being shaped in the form of a mouth (40) for hanging engagement with an aperture (51) provided in said slat (50).

4. A vertical blind as claimed in one of claims 1 to 3, in which said driven gear (15) has the inner teeth (18) thereof for positive coupling with the outer teeth (36) provided on said plug portion (31) of said holder (30).

5. A vertical blind as claimed in one of claims 1 to 4, in which said drive and driven wheel comprise a pair of worm and worm wheel (14, 15), said worm wheel (15) being toothed upto the top thereof.

6. A vertical blind as claimed in one of claims 1 to 5, in which said hook portion (33) has upper and lower jaws (37, 38) and a throat (39) forming said mouth (40), said lower jaw (38) being formed at the front end thereof with top and bottom angular projections (41, 42), said top projection (41) being in advance of said bottom projection (42) in a manner that said aperture (51) alternatively rides across the both projections (41, 42) as said slat (60) is turned about the summit thereof positioned at the upper rear corner of said mouth (40).

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7. A vertical blind as claimed in one of claims 1 to 6, in which said spacer link (60) is made of a synthetic resin material and shaped in the form of a generally narrow thin plate having a lengthwise extending slit (63), said link (60) having at the front end thereof a knob (62) and at the tail end a somewhat C-shaped gate (61) fitted in said runner (20) for hitching engagement with said knob of the succeeding spacer link.

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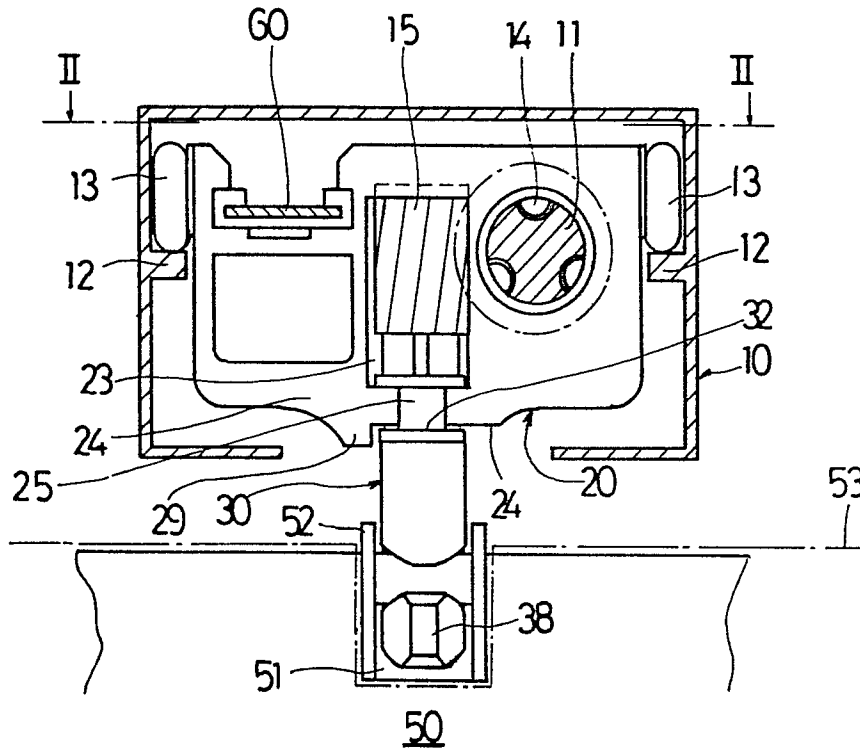
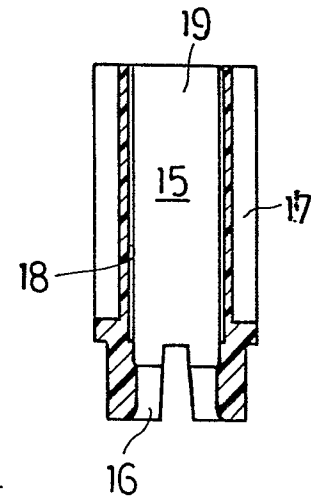
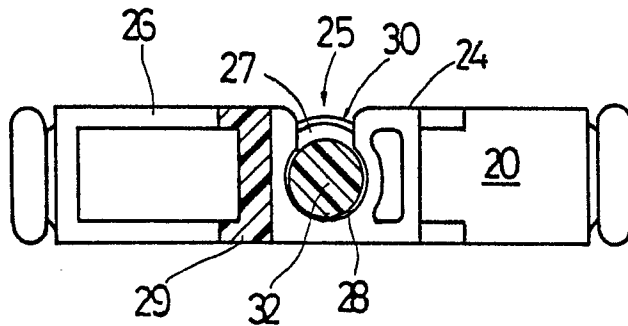
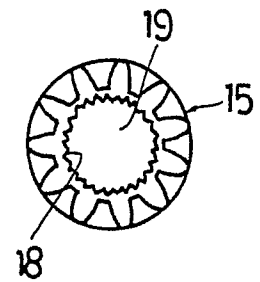
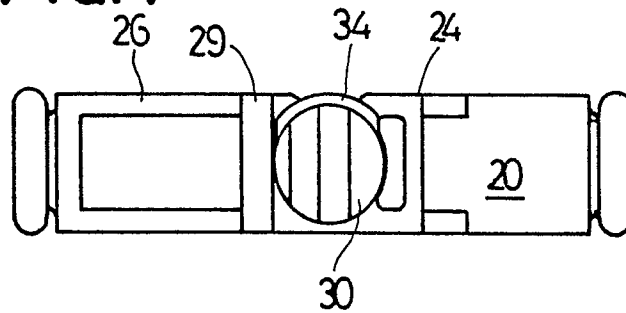
FIG.1**FIG.5****FIG.3****FIG.6****FIG.4**

FIG.2

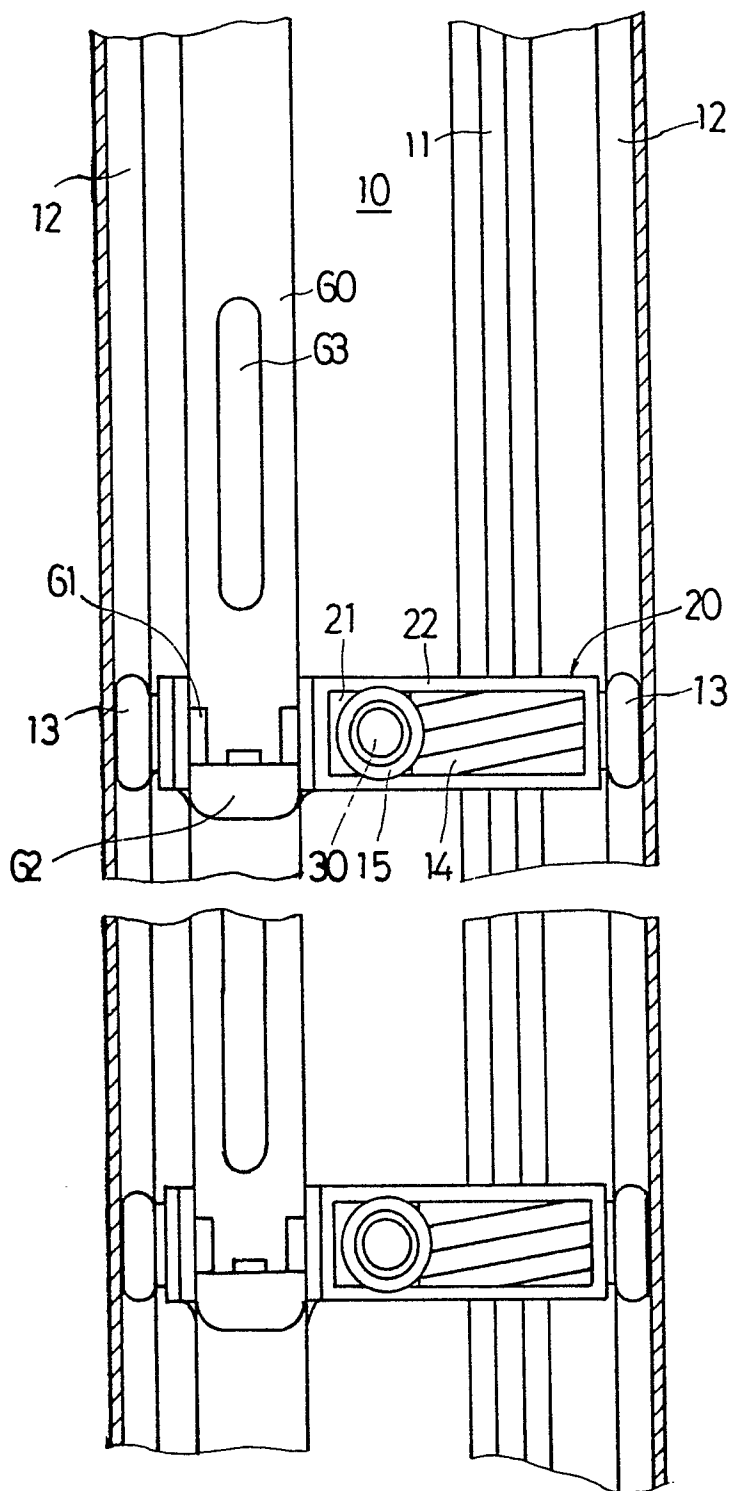


FIG.7

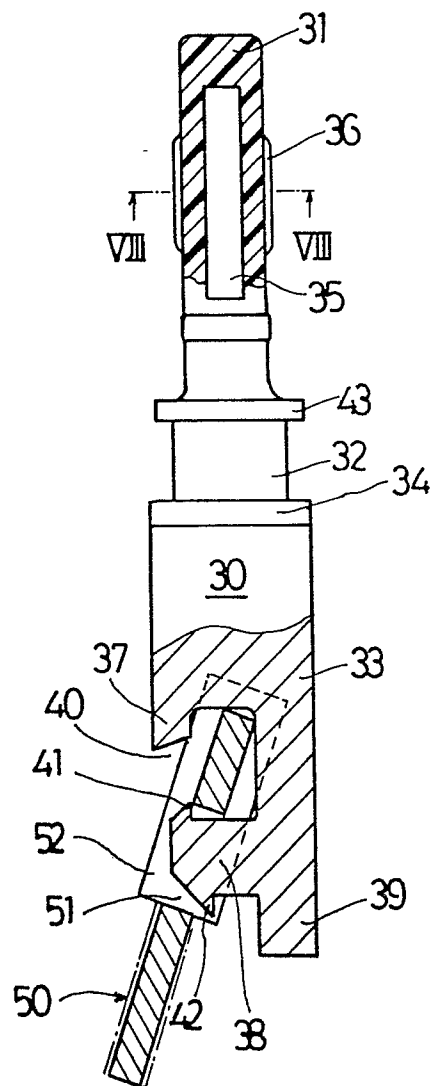


FIG.8

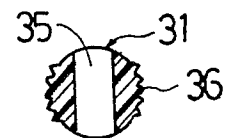


FIG.9

