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Vandenberg et al.

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[54] **SPLINE COUNTING MECHANISM**

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[51] **Int. Cl.**[6] **G06M 1/02**; G06M 1/276

[52] **U.S. Cl.** **377/3**; 377/17; 235/103

[58] **Field of Search** 377/3, 17; 235/103

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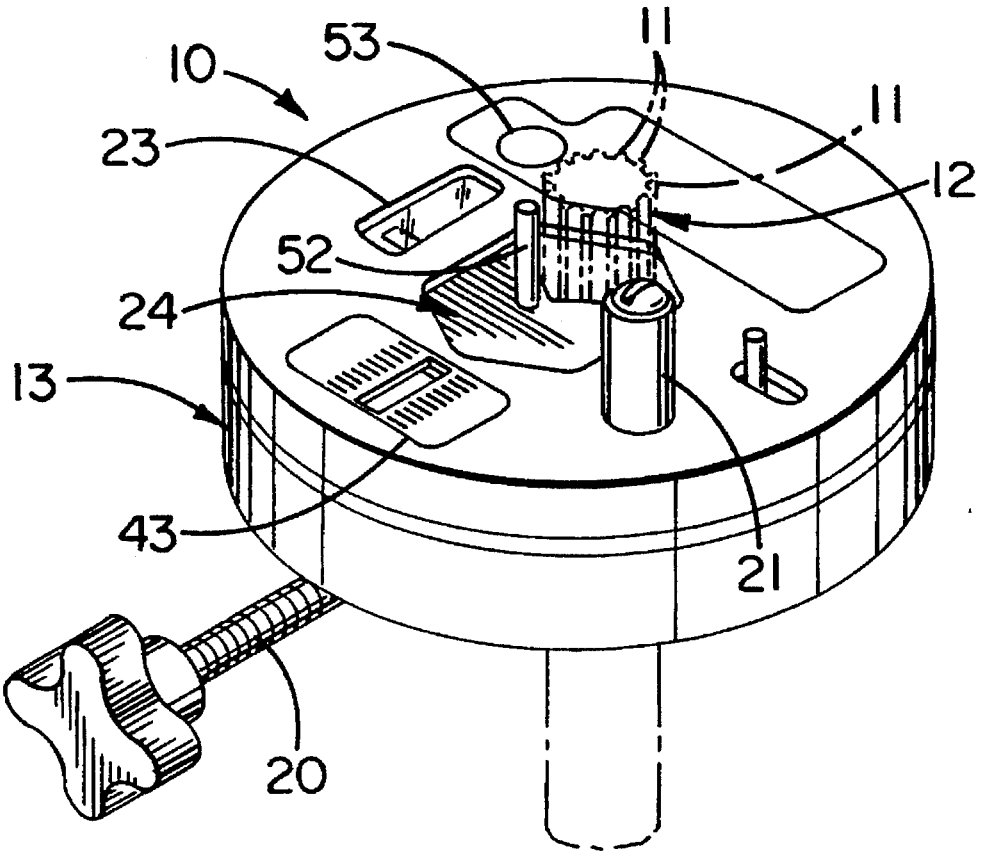
[57] **ABSTRACT**

A spline counting mechanism for determining the number of splines on a shaft. The spline counting mechanism includes a plunger urged into engagement with the shaft and adapted to be rotated with respect to the shaft. The plunger is adapted to engage each spline on the shaft as the plunger is rotated through one revolution and is operable to establish and cut off electrical continuity in an electrical circuit as the plunger rotates into engagement with and then beyond each spline. The mechanism further includes a digital counter for counting and displaying the number of times that electrical continuity is established in the electrical circuit, this number being equal to the number of splines on the shaft.

22 Claims, 4 Drawing Sheets



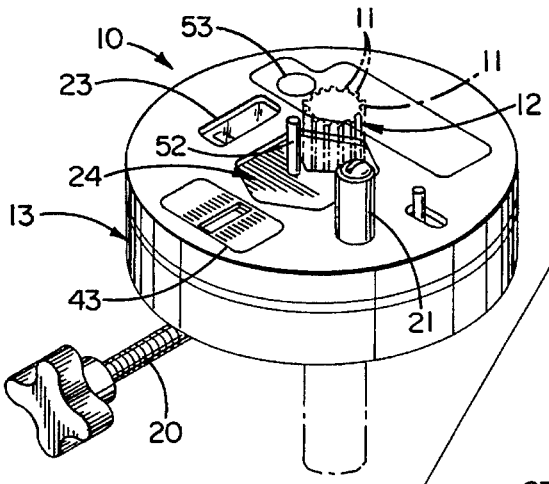

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FIG. 1

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13C
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13A
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FIG. 2

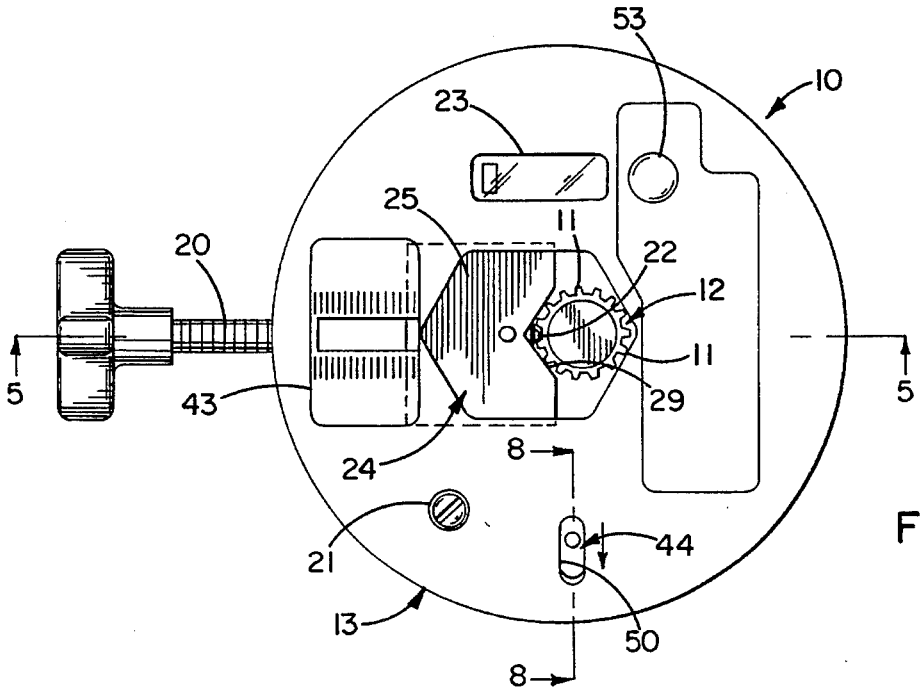

FIG. 3

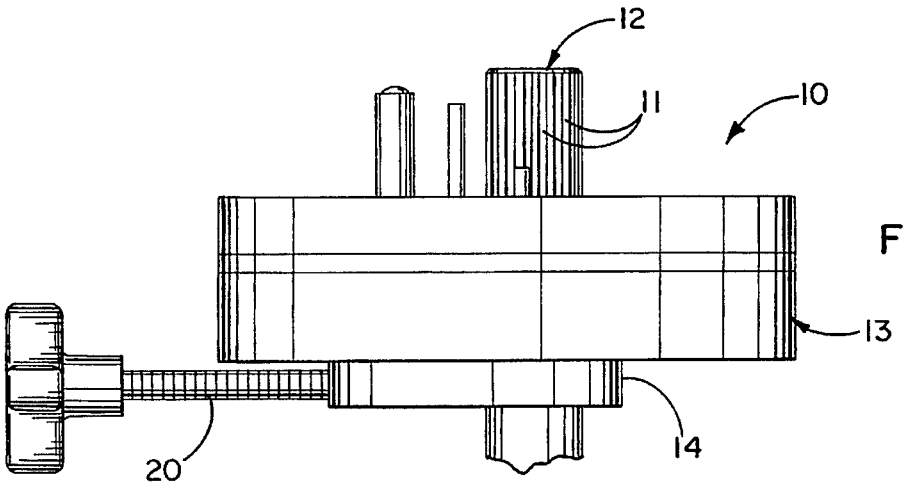

FIG. 4

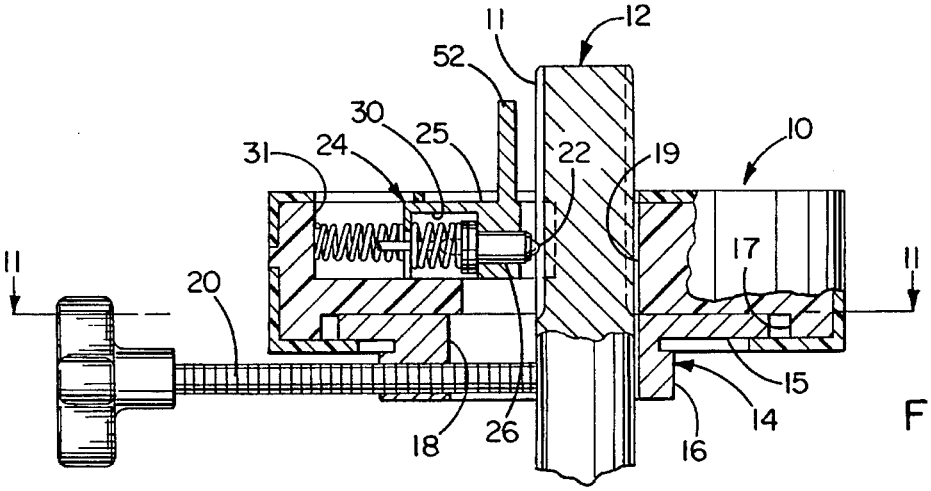

FIG. 5

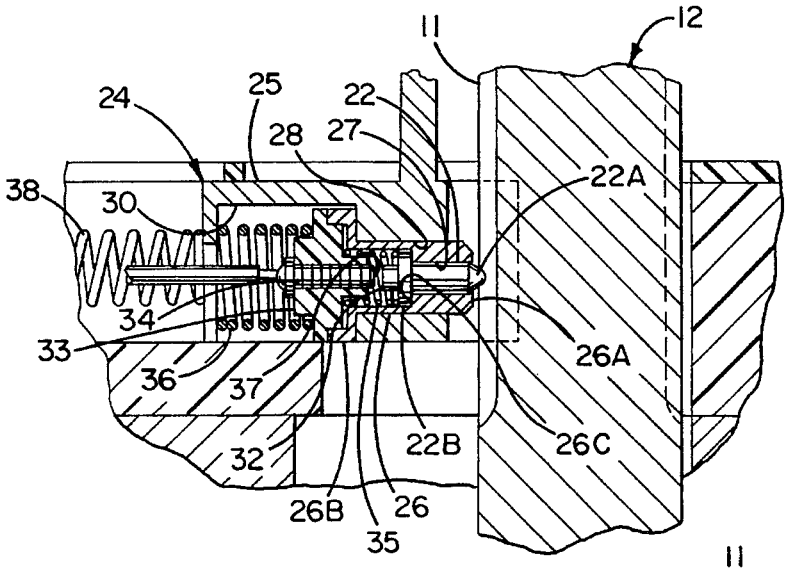

FIG. 6

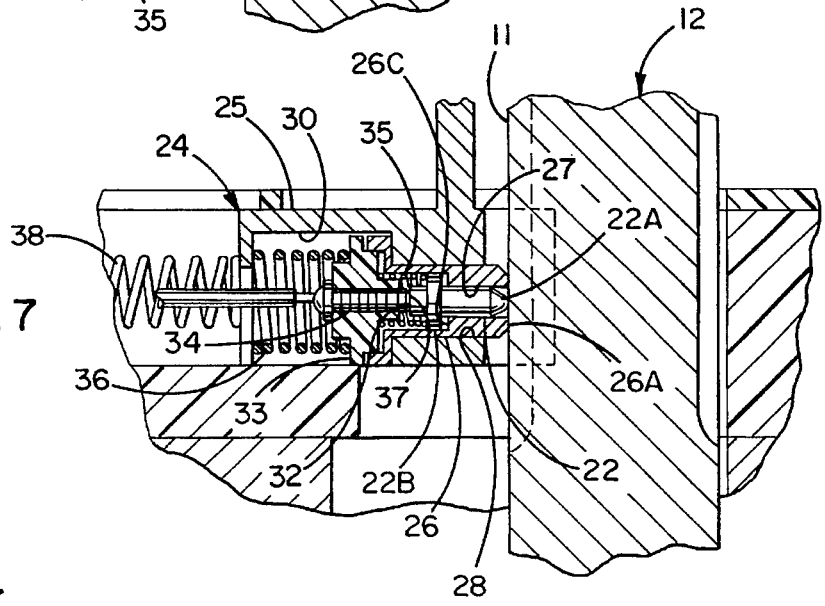

FIG. 7

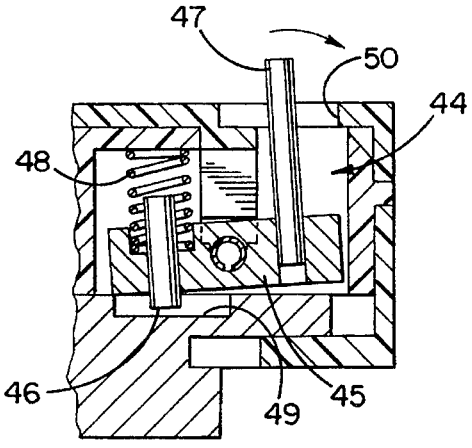

FIG. 8

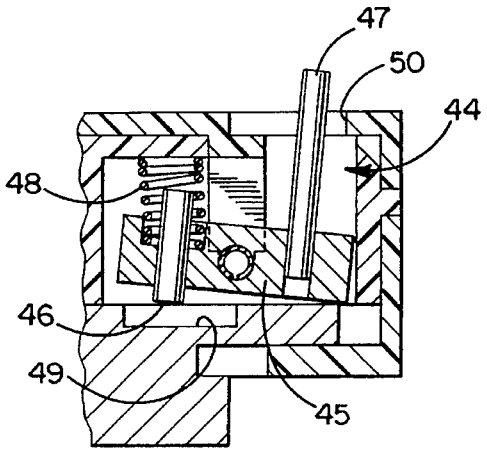

FIG. 9

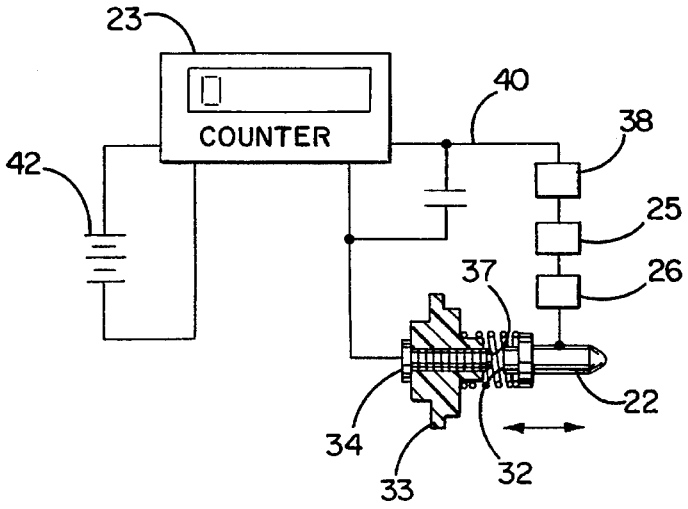

FIG. 10

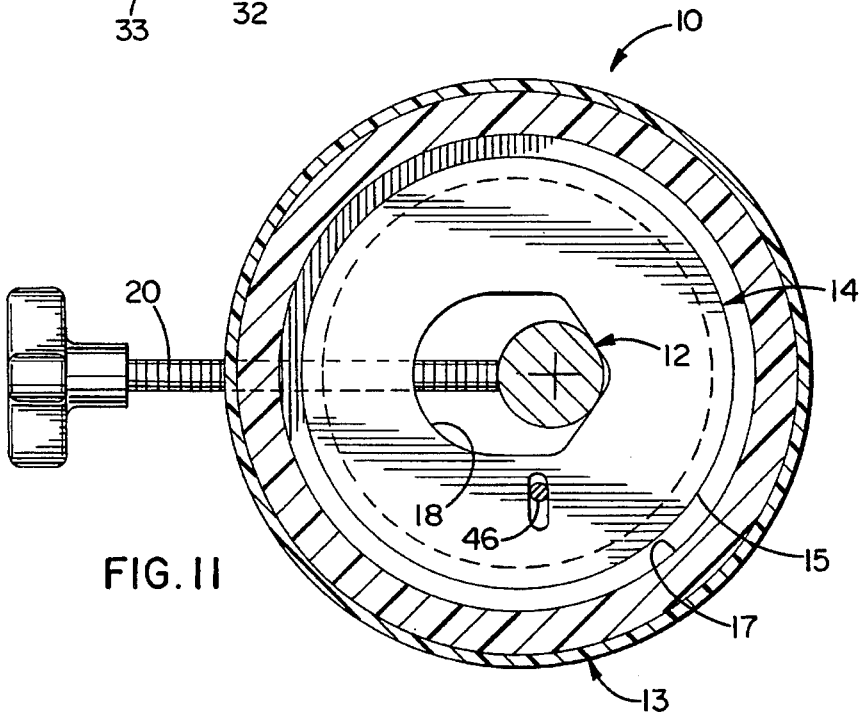

FIG. 11

SPLINE COUNTING MECHANISM

BACKGROUND OF THE INVENTION

This invention relates generally to a mechanism for determining the number of splines on a shaft and, more specifically, to a mechanism which is especially adapted for counting the number of splines on a shaft independently of the major diameter of the splines.

Many types of malfunctioning automotive assemblies such as constant velocity or CV joints are rebuilt or refurbished for subsequent use. The splined shafts used in these assemblies are frequently returned to a rebuild shop without identification regarding the manufacturer or the model of the shaft. One of the first steps in determining the source of the splined shaft is to determine the number of splines on the shaft and the major diameter of the splines. With the aid of a caliper or a micrometer, determining the major diameter of the splines is relatively easy. A spline gage may be used to determine the number of splines on a shaft. However, due to the wide variety of splined shaft designs that may be encountered, purchasing gage tooling for each size of spline that may be encountered is prohibitively expensive. At present, the only economically viable procedure to determine the number of splines on any one of several shafts having differently sized splines is to manually count the splines.

SUMMARY OF THE INVENTION

The general aim of the present invention is to provide a new and improved mechanism which is capable of automatically counting the number of splines on a shaft.

Another related objective of the invention is to provide a spline counting mechanism which is operable on shafts having splines with different major diameters and which visually indicates the major diameter of such splines.

A more detailed objective of the invention is to provide a plunger which engages each spline on the shaft as the spline counting mechanism is rotated through one revolution relative to the shaft and which is operable to establish and then to cut off electrical continuity in an electrical circuit as the plunger is rotated into engagement with and then beyond each spline.

Another more detailed objective of the invention is to provide a digital counter which is operable to count and to display the number of times that electrical continuity is established in the electrical circuit, this number being equal to the number of splines on the shaft.

A related and more detailed objective of the invention is to provide locking means which restricts free rotation of the plunger to one revolution.

These and other objects and advantages of the invention will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of a new and improved spline counting mechanism incorporating the unique features of the present invention and shows a splined shaft secured in the mechanism. FIG. **2** is an exploded perspective view of the spline counting mechanism.

FIG. **3** is a top view of the spline counting mechanism.

FIG. **4** is a side view of the spline counting mechanism.

FIG. **5** is a fragmentary cross-sectional view taken substantially along the line **5—5** of FIG. **3**.

FIG. **6** is an enlarged view of certain parts shown in FIG. **5**.

FIG. **7** is a view similar to FIG. **6** but shows the plunger engaging a spline on the shaft.

FIG. **8** is an enlarged fragmentary cross-sectional view taken substantially along the line **8—8** of FIG. **3**.

FIG. **9** is a view similar to FIG. **8** but shows a locking mechanism in a released position.

FIG. **10** is an electrical schematic of the spline counting mechanism.

FIG. **11** is a cross-sectional view taken substantially along the line **11—11** of FIG. **5**.

While the invention is susceptible of various modifications and alternative constructions, a certain illustrated embodiment hereof has been shown in the drawings and will be described below in detail. It should be understood, however, that there is no intention to limit the invention to the specific form disclosed, but on the contrary, the intention is to cover all modifications, alternative constructions and equivalents falling within the spirit and scope of the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

For purposes of illustration, the present invention is shown in the drawings as embodied in a portable spline counting mechanism **10** (FIG. **1**) which is suitable for determining the number of splines **11** on a shaft **12**.

The spline counting mechanism **10** includes a housing **13** and a base member **14** (FIG. **2**) which is rotatable with respect to the housing. The housing is made by bonding three molded plastic sections **13A**, **13B**, and **13C** together. The base **14** includes a flange **15** (FIG. **5**) which extends radially outwardly from the upper end of a collar **16**. The flange **15** is captured axially by and is capable of rotating in a radially extending groove **17** defined between the lower housing section **13A** and the middle housing section **13B**. Internal components (discussed below) are trapped between the middle housing section **13B** and the upper housing section **13C**.

The shaft **12** is received in an opening **18** in the base **14** and is positioned with at least a portion of the splines **11** extending through an opening **19** in the housing **13**. The shaft is secured in the base by a clamping screw **20** so that the shaft is rotatable with respect to the housing. During normal use of the spline counting mechanism **10**, either the shaft or the housing is held in place and the other is rotated. In the embodiment illustrated, the shaft is securely held in place in, for example, a vise (not shown) and the housing is manually rotated with respect to the shaft. A knob **21** (FIG. **2**) is secured to the housing to facilitate manual rotation of the housing.

In accordance with one aspect of the invention, the spline counting mechanism **10** includes a pickup pin or plunger **22** (FIG. **6**) which slidably engages each spline **11** as the housing **13** is rotated and which is operable to generate and cutoff an electrical signal in an electrical circuit as the plunger engages and is rotated beyond each spline. As a result, the number of splines on the shaft **12** is equal to the number of times that the electrical signal is generated in the electrical circuit. The spline counting mechanism further includes a digital counter **23** which is operable to count and

visually display the number of times the electrical signal is generated so as to indicate the number of splines on the shaft.

More specifically, the spline counting mechanism **10** includes a slider assembly **24** having an aluminum body **25**, a generally cylindrical brass or bronze casing **26**, and the generally cylindrical plunger **22**. The plunger is made from hardened corrosion-resistant steel. The plunger is slidably received in an opening **27** formed in the casing which, in turn, is slidably received in an opening **28** formed in the body. The openings **27** and **28** extend radially with respect to the shaft **12**. As a result, the casing and the plunger are radially moveable with respect to the shaft. The end **22A** of the plunger adjacent the shaft is defined by a rounded tip which is adapted to slide along the profile of each spline **11** as the housing **13** is rotated. The end **26A** (FIG. 7) of the casing adjacent the shaft is formed with a flat surface which is adapted to ride on the crowns of the splines as the housing is rotated.

The body **25** is formed with a V-shaped end **29** (FIG. 3) adjacent the splined portion of the shaft **12**. The opening **28** extends from the end **29** of the body to a cavity **30** (FIG. 6) formed in the body. The body is slidably received in a slot **31** formed in the middle housing section **13B** and is trapped between the middle housing section **13B** and the upper housing section **13C**. The slot extends radially from and is partially defined by the opening **19** in the housing. In this way, the body, and therefore the entire slider assembly, is rotatable with the housing and radially moveable with respect to the shaft.

A flange **26B** (FIG. 6) formed at the end of the casing **26** is located in the cavity **30** and is adapted to engage a sidewall of the cavity so as to restrict movement of the casing toward the shaft **12**. A flange **22B** formed near the end of the plunger **22** is adapted to engage the end **26C** of a counterbore formed in the casing so as to restrict movement of the plunger toward the shaft. As a result, the plunger is slidably retained in the slider assembly **24**. With a shaft **12** installed in the spline counting mechanism **10**, the flanges **26B** and **22B** are normally separated from the cavity sidewall and the end **26C**, respectively. The slider assembly further includes a contact cap **33** made from an electrically insulating plastic. The contact cap is located in the cavity and is adapted to engage the flange **26B** of the casing.

A spring **35** is located. between and engages the contact cap **33** and the plunger **22**. The spring **35** urges the plunger toward the shaft **12** so that the end **22A** of the plunger normally projects beyond the end **26A** of the casing **26**. A second spring **36** engages the contact cap and the backwall of the body **25** and urges the contact cap into engagement with, the casing. In addition, the spring **36** urges the contact cap and the casing toward the shaft so that the end **26A** of the casing normally extends beyond the end **29** of the body **25** and slidably engages the crowns of the splines **11**. At least one and preferably a pair of springs **38** is located in the slot **31**, radially outwardly of the body and engage the body. The springs **38** also engage the backwall of the slot **31** to urge the entire slider assembly **24** toward the shaft **12** and to urge the V-shaped end **29** of the body into engagement with the splined portion of the shaft.

With the foregoing arrangement, the plunger **22** is operable to move radially inwardly and outwardly with respect to the shaft **12** between inner and outer positions, respectively, as the housing **13** is rotated. More specifically, the plunger moves to its inner position when the end **22A** of the plunger is angularly aligned with the root between two adjacent splines **11** (FIG. 6). The spring **35** urges the plunger toward its inner position. The plunger is moved to its outer position when the plunger is in contact with the crown of a spline (FIG. 7). As the plunger is rotated with the housing, a spline engages the end **22A** of the plunger and drives the plunger from its inner position to its outer position as the end of the plunger slides along the spline profile. As the plunger rotates beyond the spline, the spring **35** returns the plunger to its inner position.

The spline counting mechanism is uniquely configured so that the opening **19** in the housing **13** is self-aligning with the opening **18** in the base **14**. The outside diameter of the flange **15** is substantially smaller than the inside diameter of the groove **17** formed in the housing. As a result, the housing is radially moveable with respect to the opening **18** and with respect to the shaft which is held firmly in the opening **18** by the clamping screw **20**. By virtue of the location of the springs **38**, they act on the housing **13** as well as on the body **25**. As the springs **38** drive the V-shaped end **29** of the body into engagement with the splined portion of the shaft **12** in one direction, the springs simultaneously draw the V-shaped end of the opening **19** into engagement with the shaft from the opposite direction. The V-shaped profiles on the body and on the opening **19** aid in aligning the housing with the shaft. As a result, the plunger **22** and the slider assembly **24** automatically align with the splined portion of the shaft independently of the major diameter of the splines **11**. These provisions for automatically aligning the opening **19** in the housing with the shaft also avoid the need for closely toleranced alignment bearings between the base and the housing.

In the preferred embodiment, the body **25**, the casing **26**, the plunger **22**, and one of the springs **38** are electrically conductive and define, in part, one side of the electrical circuit (FIG. **10**). A wire **40** is soldered to one of the springs **38** to establish electrical continuity between the spring and the counter **23**. The springs **38** are seated against the body so that electrical continuity is established between the wire **40** and the body. Electrical continuity is established between the body and the casing by virtue of line-to-line surface contact between the opening **28** and the outside surface of the casing. The first side of the electrical circuit is completed by the line-to-line sliding contact between the opening **27** in the casing and the outside surface of the plunger. The end of the plunger **22** opposite the end **22A** defines an electrical contact surface **32**.

An electrical contact **34** is carried by the electrically insulating contact cap **33** and is aligned with the plunger **22**. A second electrical contact surface **37** is defined on the end of an electrical contact **34** adjacent the contact surface **32**. The second side of the electrical circuit is completed by connecting a second electrical wire **41** between the counter **23** and the contact **34**.

In the preferred embodiment, the two sides of the electrical circuit are normally isolated from each other and an electrical signal is generated when electrical continuity is established between the two sides of the circuit. The two sides of the electrical circuit are normally isolated by the spring **35**, which normally separates the electrical contact surfaces **32** and **37**, and by the contact cap **33** which electrically insulates the contact **34** from the casing **26**. Electrical continuity is established in the electrical circuit when the plunger moves to its outer position so that the first electrical contact surface **32** engages the second electrical contact surface **37**. A battery **42** supplies electrical power to the counter **23** and the electrical circuit. To facilitate portability of the spline counting mechanism **10**, all of the

components in the electric circuit, including the battery, are secured between the middle housing section **13B** and the upper housing section **13C** for rotation with the housing **13**.

With the foregoing arrangement, the plunger **22** is operable to establish and cut off electrical continuity in the electrical circuit as the plunger moves between its outer and inner positions. As the plunger is driven to the outer position by a spline **11**, the plunger overcomes the force of the spring **35** to enable the electrical contact surface **32** to engage the electrical contact surface **37** on the contact **34**. As a result, the plunger establishes electrical continuity in the electrical circuit as the plunger rotates into engagement with each spline. Additionally, as the plunger rotates beyond the spline, the spring **35** returns the plunger to its inner position, separating the electrical contact surfaces and cutting off electrical continuity in the electrical circuit.

In carrying out the invention, the electrical contact surfaces **32** and **37** engage before the crown of a spline **11** becomes fully aligned with the plunger **22**. This arrangement insures that the electrical contact surfaces engage for splines having different heights. During use of the spline counting mechanism, a spline initially drives the plunger against the spring **35** until the electrical contact surfaces engage. However, to avoid damage to the plunger and to the contact **34** as the spline continues to drive the plunger, the second electrical contact surface **37** is moveable by the first electrical contact surface **32**. Specifically, as the spline continues to drive the. plunger outwardly, the plunger separates the contact cap **33** from the flange **26B** of the casing **26** and drives against the spring **36** until the crown of the spline is aligned with the plunger.

Further in carrying out the invention, a locking mechanism **44** (FIG. **8**) normally locks the housing **13** and the shaft **12** in a predetermined relative position to normally prevent rotation of the housing with respect to the shaft. In this way, the housing and the shaft are normally stationary relative to one another. The locking mechanism is operable to permit 360 degrees of uninterrupted rotation, i.e., one revolution, of the housing after the locking mechanism has been released. The locking mechanism automatically re-locks, to prevent further rotation of the housing at the completion of one revolution of the housing, until the mechanism is again released. The locking mechanism includes a rocker arm **45** which is pivotally mounted in the middle housing section **13B**. A locking pin **46** is secured into an opening at one end of the rocker arm and projects downwardly from the rocker arm. An actuating pin **47** is secured into an opening at the opposite end of the rocker arm and projects upwardly through a slot **50** formed in the upper housing section **13C**. A spring **48** normally urges the end of the locking pin **46** downwardly and into a slot **49** formed in the base so that rotation of the housing with respect to the base is normally prevented.

The locking mechanism **44** may be released by pressing downwardly on the actuating pin **47** and then rotating the housing **13**. When the actuating pin is pressed downwardly, the rocker arm **45** pivots against the force of the spring **48** and raises the locking pin **46** out of the slot **49**. At this point, the housing may be freely rotated. After the housing **13** has been rotated a few degrees, the locking pin rotates out of alignment with the slot **49**. The actuating pin may then be released and the locking pin will slide on the upper surface of the base **14** as the housing is rotated. When the locking pin realigns with the slot **49** at the completion of one revolution of the housing, the spring **48** causes the locking pin to drop back into the slot, automatically re-locking the locking mechanism **44** and preventing further rotation of the housing.

With the foregoing arrangement, the spline counting mechanism **10** is operable to automatically count the number of splines **11** on a shaft **12** as the housing **13** is manually rotated through one revolution. As the shaft is installed in the openings **18**, **19**, the slider assembly **24** may be slid outwardly in the slot **31** by pressing outwardly on a post **52** which is secured to the body **25**. The shaft is initially secured in the opening **18** with the plunger **22** located between two adjacent splines (FIG. **6**). In this position, the electrical contact surfaces **32** and **37** are separated. The counter **23** is reset to zero by pressing on a button **53** (FIG. **1**) which is integrally molded in the upper housing section **13C**. The button **53** includes an integrally molded plastic post (not shown) which projects downwardly from the lower surface of the upper housing section **13C** and which engages a reset button **54** (FIG. **2**) on the counter. To determine the number of splines, the locking mechanism **44** is released and the housing is smoothly and continuously rotated until the locking mechanism prevents further rotation. As the housing is rotated through one revolution, the digital counter **23** counts and visually indicates the number of times electrical continuity is established in the electrical circuit, this number being equal to the number of splines on the shaft.

Further in accordance with the present invention, a predetermined distance is maintained between the second electrical contact surface **37** and the crowns of the splines **11** independently of the major diameter of the splines **11** on the shaft **12**. Additionally, the length of the plunger **22** is greater than this predetermined distance. As a result, the spline counting mechanism **10** is operable to determine the number of splines on differently sized splines.

The V-shaped end **29** of the body **25** normally rests against the splined portion of the shaft **12** and the crowns of the splines slidably contact each side of the V-profile. The casing **26** normally projects from the center of the V-shaped end and slidably engages the crowns of the splines **11**. As a result, the position of the casing **26** changes with respect to the body as the major diameter of the splines **11** change. Specifically, as the major diameter increases, the splines engage the sides of the V-shaped end further outwardly from the center. Similarly, as the major diameter decreases, the splines engage the sides of the V-shaped end further inwardly or closer to the center. Alternately stated, the shaft is received further into the V-shape as the major diameter of the splines decreases. Therefore, the casing is driven further inwardly with respect to the body as the major diameter of the splines decreases.

In carrying out the invention, the contact cap **33** is fixed with respect to the casing **26** in the sense that they move radially together as the position of the casing changes relative to the body **25** due to a change in the major diameter of the splines **11**. More specifically, the spring **36** urges the contact cap into engagement with the flange **26B** of the casing and urges the end **26A** of the casing into engagement with the splines, so as to establish a predetermined distance between the second electrical contact surface **37** and the crowns of the splines. Therefore, as the casing position changes with respect to the body, the spring **36** maintains this predetermined distance. As a result, the second electrical contact is automatically positioned with respect to the crowns of the splines. Since the length of the plunger is greater than this predetermined distance, the plunger is operable to establish and cut off electrical continuity in the electrical circuit independently of the major diameter of the splines.

Advantageously, the spline counting mechanism **10**

includes a scale **43** (FIG. **3**) to visually indicate the major diameter of the splines **11** on the shaft **12**. The scale **43** is mounted on the upper surface of the housing **13** adjacent a slot **55** formed in the upper housing section **13C**. The slot **55** is formed parallel with the slot **31** and adjacent the slider assembly **24** so that a portion of the body **25** is visible through the slot **55**. The graduations on the scale are marked so that the major diameter of the splines on the shaft is visually indicated by the marking of the graduation that is aligned with the back surface of the body **25** when the shaft is secured in the spline counting mechanism **10**.

From the foregoing, it will be apparent that the present invention brings to the art a new and improved spline counting mechanism **10** which is capable of automatically counting the number of splines on a shaft as the mechanism is simply rotated through one revolution. By virtue of the unique construction of the slider assembly **24**, the spline counting mechanism is capable of counting the number of splines on a shaft independently of the major diameter of the splines. As a result, splined shafts may be quickly and easily identified and sorted as to the number of splines on the shaft and as to the size of the splines.

We claim:

1. A mechanism for determining the number of splines on a shaft member, said mechanism comprising a housing member, means for rotating one of said members relative to said other member, means for normally locking said one member in a predetermined position with respect to said other member whereby said one member is normally stationary relative to said other member, means for releasing said locking means whereby said one member may be freely rotated through one revolution whereupon said locking means automatically re-locks, means for automatically counting the number of splines on said shaft member as said one member is rotated through one revolution, and means for displaying the number of splines on said shaft member after said one member has rotated through one revolution.

2. A mechanism as recited in claim **1** further comprising means for automatically positioning said counting means with respect to said splines independently of the major diameter of said splines whereby said counting means are operable on differently sized shaft members.

3. A mechanism as recited in claim **2** wherein said positioning means includes a body moveable radially of said splines and having a v-shaped end, said positioning means further comprising a spring for urging said v-shaped end into engagement with said splines.

4. A mechanism as recited in claim **1** wherein said counting means includes means for slidably engaging said splines as said one member is rotated relative to said other member.

5. A mechanism as recited in claim **4** wherein said engaging means comprise a casing and a plunger, said casing and said plunger being moveable with respect to said shaft member, said plunger having a first end operable to engage the crown of each spline as said one member is rotated through one revolution, said casing being normally urged into engagement with the crown of said splines, and wherein said counting means further includes first and second electrical contact surfaces, said first electrical surface being connected to said plunger for movement with said plunger whereby a first predetermined distance is established between said first end and said first electrical contact, said second electrical contact surface being connected to said casing for movement with said casing whereby a second predetermined distance is established between said second electrical contact surface and the crown of said splines, said electrical contact surfaces being operable to engage each time said first end engages a spline, said counting means being operable to count the number of times said electrical contacts engage, and said first predetermined distance being greater than said second predetermined distance whereby said counting means is operable to count splines independently of the major diameter of said splines.

6. A portable mechanism for determining the number of splines on a shaft, said mechanism comprising a housing, means for rotating said housing relative to said shaft, means for normally locking said housing in a predetermined position with respect to said shaft whereby said housing is normally prevented from rotating relative to said shaft, means for releasing said locking means whereby said housing may be freely rotated through one revolution whereupon said locking means automatically re-locks, and means for counting and displaying the number of splines on said shaft as said housing is rotated through one revolution, said counting and displaying means including a battery secured to said housing for rotation with said housing.

7. A mechanism as recited in claim **6** further comprising means for automatically positioning said counting means with respect to said splines independently of the major diameter of said splines whereby said counting means are operable on differently sized shafts.

8. A mechanism for counting the number of angularly spaced splines on a shaft member, said mechanism comprising an electrical circuit, a plunger member, means for urging said plunger member toward said shaft member, said plunger member being movable radially of said shaft member between inner and outer positions, said plunger member being in said inner position when aligned angularly with the root between two adjacent splines and being in said outer position when in contact with the crown of a spline, said plunger member being operable to generate an electrical signal in said circuit when said plunger member is in said outer position and being operable to cut off said electrical signal when said plunger member is in said inner position, means for rotating one of said members with respect to the other of said members whereby each spline engages and drives said plunger member from said inner position to said outer position so as to generate said electrical signal in said electrical circuit as each spline aligns with said plunger member, said urging means causing said plunger member to move from said outer position to said inner position so as to cut off said electrical signal as said plunger aligns with the root between two adjacent splines, means for normally locking said one member in a predetermined position with respect to said other member whereby said one member is normally stationary relative to said other member, means for releasing said locking means whereby said one member may be freely rotated through one revolution whereupon said locking means automatically re-locks, and means for counting and displaying the number of times said electrical signal is established in said circuit whereby the number of times said electrical signal is established as said one member travels through one revolution is equal to the number of splines on said shaft member.

9. A mechanism as recited in claim **8** wherein said plunger member is electrically conductive and said electrical circuit includes said plunger member.

10. A mechanism for counting the number of angularly spaced splines on a shaft, said mechanism comprising a housing, means for rotating said housing with respect to said shaft, a plunger, means for securing said plunger for rotation with said housing while permitting said plunger to be movable radially of said shaft between inner and outer

positions, said plunger being in said inner position when said plunger is located angularly between two adjacent splines and being in said outer position when in contact with the crown of each spline, means for urging said plunger toward said inner position, an electrical circuit having a first electrical contact surface moveable with said plunger and a second electrical contact surface, said electrical contact surfaces engaging to establish electrical continuity in said circuit when said plunger is in said outer position and separating when said plunger is in said inner position, and means for counting and displaying the number of times electrical continuity is established between said electrical contact surfaces whereby the number of times electrical continuity is established as said housing travels through one revolution is equal to the number of splines on said shaft.

11. A mechanism as recited in claim **10** wherein said plunger is electrically conductive and said electrical circuit further includes said plunger.

12. A mechanism as recited in claim **10** further comprising a base having an opening adapted to slidably receive said shaft and having a radially extending flange, and means for securing said shaft in said opening, and wherein said housing is formed with a radially extending groove adapted to receive said flange, said flange being secured in said groove for rotation relative to said housing.

13. A mechanism as recited in claim **10** further comprising means for normally locking said housing in a predetermined position with respect to said shaft whereby said housing is normally prevented from rotating relative to said shaft, and means for releasing said locking means whereby said housing may be freely rotated through one revolution whereupon aid locking means automatically re-locks.

14. A mechanism as recited in claim **13** wherein said base is formed with a second opening, and wherein said restricting means comprise a pin movably secured to said housing, said pin having a first position defined when said pin is partially located in said second opening to prevent rotation of said housing and having a second position defined when said pin is removed from said second opening to permit rotation of said housing, said restricting means further comprising means for urging said pin into said first position for normally preventing rotation of said housing.

15. A mechanism as recited in claim **10** wherein said housing is formed with a slot extending radially from said shaft, wherein said securing means comprise a body slidably received in said slot, said plunger being slidably received in said body, and wherein said urging means comprise a spring urging said body into engagement with the splined portion of said shaft and second means for urging said plunger toward said shaft, said second urging means being located in said body.

16. A mechanism as recited in claim **15** further comprising a scale secured to said housing and having graduations, and wherein said housing further includes a second slot, said second slot being parallel to said first slot and adjacent said body whereby said body is visible through said second slot, the major diameter of said splines being visually indicated by the graduation that aligns with said body when said body is in engagement with said splines.

17. A mechanism as recited in claim **15** wherein said housing is formed with a wall adjacent said shaft, said wall being located oppositely of said body with respect to said shaft, and wherein said spring engages said housing and is located outwardly of said body with respect to said shaft whereby said spring draws said wall into engagement with said shaft as said spring urges said body into engagement with said shaft.

18. A mechanism as recited in claim **10** wherein said urging means comprise a first spring normally separating said electrical contact surfaces, said urging means further comprising a second spring connected to said second electrical contact surface, said second spring urging said first electrical contact surface toward said shaft when said electrical contact surfaces are engaging.

19. A mechanism as recited in claim **18** further comprising a casing engaging said shaft, a contact cap, and means for rotatably securing said casing and said contact cap for rotation with said housing while permitting said casing and said contact cap to move radially of said shaft, said second electrical contact surface being secured to said contact cap, wherein said second spring normally urges said contact cap into engagement with said casing so as to establish a predetermined distance between said second electrical contact surface and the crowns of said splines whereby said contact cap is radially moveable with said casing so as to maintain said predetermined distance independently of the major diameter of said splines.

20. A mechanism as recited in claim **19** wherein the length of said plunger is greater than said predetermined distance.

21. A mechanism for counting the number of angularly spaced splines on a shaft, said mechanism comprising a housing, means for rotating said housing with respect to said shaft, means for normally locking said housing in a predetermined position with respect to said shaft whereby said housing is normally prevented from rotating relative to said shaft, means for releasing said locking means whereby said housing may be freely rotated through one revolution whereupon said locking means automatically re-locks, said housing being formed with a slot extending radially from said shaft, a body slidably located in said slot, said body having an opening extending radially with respect to said shaft and having a backwall formed at the end of said opening to define a cavity internally of said body, a casing slidably received in said opening, said casing having a first end and a flange located in said cavity, said first end extending beyond said body and engaging the crowns of said splines, said casing further having an opening formed in said first end and extending radially of said shaft, a plunger slidably received in said opening in said casing, said plunger having a first end extending beyond said first end of said casing and having a second end, said plunger being movable radially of said shaft between inner and outer positions, said plunger being in said inner position when said first end of said plunger is located angularly between two adjacent splines and being in said outer position when said first end of said plunger is in contact with the crown of a spline, a contact cap located in said cavity, said contact cap having a flange capable of engaging said casing, an electrical circuit having a first electrical contact surface defined at said second end of said plunger and a second electrical contact surface connected to said contact cap, said contact surfaces engaging when said plunger is in said outer position and separating when said plunger is in said inner position, said contact surfaces establishing electrical continuity in said electrical circuit when said contact surfaces engage, a first spring located between and engaging said plunger and said contact cap and normally separating said electrical contact surfaces, said first spring normally urging said plunger toward said inner position whereby each spline drives said plunger to said outer position as the first end of said plunger engages each spline when said housing is rotated, a second spring normally urging said flange of said contact cap into engagement with said casing so as to normally urge said casing toward said shaft and establish a predetermined distance

between said second electrical contact surface and the crowns of said splines independent of the major diameter of said splines, the length of said plunger being greater than said predetermined distance whereby said plunger separates said contact cap from said casing when said plunger is in said outer position, a third spring urging said body into engagement with said shaft, and means for counting and displaying the number of times electrical continuity is established between said electrical contact surfaces whereby the number of times electrical continuity is established as said housing travels through one revolution is equal to the number of splines on said shaft.

22. A mechanism as recited in claim **21** wherein said housing is formed with a wall adjacent said shaft, said wall being located oppositely of said body with respect to said shaft, and wherein said third spring engages said housing and said body and is located outwardly of said body with respect to said shaft whereby said spring further draws said wall into engagement with said shaft.

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