

[54] **METHOD OF JOINING TWO BODIES IN CAPTIVE, INDEPENDENTLY ROTATABLE ASSEMBLY**

- [72] Inventor: **Clemens A. Iten**, Staunton, Va.
 [73] Assignee: **Philip Morris Incorporated**, New York, N.Y.
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Related U.S. Application Data

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 [51] Int. Cl. **B23p 11/00**
 [58] Field of Search **29/437, 443, 511, 149.5, 512, 29/522; 264/242, 310, 312, 249**

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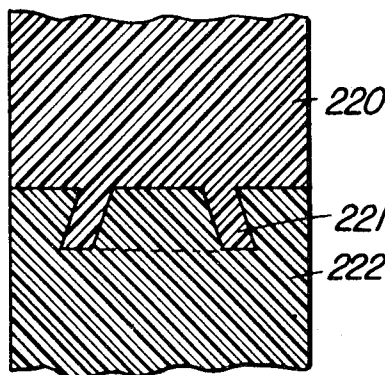
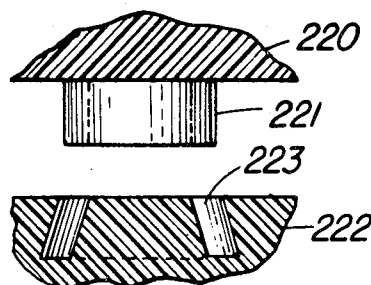
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Primary Examiner—Charlie T. Moon
Attorney—Watson, Leavenworth & Kelton

[57] **ABSTRACT**

A safety razor of the clam shell type in which certain of the several components of the razor are of improved construction lending to reduction in manufacturing and assembling costs of the razor. Thus, spider bar movement for controlling the opening and closing of the cap members is effected by rotating a control knob connected to the bottom of a grip member in captive but independently rotatable movement therewith, the control knob being internally threaded for receiving the threaded lower end of a spindle which is fixedly connected at its upper end with the spider bar, the captive assembly of the control knob with the grip member being effected by plastically deforming a projecting part on the control knob in a undercut groove in the grip member without allowing any adhesion between the two to occur. The spider bar also has a stem which is provided with a pair of lateral shoulders, at least one of which is adapted to abut on the underside of the razor bridge member when the spider bar is raised up to open the cap member thereby providing an upstop means to limit the degree of cap member opening and also to preclude accidental disengagement of the spindle from the control knob.

11 Claims, 19 Drawing Figures



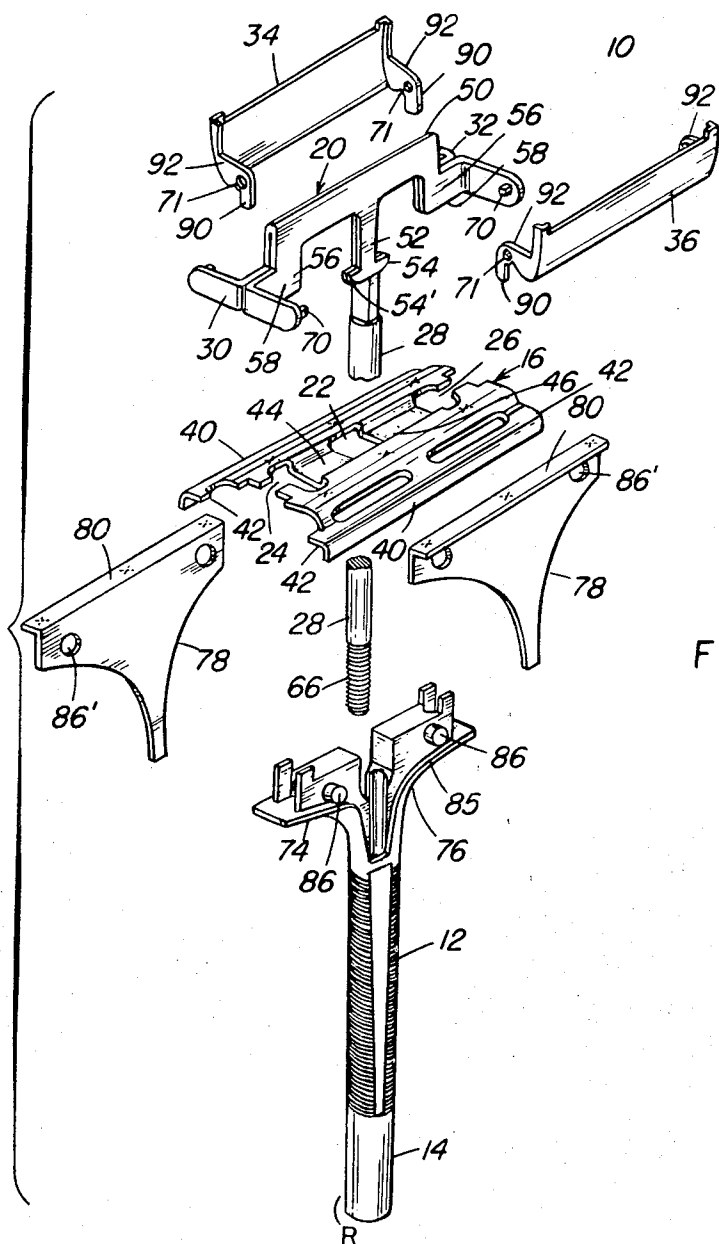


FIG. 1

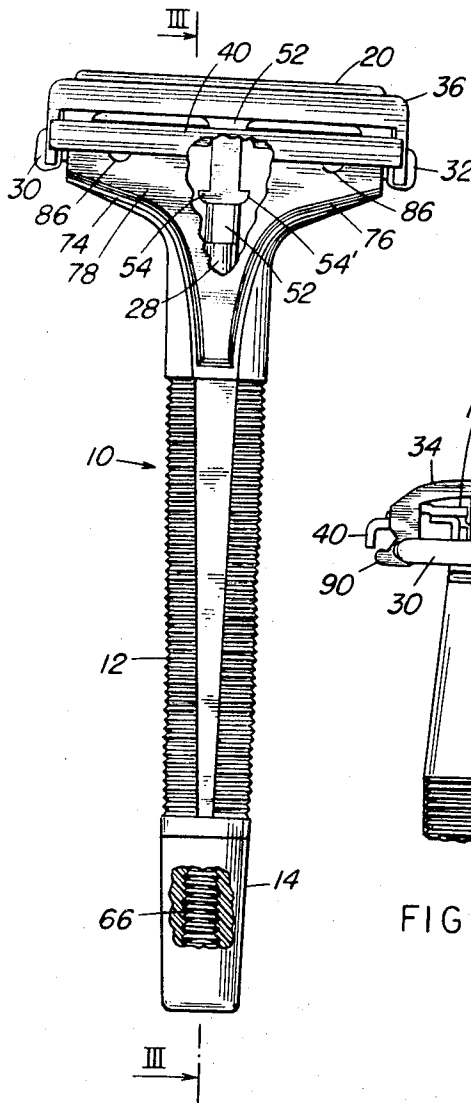


FIG. 2

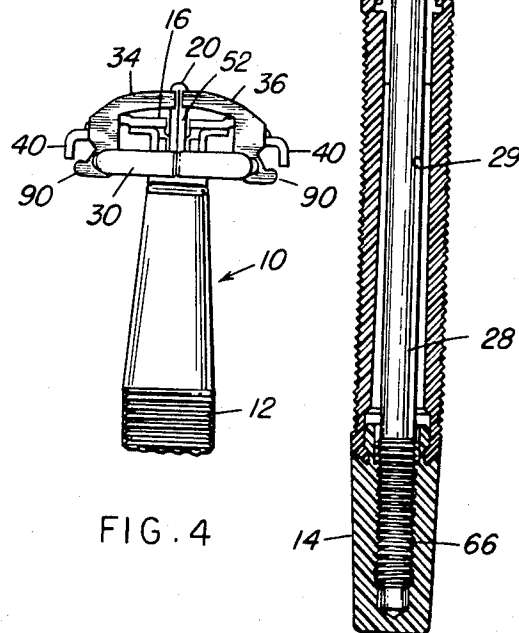


FIG. 4

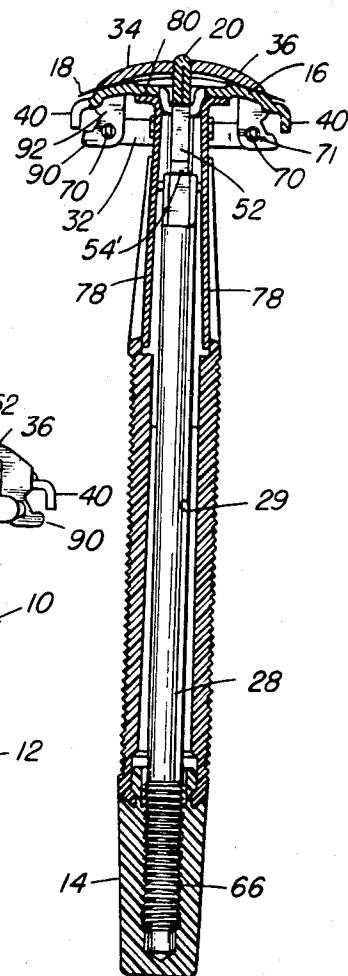


FIG. 3

FIG. 6

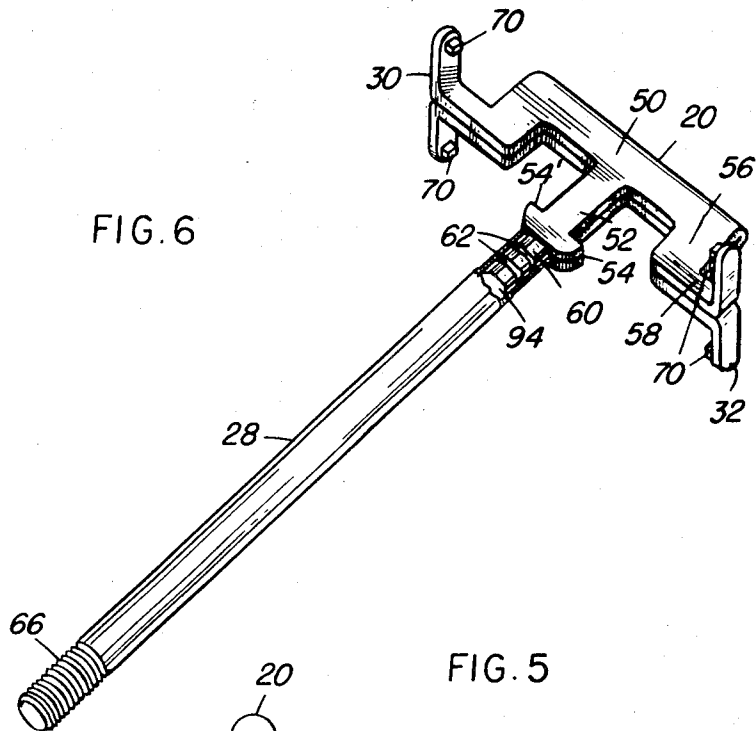
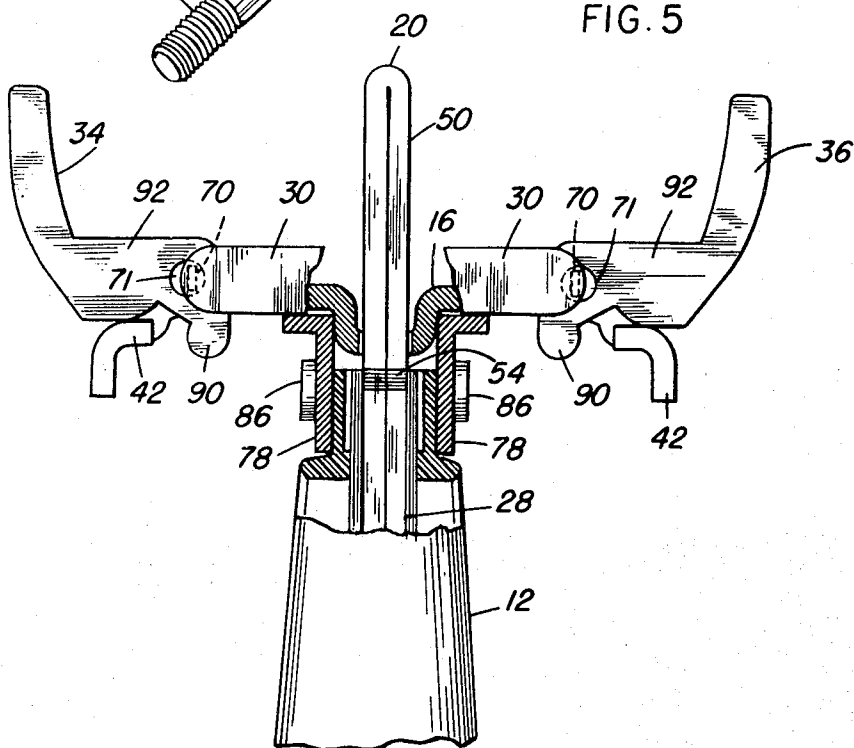
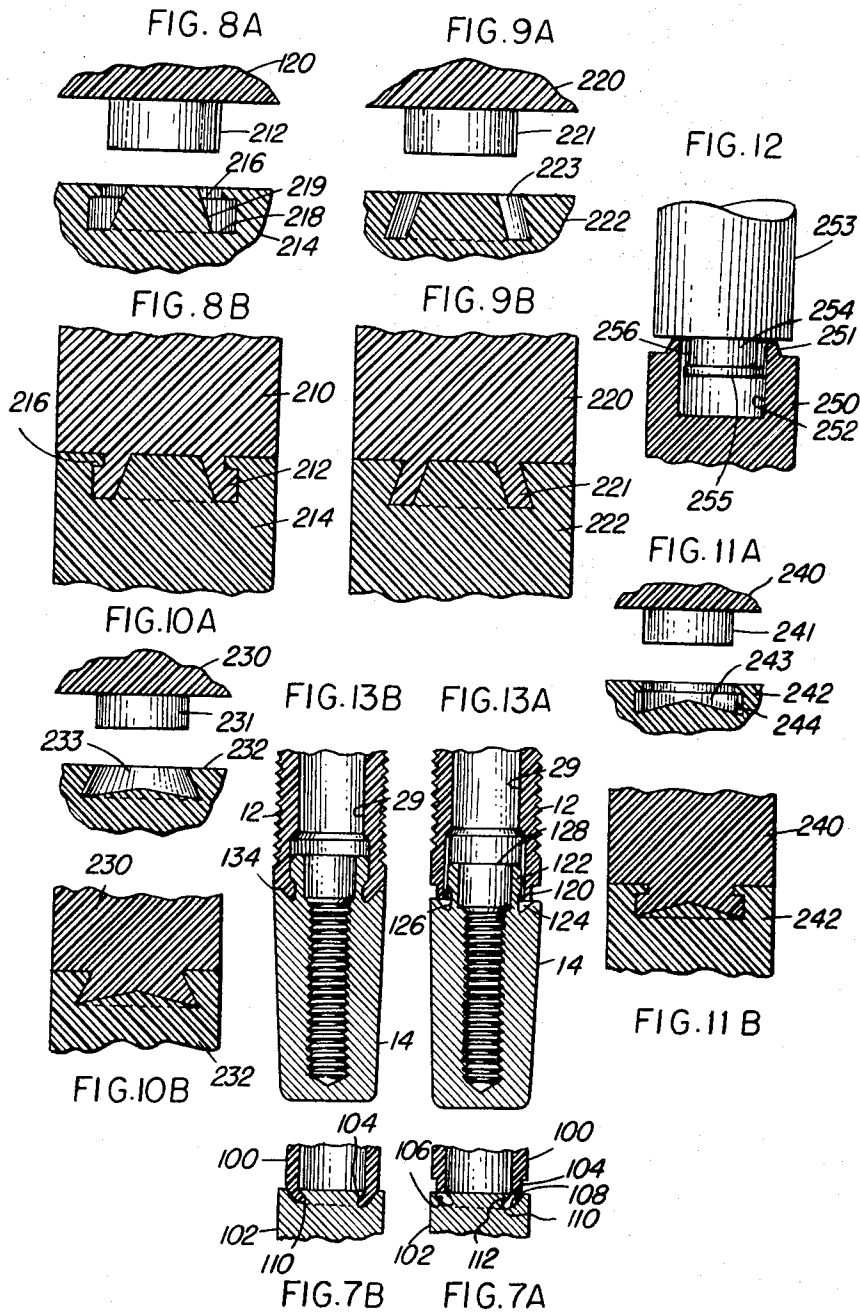


FIG. 5





METHOD OF JOINING TWO BODIES IN CAPTIVE, INDEPENDENTLY ROTATABLE ASSEMBLY

This is a division of application Ser. No. 738,570 filed June 20, 1968, now U.S. Pat. No. 3,541,683.

BACKGROUND OF THE INVENTION

Safety razors of the clam shell type generally include as essential design features, a rotary control element in the form of a cap or nut for axially displacing a spindle to which the spider bar is connected, the axial movement of the spindle being utilized to open and close the cap members of the razor. The cap must be rotatable so that internal screw threads therein can cooperate with an externally threaded part of the spindle received therein to impart axial displacement to the spindle. Furthermore, stop means must be provided to limit spindle travel lest it become disengaged from the cap due to continued excessive rotation of the latter. The foregoing features as found on razors of known construction generally are complicated devices which are expensive to incorporate in the razor and involve special manufacturing and assembling procedures. Illustrative of a razor embodying a relatively complicated spindle upstop is that described in U.S. Pat. No. 1,956,175 wherein a stationary pin is fixed in the barrel of the razor to engage with a slot formed in the spindle. The machining operation necessary to form the slot in the spindle as well as aperturing the barrel to receive the pin is costly and must be done within closely prescribed tolerances if the razor is to function as intended. U.S. Pat. No. 2,900,721 describes use of a stop ring kept on a groove at the end of spindle to limit travel of the latter. Thus several special manufacturing measures are entailed in providing this razor with proper upstop means. In the razor described in U.S. Pat. No. 2,656,599, a knurled head is connected in captive assembly with the handle of the razor by a headed end formed on a nut, an expedient that is expensive and requires special machining and assembling operations. The present invention on the other hand eliminates the foregoing drawbacks in razor design by providing a simplified upstop means in the form of lateral shoulders on the spider stem which engage the underside of the bridge member to limit spindle travel and cap member opening. The joinder of the control knob with the razor grip member for effecting spindle travel by rotating same is provided by a novel joining method involving a plastic deformation of a part of the control knob within an anchorage formed in the grip member.

SUMMARY OF THE INVENTION

The present invention is concerned with an improved clam shell type of safety razor the construction of which is characterized by features which minimize the number of parts thereof and hence reduces manufacturing costs and facilitates assembly operations especially as applicable to mass production manufacturing.

According to a feature of the invention, the control knob which is rotated to open and close the razor cap members as an incident of changing blades, is connected with the grip member in captive but independently rotatable assembly without using separate keeper rings, retainers, flared nuts or like means employed in prior art razor construction. This is provided by forming an annular groove in the control knob which receives an annular skirt on the grip member. Relative rotation is then produced between the two bodies accompanied by applying a force that tends to press the two bodies together to frictionally induce heating of the annular skirt to make it plastic and cause it to invest the annular groove. The force is then released but relative rotation maintained until the now deformed annular skirt solidifies without adhering to the control knob and thus provides the captive but independently rotatable connection.

A further feature of the invention involves providing the spider stem with lateral shoulders which function as upstop means to preclude accidental disengagement of the spindle from the control knob and also to limit the amount of opening

of the cap members. The lateral shoulders are formed integral with the spider stem and at least one shoulder is adapted to engage with the undersurface of the razor bridge member adjacent a central spider stem receiving opening in the bridge member to provide the upstop function. In the prior art, razor upstop means generally involve special machining of either the razor handle or spindle or both to receive upstop pins or like protuberant structure.

According to the invention, fixed connection of the spider with the spindle is provided in a very simple yet effective manner which eliminates the heretofore practiced costly procedure of providing these components with mating holes which were adapted to receive connector pins. This is provided by forming the spider stem with a polygonal outer surface having a number of concentric annular axially spaced grooves formed therein. The upper end of the spindle is bored to receive the stem and after the latter is inserted in the spindle bore, the spindle upper end is swaged to flow the softer material thereof into the concentric grooves and conform it with the external shape of the stem. In this manner axial or rotative movement between the stem and spindle is impossible.

The invention accordingly comprises the features of construction, combination of elements, and arrangement of parts, which will be exemplified in the construction hereinafter set forth and the scope of the invention will be indicated in the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

A fuller understanding of the nature and objects of the invention will be had from the following detailed description taken in conjunction with the accompanying drawings, in which:

FIG. 1 is an exploded view in perspective of a safety razor constructed in accordance with the principles of the present invention.

FIG. 2 is a front elevational view partly in section of the razor in assembled condition.

FIG. 3 is a sectional view as taken along the line III—III in FIG. 2, some parts being shown in full lines and a blade being mounted in the razor.

FIG. 4 is a side elevational view of the upper part of the razor as viewed from the right end in FIG. 2, the cap members being shown in closed position.

FIG. 5 is a vertical sectional view of the upper part of the razor shown in FIG. 4 with the cap members in open position and illustrates the manner in which the spider upstop functions to limit the degree of opening of the cap members and prevent disengagement of the spindle from the control knob.

FIG. 6 is a perspective view illustrating the manner in which the spider is connected to the spindle, the upper part of the spindle having a blind bore which receives the spider stem, the spindle upper part being partly broken away for purposes of clarity.

FIG. 7A is a fragmentary sectional view of two bodies arranged in juxtapositioning with one another preliminary to joining same in captive independently rotatable assembly in accordance with a novel joining method forming part of the present invention.

FIG. 7B is the same as FIG. 7A, except it shows the two bodies after effecting the connection between same.

FIGS. 8A to 11A are fragmentary views of alternate arrangements of two bodies similar to those shown in FIG. 7A preliminary to joining same, the two bodies in the respective views being in spaced juxtaposition.

FIGS. 8B to 11B show the two bodies in FIGS. 8A to 11A, respectively, after joining them in captive, rotative assembly.

FIG. 12 shows a further variation in the forms of bodies which can be joined in captive rotation assembly in accordance with this invention.

FIGS. 13A and 13B correspond respectively with FIGS. 8A and 8B as applied to the joinder in captive independent rota-

tive assembly of the knob and grip member of the razor of the present invention.

Throughout the description like reference numerals are used to denote like parts in the drawings.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The razor of the present invention is of a type commonly referred to in the art as a "clam shell" type, that is, one provided with a pair of pivotable cap members which clamp a double edged razor blade tightly against the blade supporting surface of a bridge member when closed and which open in the manner of a clam shell to provide access for the removal of a used blade and the insertion of a new or clean blade in the razor head.

FIGS. 1 to 3 illustrate the razor 10 of the present invention in an assembled condition and show the several component elements of which the razor is comprised. As will appear, the design of razor 10 is characterized by the improvements in certain of the several components to the end that number of parts are minimized thereby reducing overall razor cost and facilitating razor assembly. The essential components of the razor include grip member 12 which is an elongated hollow cylindrical element, the upper part of which flares outwardly to provide a relatively wide supporting structure for the razor head and the lower end of which is connected in captive but rotatable assembly with control knob 14. The top or head part of the razor, (the shaving part of the razor) includes a bridge member 16 which serves as a platform for receiving a double edge razor blade 18, a blade locating bar or spider 20, which extends through slotted openings 22, 24, 26, formed in the bridge member and upwardly vertically thereof, a spindle 28 connected at its upper end with the spider 20 and extending downwardly into the grip member 12 and threadedly connected with the control knob 14, a pair of cross bars 30, 32 which can be formed integral with the spider 20 at opposite ends as for example in the manner shown in U.S. Pat. No. 2,009,272, and a pair of cap members 34 and 36 pivoted to the cross bars which function in conventional manner to clamp razor blade 18 tightly against the upper surface of bridge member 16 to hold the blade in a shaving position.

By referring to FIG. 1, the constructional features of the aforementioned components can be discerned with greater clarity. Bridge member 16 is an elongated generally rectangular member having an essentially flat body, and has a pair of curved guards or soap bars 40 formed at its longitudinal extremities with each guard including at the ends thereof laterally or transversely intumed lugs 42 provided for purposes as will appear. The center body part of the bridge member 16 is of stepped down structure comprising segments 44 and 46 spaced from each other so as to define central opening 22 which is elongated from the vertical central axis of the razor toward one end of the flat body to a greater extent than toward the other end so as to provide an offset for the purpose which will appear later in the course of the description and which as a consequence renders one segment 44 of slightly lesser longitudinal dimension than the other segment 46. Spider bar 20 is a generally flat upright member and preferably is formed from a single piece of thin strip stainless steel shaped with symmetrical arranged pairs of parts corresponding to those to be described, said single piece being folded over along a central fold line to form the overall profile of the spider. The spider also could be formed as a solid, shaped element as for example by stamping. As will be noted in FIG. 1, the spider 20 includes a main crosspiece or blade locator section 50, a stem 52 depending downwardly from the blade locator section 50, with the stem having a pair of lateral shoulders 54, 54' thereon, the spider further having vertical branches 56 at opposite ends of the blade locator section from whence extend longitudinally legs 58. The lowermost part 60 of the stem as will be noted best in FIG. 6, is of generally octagonal cross section and is provided with a number of axially spaced annular grooves 62. The purpose for forming the stem

of the spider in this manner will be given later in the description. The spider stem 52 extends through the central opening 22 in the bridge member when the razor is assembled and is fixedly connected with the upper part of spindle 28, the spindle extending downwardly in a central bore 29 formed in grip member 12 with the lower end of the spindle being provided with an externally threaded section as at 66. With the razor assembled, the threaded section 66 of the spindle is threadedly connected with the control knob 14, the latter having an internally threaded surface. The purpose of so connecting the spindle 28 with the knob 14 is to provide means for axially displacing the spindle when the knob is rotated and thereby providing for opening and closing of the cap members 34, 36 when it is required to make a blade change.

Extending laterally from and preferably formed integrally with the legs 58 of the spider are cross bars 30 and 32 which extend transversely of the main plane of the spider and which have longitudinally directed pivots 70 formed at the ends thereof, the pivots being directed towards the opposite cross bar and serving to receive the openings 71 in cap members 34 and 36 for rotatably mounting the latter. The cap members are opened when changing blades and when closed, clamp the blade tightly against the bridge member. As was mentioned, the grip member 12 provides supporting structure for receiving the razor head components and at its upper portion is bifurcated having two branch portions 74 and 76, which are of substantially identical shape and arranged in opposed orientation with each other, the branches 74, 76 providing an attaching surface for securing the razor head component assembly to the grip member 12. Physical attachment is effected as may be discerned from FIG. 1, with a pair of side plates 78 corresponding in plan outline with that of the flared or widened upper portion of grip member 12, each plate 78 having an angled top leg 80, the top legs 80 being welded to the undersurface of the bridge member 16 as by tack welding at the locations "X". The side plates 78 when secured to the bridge member are arranged parallel spaced on opposite sides of the longitudinal axis of the bridge member, straddling the central opening 22 therein. The side plates 78 in turn are connected to the branches 74, 76 of the grip member by means of lugs or pins 86 formed integral with the branches and which pass through openings 86' formed in the side plates. For nesting the side plates 78 flush with the outer surface of the grip member, the upper part of the latter is provided with a plate receiving depression as defined by edge flanges 85.

A further understanding of the constructional features of the razor of the present invention will be had from a brief description of the manner in which a blade change is made. As seen in FIG. 3 with the razor in a closed condition the cap members 34, 36 are closed and hold the razor blade 18 down tightly against the upper surface of bridge member 16 in a shaving position wherein the blade is arcuately flexed as shown. The threaded portion 66 of spindle 28 will in this condition locate fully within the internally threaded portion of control knob 14. When it is required to open the razor, i.e., move the cap members to an open position to provide access for removing the old or used blade, the control knob is rotated about its own axis in the direction of rotation indicated by arrow R in FIG. 1. Control knob 14, is, however, captively connected with the grip member 12 so that rotative movement of the control knob will produce axial upward displacement of the spindle 28 and in turn the spider 20 which is rigidly connected therewith. In the course of the upward movement of spider 20 from the position shown in FIGS. 3 and 4 in which position the cap members are in closed position, the cap members initially move upwardly a distance in a movement of translation followed by a movement of rotation of same outwardly of the spider the latter movement being induced by engagement of a cam-like terminal part 90 of legs 92 at each end of the cap members against the undersurface of the intumed lugs 42 on the bridge member 16. In pivoting outwardly, the cap members move from the fully closed position shown in FIGS. 3 and 4 to the fully opened position of FIG. 5. In the

fully opened position of the cap members 34, 36, the terminal parts 90 of the cap legs 92 swing clear of the intumed lugs 42 and an intermediate length of the outer edges of the legs 92 come to rest on the top surfaces of the lugs. A new razor blade 18 is then inserted in the razor in the usual manner with the central slotted portion of the blade being received on the locator portion 50 of the spider. Control knob 14 is then rotated in an opposite direction to close the cap members, the spindle 28 being displaced axially downwardly carrying the spider therewith. In moving downwardly, the spider pulls the cap members downwardly and they pivot inwardly from the FIG. 5 position to the closed position of FIGS. 3 and 4.

The manner in which the spider 20 is connected with the spindle 28 in a fixed manner so as to preclude relative movement therebetween in either an axial direction or in a rotative movement is shown in FIG. 6. As a preliminary, it should be noted that providing fixed connection of the spider and spindle in this type of razor is a known expedient. However, in accordance with known procedures this connection is effected by means of pins which pass through openings formed in the spindle body and the spider stem. This expedient involves exacting manufacturing procedures requiring close tolerances of fit and proper alignment of the holes in the two parts during assembly. The present invention, on the other hand, does away with these exacting requirements. This is done by effecting the connection with a flowing of metal from one part into suitably shaped recesses in the other part. Turning now to a specific designation of this mode of joiner, as was mentioned, the lowermost part 60 of the spider which is preferably made of stainless steel is provided with an externally shaped section of a plurality of intersecting flat surfaces, such as an octagonal configuration so provided to give a surface which when interfitted with a complementary surface is not amenable to rotation with respect to the latter. Lowermost part 60 also has a series of axially spaced serrations or annular grooves 62 formed therein. The upper end of the spindle which is preferably made of a softer metal such as brass, is, on the other hand, provided with a blind axial bore 94 extending some distance downwardly into the spindle body and serving to receive the spider stem lower part 60. In effecting the assembly, the spider stem lower part is inserted in the spindle bore 94 and the upper end of the spindle which encloses bore 94 is subjected to a swaging, crimping or similar metal working procedure causing the softer metal of the upper end of the spindle to flow into the serrations 62. The thus produced connection is such that it is not possible for any relative axial displacement to occur between the two parts. Similarly, the softer material inner surfaces of bore 94 of the spindle upper end are caused in the course of the swaging operation to conform generally complementally to the octagonal configuration of the spider stem lower part 60 and hence produces a connection condition making it also impossible for either part to rotate with respect to the other.

As was mentioned earlier, the spider stem 52 is provided with a pair of lateral shoulders 54, 54' one of which serves as an upstop means functioning when the razor is opened, to prevent the spindle 28 from moving upward axially beyond the point where the threaded section 66 at the bottom thereof becomes disengaged from the internally threaded part of the control knob 14 and also to limit the extent to which the cap members can open. As seen in FIGS. 2 and 3, the lateral shoulders 54, 54' with the razor closed located some distance below the undersurface of bridge member 16. However, when the razor is opened, the spider stem moves upwardly until one shoulder 54 strikes against the undersurface of the bridge member 16 adjacent the central opening 22 in which position the said one abutting shoulder 54 is located as shown in FIG. 5. It will be understood that only one shoulder 54 makes engagement with the undersurface of bridge member 16 since central opening 22 is elongated to an extent beyond the maximum lateral expanse of the other shoulder 54' in the manner earlier described. The spider stem is, however, formed with a pair of shoulders since this eliminates any need for special orientation during manufacture.

As has already been made apparent from the present description, the opening and closing of the razor cap members 34, 36 is controlled by rotating control knob 14 located at the bottom of the razor grip member 12. In a particular embodiment, a rotation of control knob 14 approximately 2% revolution is sufficient to move the cap members between fully opened and closed positions. While control knob 14 is capable of rotation about its own axis, it does not displace axially but rather the spindle 28 moves axially upwardly or downwardly depending on the direction in which the control knob is rotated since the control knob is captively connected with the fixed structure of the grip member. The manner of connecting control knob 14 with the grip member 12 in captive but rotatable assembly is an important feature of the present invention.

Before turning to a specific consideration of the manner in which this connection is effected, reference will be made first to the broader aspects of the connection procedure as it applies generally to connecting a first body to a second body in captive but independently rotatable assembly. It will be understood that this procedure has a wide range of application. For example, the fixed and rotatable parts of castors, rollers, wheels for toys and like devices can be assembled in accordance with the method to be described shortly. As will be apparent from a reading of this description, the advantages of the procedure are many. For example, certain connector parts such as cotter pins, nuts, and the like are eliminated with commensurate cost-saving and precision fit between the mating or joined parts is possible. Moreover, it will be understood that the procedure can be applied to provide seals for obstructing leakage from various types of hydraulic and pneumatic devices as, for example, pump glands. In its broader application, the procedure can be applied for joining together two bodies of various types of materials, one body being of material which is solid at ambient temperatures but amenable to plastic deformation at elevated temperatures. The other body can be of the same or a different material. As will appear the procedure is such that if the bodies are of the same material only one will become plastic in the course of the joiner operation. Representative combinations include joining a plastics body to a metal body, one plastics body to a second body of a dissimilar plastics, a metal body to a metal body, or a plastics body to a ceramic body. As used herein "plastics" means synthetic materials that become plastic (state) upon application of heat thereto and which are capable of being formed to shape under pressure. "Plastic" on the other hand is intended to mean a state or condition created in a body by application of heat thereto and in which condition, shape changes can be effected to the body.

In accordance with the invention, one of the bodies to be joined is provided with a circumambient projecting means such as an annular skirt, a cylindrical boss or a circle of tooth-like projections while the other is provided with a circumambient, laterally projecting anchorage means. The anchorage means may take various forms including an outwardly tapering or inwardly tapering passage, a bored passage having an outwardly formed undercut remote from a surface of the body in which the anchorage means is formed, or other various configurations as appear in the drawings and to be described shortly. The arrangement is such that at least a portion of the projecting means is telescopically interfittable with the anchorage means and when so interfitted, opposed surface contact between the projecting means and surfaces provided in the other body occurs. With the two bodies telescopically interfitted, relative rotation between the two is established as by spinning one body relative to the other in accompaniment with application of force in the direction of the axis of spin to maintain surface contact between the projecting means and the opposed surfaces provided in the other body. This causes sufficient frictionally induced heat to be generated in the projecting means to render at least a portion of it plastic with that portion deforming against and flowing into the anchorage means under the impetus of the axially applied force. The axial force is then discontinued while spin is maintained until the portion of the projecting means which flowed into the

anchorage means solidifies therein without adhering to the anchorage means surfaces. The foregoing can be further understood by reference to FIGS. 7A and 7B which show respectively, two bodies 100 and 102 before and after joining them in captive independently rotatable assembly. One body 100 is formed as a tubular body and has a projecting means in the form of an annular skirt 104 at an end thereof. The other body 102 on the other hand, is provided with an anchorage means formed as a groove 106 formed in a face 108 thereof, the groove being such that at its base end 110 it is laterally projecting and of circumambient character, the anchorage thus being inwardly directed remote from the face 108 of the body relative to the expanse of the groove at said face. The bodies 100, 102 are then juxtaposed as shown in FIG. 7A and the annular skirt 104 of the first body 100 is telescopically interfitted in the annular groove 106 of the second body 102 with the edge face of the skirt 104 in opposed contact with surfaces in groove 106. Relative rotation is then produced between the two bodies either by holding one and spinning the other, or by counter-rotating the two bodies. Concurrent with the creation of relative rotation between the two bodies, a force is applied to at least one body, the force being applied in the direction of the axis about which the relative rotation is occurring and in a manner tending to force the two bodies together. The combination of rapid relative rotation and forcing together of the bodies causes localized, frictionally induced heating of the annular skirt 104. As soon as the annular skirt 104 becomes sufficiently plastic to deform, it flows into and conforms with the configuration of the groove 106 investing the latter. Thereupon, the application of axially directed force is terminated but the relative rotation between the two bodies is continued until the material of the annular skirt now filling groove 106 solidifies sufficiently to prevent any adhesion between it and the material of the anchorage means of the second body 102. The continued spinning helps to dissipate heat and prevent seizure between the two bodies. A suitable lubricant may be applied to the surfaces of groove 106 either before or during the spinning operation to prevent seizure or adhesion of the parts during the time the deformed annular skirt is solidifying. When the annular skirt 104 deforms the material thereof will flow into the annular groove producing a joint as shown in FIG. 7B, with the first body now being capable of rotation about its own axis and relative to the second body but being incapable of moving axially thereof or pulling loose therefrom since the first body is anchored behind the outwardly flaring section of material of the second body at 112. FIGS. 13A and 13B illustrate the manner of effecting a captive but independently rotatable connection of the grip member 12 and control knob 14 of razor 10. As will be noted in FIG. 13A, the lower part of the grip member 12 is provided with an annular skirt 120 serving as a projecting means. The control knob 14 on the other hand has a cylindrical boss 122 which extends outwardly axially from the control knob main body and which has a diameter only slightly less than the internal diameter of the grip member, i.e., several thousands of an inch. The control knob 14 is provided with an annular groove 124 which as will be noted, has a base portion or undercut part 126 which extends inwardly of the outer circumferential surface of the boss 122 thereby providing a shouldered anchorage remote from the outer face 128 of the boss. When either the control knob 14 or the grip member 12 is spun with respect to the other, accompanied by simultaneous application of an axially directed force applied to one tending to force the grip member and control knob together, the plastic material of the annular skirt 120 will deform after sufficient frictionally induced heat is produced therein to render it plastic, and the skirt material will flow into the annular groove anchoring itself in the undercut 126. Relative rotation of the cap and grip member is continued until the deformed skirt solidifies at which point the captive assembly is formed. The character of the joint is such that the end faces of the grip member and control knob locate in close juxtaposition into each other as at 134 having effectively no measurable axial separation therebetween. This is

achieved by sizing the annular skirt 120 on the grip member to have a volume substantially equal to that of the annular groove 124 in control knob 14. As was mentioned earlier, the procedure as it applies to joining bodies of the same material generally results in only one body becoming plastic. Thus the annular skirt 120 having relatively less overall mass is more amenable to becoming plastic during spinning than the control knob 14 which has a greater overall mass resulting in dissipation of the heat therein to preclude its becoming plastic.

FIGS. 8A-8B to 11A-11B show variations in the manner of forming the projecting means and anchorage means in two bodies to be joined according to the invention. Thus, in FIG. 8A one body 210 is provided with a projection means 212 in the form of a hollow tubular boss, whereas the second body 214 is provided with an anchorage means 216 which has an outwardly laterally projecting anchorage as at 218, the groove in which the anchorage means is provided having an inclined inner surface as at 219 against which the tubular projecting means 212 makes contact when one body is spun relative to the other. FIG. 8B shows the two bodies upon completion of the joining operation and it will be noted that the tubular boss 212 has deformed to fully invest the anchorage means with the two bodies being in edge face-to-edge face contact since it is preferable that the tubular boss 212 be sized to have substantially the same volume as the anchorage means 216. FIG. 9A shows a body 220 provided with a projecting means 221 in the form of a tubular boss, whereas the anchorage 223 formed in the second body 222 is made as a tapering groove the taper being outwardly relative to the opening of the anchorage at the face of the body 222. FIG. 9B shows the bodies 220, 222 after they have been joined.

FIG. 10A illustrates the use of a solid cylindrical boss as the projecting means on a first body 230, whereas, the second body 232 is provided with an anchorage means 233 in the form of a counter-bore the base of which is conical.

FIG. 11A shows a body 240 fitted with a cylindrical boss 241 which telescopically interfits with the second body 242 in an anchorage means 243 formed in the latter, the anchorage means having an undercut as at 244. The resultant configuration produced by the joining operation of the two bodies 240, 242 is shown in FIG. 11B.

FIG. 12 shows a further variation wherein a first body 250 is formed with an annular skirt as at 51 as its projecting means and also having a blind bore as at 252. The second body 253 is provided anchorage means in the form of a boss 254 which has flange 255 at the tip end thereof. Thus, the boss 254 and flange 255 together provide the anchorage means 256. When one body is spun relative to the other the annular skirt 251 will become plastic and fill the anchorage means.

In joining two bodies as aforesaid, it is possible that a preheating of one of the bodies be employed as in the case where the body material is a poor heat conductor. Thus in joining together two bodies of certain types of plastics, one body (that having the projecting means) can be preheated in known manner to a temperature just below the plastic state temperature prior to inserting the projecting means in the anchorage means of the other body and causing relative rotation between same.

From the foregoing description it is believed apparent that the razor of the present invention offers a number of important advantages over prior art construction particularly from the standpoint of minimizing the total number of razor parts as well as simplifying the manufacturing and assembling procedures involved with consequent cost savings in the manufacture of the razor.

While there is disclosed but several embodiments of improvements of the safety razor of the present invention, it is possible to produce still other embodiments without departing from the scope of the inventive concept herein disclosed, and accordingly it should be understood that all matter contained in the above description and in the accompanying drawing should be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. A method for joining two bodies in captive, independently rotatable assembly,

one of said bodies having a circumambient laterally projecting anchorage means, the other of said bodies having projecting means at least a portion of which is telescopically interfittable with said anchorage means and being made of a material which is not susceptible to shape deformation at ambient temperatures but amenable to plastic deformation at elevated temperatures,

with one of said bodies being capable of being spun relative to the other with opposed surface contact between said projecting means and surfaces provided by the other of said bodies to develop sufficient heat to render portions of said projecting means plastic for flow against said anchorage means, said method comprising

telescopically interfitting said portion of said projecting means with said anchorage means,

spinning one of said bodies relative to the other while simultaneously applying force in the direction of the axis of spin to said bodies to maintain surface contact between said projecting means and said opposed surfaces provided by said other body thereby to generate sufficient frictionally induced localized heating in said projecting means to render it plastic for flow against and into said anchorage means under the impetus of said axially applied force,

then terminating the application of force to said bodies while continuing to spin said one body until the projecting means rendered plastic rigidifies within said anchorage means whereby non-adherent captive connection of said two bodies is produced.

2. The method of claim 1 further comprising applying lubricant to said anchorage means at least during the time said one body is being spun and force is applied in the direction of the axis of spin.

3. The method of claim 1 wherein one of said bodies is held stationary, and the other is rotated, the force applied to main-

tain opposed surface contact between said projecting means and said anchorage means being applied to said other body along a line of action coincident with the axis about which said other body is being rotated.

5 4. The method of claim 1 wherein at least a portion of said projecting means is heated to a temperature just below its plastic state temperature prior to telescopically interfitting it with said anchorage means.

10 5. The method of claim 1 wherein the anchorage means in said one body is a groove tapering inwardly in said one body from a surface thereof.

6. The method of claim 5 wherein said groove is provided with an inclined surface against which said projecting means deforms when in plastic state.

15 7. The method of claim 1 wherein said anchorage means has a volume substantially equal to that of said projecting means whereby upon being rendered plastic said projecting means completely invests said anchorage means.

20 8. The method of claim 1 wherein the circumambient laterally projecting means on said one body is a groove extending inwardly from a face of said one body, the lateral expanse of said groove at a location remote from said face being substantially different from that of said groove at said face.

25 9. The method of claim 8 wherein said groove extends inwardly in said one body from an annular opening formed in said face.

30 10. The method of claim 9 wherein the projecting means on said other body is an annular skirt projecting outwardly of a face of said other body.

35 11. The method of claim 1 wherein the circumambient laterally projecting means on said one body is a bored passage extending inwardly from a face of said one body, said passage having greater lateral expanse at a location remote from said face than at said face, said projecting means on the said other body being a cylindrical boss.

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