

Aug. 10, 1965

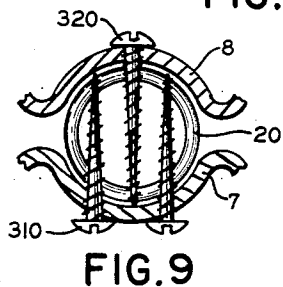
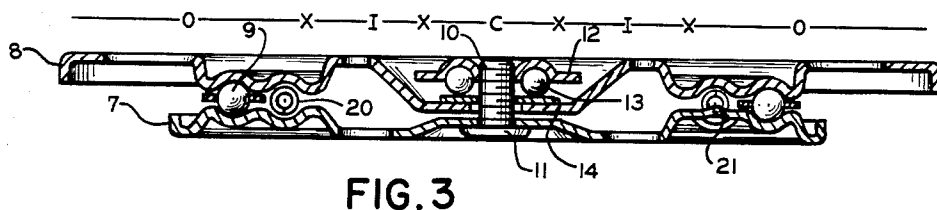
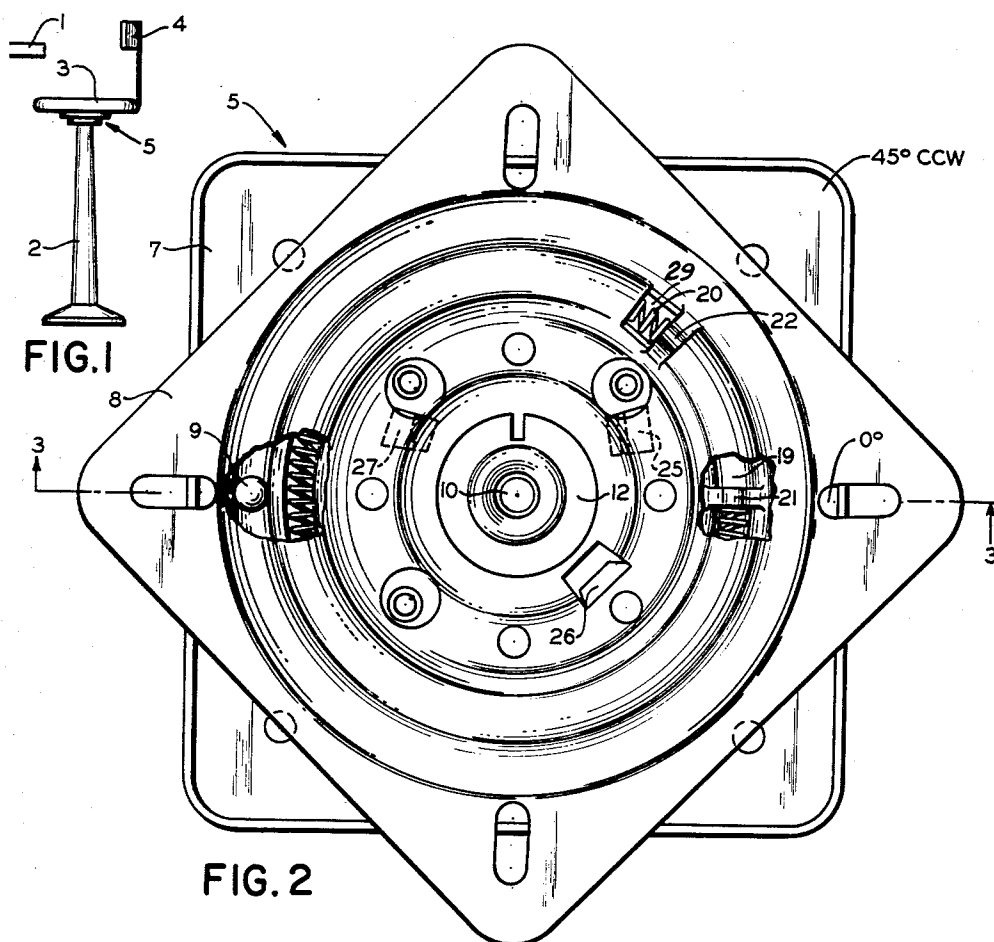
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3,199,826

SELF-RETURN SWIVEL OF OPPOSED PLATE TYPE

Filed Jan. 13, 1964

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

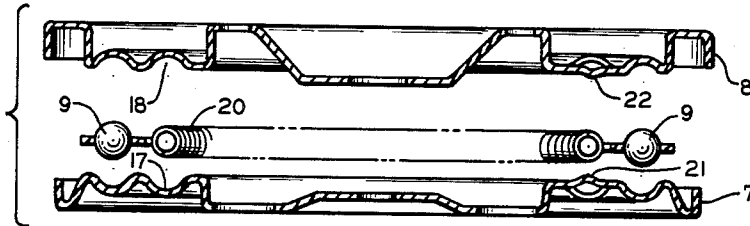


FIG. 4

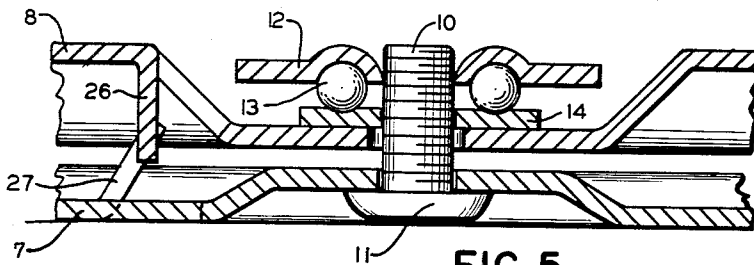


FIG. 5

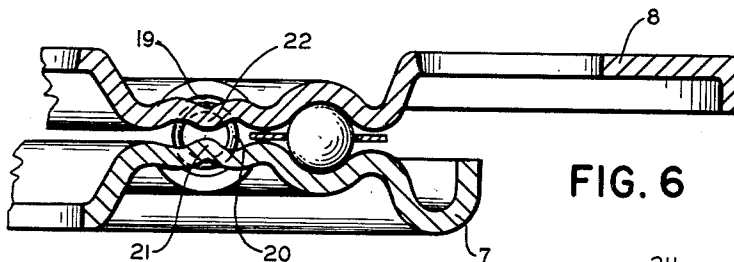


FIG. 6

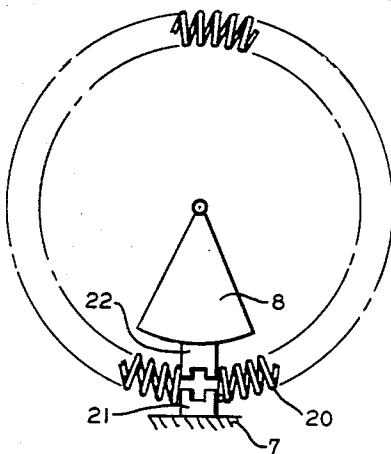


FIG. 7

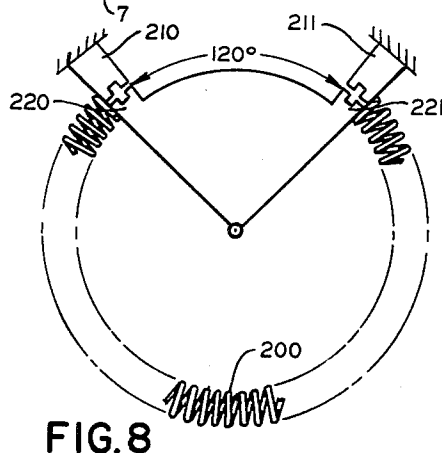


FIG. 8

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SELF-RETURN SWIVEL OF OPPOSED PLATE TYPE
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10 Claims. (Cl. 248—417)

This invention relates to self-return swivels.

Counter stools of the type having a back, i.e., a member providing support for the back of an occupant, are customarily provided with swivels. For various reasons, it is desirable to provide swiveled counter stools with self-return means urging the stool toward, and yieldably holding it in a neutral position. The satisfactory accomplishment of this desideratum has been found difficult in swivels of the opposed plate type, wherein the upper plate is mounted on the lower plate for horizontal rotary movement about a vertical axis and is vertically spaced from the lower plate slightly but sufficiently to provide the clearance required for such horizontal rotary movement.

The principal object of the present invention is, therefore, to provide a highly satisfactory self-return swivel of the opposed plate type.

Other objects are: to provide a self-return swivel of the opposed plate type which is so simply constructed as to render it relatively inexpensive to manufacture and assemble; to provide one which, when assembled, may be easily and quickly installed; to provide one which, when installed, provides a smooth quiet operating action in a sturdy construction requiring relatively little maintenance; and to provide one which, when maintenance is required, may be readily removed and either repaired or replaced at low cost.

A specific object of this invention is to provide a preferred form of self-return swivel of the opposed plate type which utilizes a spring long enough to insure balanced spring pressure in opposite directions in the neutral position and smooth spring pressure in either direction over an operating angle of substantial value, say 90° more or less in each direction.

The foregoing objectives of my invention are simply and fully accomplished in the preferred embodiment of my invention by modifying a swivel of the opposed plate type in the following manner, viz.: (1) providing the inner face of the lower plate with an upwardly-open groove, which extends in a complete circle about said axis; (2) providing the inner face of the upper plate with a corresponding downwardly-open circular groove, which cooperates with the lower groove to form a longitudinal circular passageway; (3) providing the lower plate with a spring-stopping abutment which extends across the lower groove within the confines of the lower plate; (4) providing the upper plate with a spring-compressing abutment, which extends across the upper groove within the confines of the upper plate and which, in the neutral position, is vertically aligned with the lower abutment but vertically spaced therefrom sufficiently to permit the movement of the upper abutment in either direction; and (5) providing the circular passageway formed by these grooves with a helical spring which lengthwise extends the full length of the circular passageway from one side of neutral to the other and which diameter-wise fills both halves of the longitudinal passageway sufficiently to place a substantial portion (a) of its lower half at each end in axial face-to-face relationship with the adjacent axial face of the lower spring-stopping abutment and (b) of its upper half at each end in axial face-to-face relationship with the adjacent axial face of the upper spring-compressing abutment.

In the preferred embodiment, the length of the circular passageway approximates the circumference of a complete circle while the length of the spring is slightly greater so that it must be compressed somewhat in order to be installed within that passageway. With this arrangement, the initial compression of the spring provides a balanced spring pressure in opposite directions in the neutral position of the swivel while its substantial length insures the production of a smooth operating action in each direction over a substantial operating angle of 90° more or less. In other words, a spring 360° long when slightly compressed permits the securement of optimum (or at least highly satisfactory) performance over a seat moving angle of 200° from one extreme limit to the other.

Springs shorter than 360° can be employed with a somewhat proportional sacrifice in performance. This reduction must be kept within practical limits and, when this is done, the sacrifice in performance may be minimized if the ratio of spring length in degrees to the angle of seat movement remains at a value approximating 360°:200° or 1.8:1.0. Nevertheless, while springs shorter than 270° may be used in some cases, they are not recommended for general use.

In the preferred embodiment the lower spring-stopping abutments and the upper spring-stopping abutments lie on opposite sides of a horizontal plane passing centrally through the clearance space between the plates. However, these stop abutments may project through that plane so long as the lower spring-stopping abutments are out of the horizontal rotary path of movement of the upper spring compressing abutments. In any event, it will be appreciated that the use of our invention involves only the simplest of inexpensive changes in the manufacture of the swivel and that these changes do not complicate the manufacture, assembly, operation or maintenance of the construction or otherwise appreciably increase the cost thereof.

The invention is illustrated in the drawings wherein:

FIG. 1 shows a conventional counter stool in its normal relationship to a conventional food-service counter;

FIG. 2 is a top plan view of a self-return swivel made in accordance with our invention, the top plate in this view being rotated 45° counter-clockwise out of its neutral position and being partly broken to show the "self-return" spring and its relationship to the spring-stopping abutment of the lower plate and the spring-compressing abutment of the upper plate;

FIG. 3 is a vertical central section taken along line 3—3 of FIG. 2, this view showing how the lower spring-stopping abutment blocks the lower half of one end of the spring;

FIG. 4 is an exploded view of the swivel as seen in FIG. 3 except that the upper plate is now shown in its neutral position;

FIG. 5 is a fragmentary vertical section taken centrally through the center portion of the swivel to show the relationship of the cooperating upper and lower abutments when the upper plate has been rotated out of its neutral position over an angle of desired maximum value, say 100°;

FIG. 6 is a fragmentary section corresponding to one taken through the swivel along the right end portion of line 3—3 of FIG. 2 when the upper plate is in its neutral position, this view showing the neutral position relationship of the upper spring-compressing abutment and the lower spring-stopping abutment;

FIG. 7 is a somewhat schematic view illustrating the relationship of the spring-stop and spring-compressing abutments to the spring;

FIG. 8 is a schematic view illustrating a modification in a manner similar to that of FIG. 7; and

FIG. 9 is a fragmentary view of a modified arrangement of the spring-stopping and spring-compressing abutments adjacent one or both ends of the spring.

A counter stool is shown in FIG. 1 as it appears when conventionally positioned before a conventional service counter 1. This counter stool conventionally comprises: a pedestal base 2; a seat 3 having a back 4; and a self-return swivel 5 mounting the seat 3 upon the upper end of the pedestal base 2 for limited rotational or angular movement about the vertical axis of the pedestal.

The self-return swivel 5 holds the seat 3 in its neutral position wherein it "faces" the counter 1. An occupant, desiring to occupy the seat, will normally rotate the seat about 90° out of neutral, occupy it and then turn to face the counter 1, during which the occupant normally rotates the seat back to its neutral position. Upon leaving the seat, the occupant will once again rotate it approximately 90° but this time, when the occupant releases the seat, it will automatically return to the neutral position shown.

FIGS. 2-4 show a swivel of the opposed plate type which may be made in accordance with any of the conventional swivel designs such as that disclosed in U. S. Patent No. 3,025,116. The particular swivel plate illustrated is conventional to the extent that it includes: a pair of sheet metal plates; outer annular ball bearing means; and centrally-disposed plate-securing means.

The plates consist of a lower stationary plate 7 and an upper rotary plate 8 assembled in spaced face-to-face relationship. The said stationary lower plate 7 is adapted for firm attachment to said stationary pedestal base 2. The rotary upper plate 8 is adapted for firm attachment to said rotary seat 3. Both plates have (a) aligned center holes with a common vertically extending axis, (b) corresponding relatively-yieldable concentric center portions C located immediately adjacent said center holes, (c) corresponding concentric outer portions O located along the peripheries of the plates and spaced outwardly a substantial distance from said concentric center portions, and (d) corresponding concentric intermediate portions I located between said concentric center and outer portions.

The outer annular ball bearing means 9 is sandwiched between said concentric outer portions O of said spaced plates to facilitate the spacing of said plates and the anti-frictional rotation of the rotary plate relative to the stationary plate about said common vertical axis.

The centrally disposed plate-securing means adjustably secures the plates in assembled relationship for relative rotation about said vertical axis. It includes (1) a stub shaft 10 extending vertically through the center holes of the plate and (2) a pair of clamping members mounted on opposite ends of the shaft for relative adjusting movement toward and away from each other to clamp the yieldable center portions of the plate in assembled relationship with a clamping pressure which may be adjusted in one direction and the other to increase and decrease the force required to produce relative rotation between the plates. The lower end of said adjustable securing means is in the form of an enlarged head 11, which is located at and formed integrally with the lower end of the stub shaft 10. The upper end of said adjustable securing means includes (1) an adjustable clamping nut 12 threaded to the upper end of the stub shaft 10 and (2) a center ball bearing assembly which is interposed between said adjustable clamping nut 12 and the outer face of said concentric center portion of the adjacent upper swivel plate 8 so as to transmit the clamping pressure from said clamping nut 12 to said adjacent plate 8 through rolling bearing engagement and thereby facilitate relative rotation therebetween. The center ball bearing assembly includes a circular series of ball bearings 13, an upper ball bearing race formed on the underside of the adjustable clamping nut 12 and a lower ball bearing race provided by a washer-like member 14 encircling

stub shaft 10 adjacent to but separately fabricated from said upper plate 8.

Stated somewhat specifically, the preferred embodiment of our improved arrangement for urging the rotary upper plate 8 toward and yieldably holding it in a neutral position comprises: groove-providing means; spring-return means; and a stop means. The groove-providing means provides the inner faces of said lower and upper plates with opposed (lower and upper) grooves 17 and 18 co-operatively forming between said plates a longitudinal passageway 19 which extends circularly about said axis.

The spring-return means urges said rotary plate toward, and yieldably holds it in, its neutral position. The spring-return means includes: a spring; spring expansion-stopping means; and spring-compressing means. The spring means is in the form of an elongate helical spring 20 positioned between the inner faces of said plates 7 and 8 arranged to extend longitudinally in and along said circular passageway 19. It has its uppermost and lowermost portions in the upper and lower plate parts of said passageway 19. The spring-expansion-stopping means 21 is mounted on the lower stationary plate and arranged to present a pair of opposite side faces providing stationary lower spring expansion-stopping abutments within the confines of the lower groove 17. One spring expansion-stopping abutment axially faces the lower half of one end of spring 20 and the other axially faces the lower half of the opposite end of spring 20. The spring-compressing means is mounted on the upper rotary plate for movement therewith and arranged to present a pair of opposite side faces providing upper spring-compressing abutments within the confines of the upper groove 18. One spring-compressing abutment axially faces the upper half of said one end of spring 20 and is operative, when said rotary plate is moved in one direction out of its neutral position, to compress said spring against the stationary spring-stopping abutment 21 at the other end of the spring. The other spring-compressing abutment 22 axially faces the upper half of the other end of spring 20 and is operative, when said rotary plate is moved in the opposite direction out of its neutral position, to compress said spring 20 against the stationary spring-stopping abutment 21 at said one end of the spring.

The stop means functions to limit the angular movement of the upper rotary plate 8 in each direction out of its neutral position. It includes a spaced pair of stationary lower abutments 25 and 27 on the lower plate 7 and an upper abutment 26 interposed between lower abutments 25 and 27 and carried by the upper plate 8 in position to engage one lower plate abutment 25 when the upper plate is rotated in one direction to a predetermined extent out of its neutral position and the other lower plate abutment 27 when the upper plate 8 is rotated in the opposite direction a predetermined extent out of its neutral position.

The passageway 19 preferably is located in the outer portion O of the swivel plate in order to maximize its length and thereby permit the use of a long spring 20 as to maximize the operating angle and promote smoothness in the operating action of the swivel. This passageway preferably is located adjacent the circular passageway for the ball bearings 9 so as to avoid clamping the spring 20 between the yieldable plates 7 and 8.

The spring 20 should be longer than the length of the passageway 19 in which it is fitted. The excess length of the spring should be such as to insure a firm balanced pressure which tends to hold the rotary plate yieldably in its neutral position. The magnitude of this excess length may vary, depending upon the other specifications of the spring.

The stationary spring-stopping abutment 21 preferably is located at one side or the other of the stationary plate as distinguished from the front side thereof which would correspond to the front side of the seat 3.

In the construction shown, the movement limiting

abutments 25-27 are located in the intermediate section of the swivel but they may be located wherever they can be accommodated. These abutments may be conventionally formed simply by pressing metal tongues out of each plate. They should, of course, be so located as to prevent the spring 20 from being compressed to an excessive degree. However, the preferred arrangement of FIGS. 2-7, readily accommodates a rotary movement somewhat greater than 100° in one direction but, since 100° is sufficient to meet substantially all of the reasonable rotary movement requirements of self-return swivels, the stops 25-26 and 26-27 are positioned correspondingly. Thus, in FIG. 2, wherein the rotary plate has been rotated 45° counter clockwise, it will be appreciated that it must be rotated in the counter clockwise direction more than an additional 45° in order to engage the counter clockwise stop on the lower plate.

In the preferred form, good results have been obtained with a square 7 $\frac{3}{4}$ " x 7 $\frac{3}{4}$ " x $\frac{7}{8}$ " self-return swivel plate of the character shown; a plate thickness approximating $\frac{1}{8}$ "; a cross-sectional inside diameter of $\frac{3}{8}$ " in the passageways for the ball bearings 9 and for the spring 20; a clearance of .116" between the inner faces of the plates along each side of the passageways for bearings 9 and spring 20; a clearance of $\frac{1}{32}$ " between the stationary spring-stopping and rotary spring-compressing abutments in the neutral position; an oil tempered spring having a diameter of .335" and a relaxed length of 17.75" to 18.0", said spring approximating 7 $\frac{2}{3}$ turns per inch of .054" steel wire; and a spring-accommodating length approximating 15.7" in passageway 19.

In the FIGS. 2-7 construction, the lower plate engages the lower horizontal half of the spring 20 while the upper plate engages the upper horizontal half thereof. This construction is schematically illustrated in FIG. 7, but, for the sake of clarity, FIG. 7 shows the lower plate engaging the inner vertical half. FIG. 7 also portrays the spring-stopping and spring-compressing means 21-22 on each plate as if each of them was somewhat divided to provide two separate abutments, one for clockwise and the other for counter clockwise action. This is done to emphasize the fact that the number and location of the stops on one plate or the other may be varied and this is particularly true where a shorter spring 20 is used.

In accordance with another feature of our invention, access to circular passageway 19 for spring assembly and removal purposes is created by providing one or the other of the swivel plates 7 and 8 with an access opening on the spring engaging side of its spring engaging abutment. Thus, in FIG. 2, the top plate 8 is provided with an opening 29 providing access to the passageway 19 on and adjacent to the counter-clockwise side of its stop 22. A similar opening may be provided on and adjacent to the clockwise side of that stop but, since it is not necessary, it is not shown. With this arrangement, the swivel may be completely assembled in every respect except for the assembly of the spring 20. To complete the assembly in all respects, the spring 20 can be inserted into passageway 19 through access opening 29. Whenever necessary, it may be removed through that opening without dismantling the swivel.

FIG. 8 is a schematic representation similar to FIG. 7 of a modification of the FIG. 2-7 structure. In this modification a spring having a relaxed length approximating 13 $\frac{1}{2}$ " is compressed into a circular passageway (such as 19 of FIGURE 6) which has a spring accommodating length approximating 11.8" and extending over an angle of 270°. If the ratio of spring length in degrees (270°) to the angle of seat movement remains at a value of 1.8:1, then the angle of seat movement will approximate 150°. This angle may, however, be increased to at least 180° and possibly 200°. In FIG. 8, two spring-stopping and two spring-compressing abutments are provided. For example, in the neutral position of the swivel, one spring-stopping abutment 210 is vertically aligned

at one end of the spring 200 with one spring-compressing abutment 220 while the other spring-stopping abutment 211 is vertically aligned at the opposite end of spring 200 with the other spring-compressing abutment 221.

If some idling movement of the FIG. 8 rotary plate can be tolerated, when the swivel is unrestrained, the 90° spacing between the upper or rotary plate abutments 220 and 221 may be reduced. If reduced to 60°, the rotary swivel can swing idly through an angle of 30° without undergoing any spring action. With only one upper abutment, the rotary plate can swing idly through an angle approximating 90°.

In the FIG. 2-7 construction and in the FIG. 8 modification thereof, the spring-stopping abutments remain "within the confines of the lower plate" while the spring-compressing abutments remain "within the confines of the upper plate." In other words, the lower stop 21 (or 210) is spaced below and the upper stop 22 (or 220) is spaced above a horizontal plane centrally disposed between plates. A modification of this arrangement is illustrated in FIG. 9 wherein one plate, preferably the lower plate 7, is provided with a spring-stopping abutment in the form of a screw 310 which projects upwardly through passageway 19 in position to abut one portion of one end face of said spring while the upper plate is similarly provided with one abutment in the form of screw 320 projecting downwardly through passageway 19 in position to abut a different portion of said one end face of said spring. The bottom plate preferably has one set of two screws 310 in order to provide balanced spring engaging action. In the 360° arrangement of FIG. 9, two bottom screws 310 cooperate with one top screw 320 (or vice versa) to provide one set of spring engaging abutments accommodating movement in both directions. Two such sets are necessary for the 270° arrangement of FIG. 8.

While the foregoing type of self-return swivel is admirably suited for use in counter stools, it is equally well suited for use in dinette chairs, lounge chairs and various other products. Its simplicity renders it relatively inexpensive to manufacture, assemble, install and maintain. It provides a sturdy structure having a smooth quiet and dependable operating action which should require relatively little maintenance and which, when maintenance is required, may be readily removed and either repaired or replaced at low cost.

The term "spring-actuating abutment" is intended to be identical in meaning to the term "spring-compressing abutment"; hence may be used interchangeably therewith.

Having described our invention, we claim:

1. In a self-return swivel of the opposed plate type wherein the upper plate is vertically spaced from the lower plate and mounted thereon for horizontal rotary movement about a vertical axis, an improved arrangement for urging the rotary plate toward and yieldably holding it in a neutral position, comprising:

(A) means providing the inner faces of said lower and upper plates with opposed grooves cooperatively forming, between said plates, a longitudinal passageway which extends circularly about said axis; and

(B) means urging said rotary plate toward, and yieldably holding it in its neutral position, said means including

(1) an elongated helical spring extending longitudinally in and along said circular passageway,

(2) spring-stopping means

(a) providing a pair of stationary abutments mounted on the lower stationary plate, one to abut one end of said spring and the other to abut the other end thereof, and

(3) spring-compressing means

(a) providing one actuating abutment, which is stationarily mounted on the upper rotary plate to abut one end of said spring and which is operative, when the upper plate is

- moved one way out of said neutral position, to compress said spring in one direction against said other stationary abutment,
- (b) providing another actuating abutment, which is stationarily mounted on the upper rotary plate to abut the other end of said spring and which is operative when the upper plate is moved the other way out of said neutral position, to compress said spring in the other direction against said one stationary abutment.
2. The improved arrangement of claim 1 wherein:
- (A) each actuating abutment is carried by the upper rotary plate for movement along circular paths which clear the lower stationary abutments.
3. The improved arrangement of claim 2 wherein:
- (A) in the neutral position of said swivel, said spring is partially compressed between said stationary abutments.
4. The improved arrangement of claim 3 wherein:
- (A) one of said swivel plates has an access opening to facilitate the insertion and removal of said spring,
- (1) said access opening being located adjacent one end of said spring when the swivel is in its neutral position.
5. A self-return swivel of the opposed plate type, comprising:
- (A) a lower horizontal stationary plate;
- (B) an upper horizontal rotary plate;
- (C) means rotationally mounting said upper plate on, and in vertically spaced relationship relative to said lower plate for limited horizontal rotary movement about a vertical axis of rotation in either direction out of a neutral position;
- (D) means providing the inner faces of said lower and upper plates with opposed grooves cooperatively forming between them a longitudinal passageway which extends circularly about said axis; and
- (E) means urging said rotary plate toward, and yieldably holding it in, its neutral position, said means including
- (1) an elongate helical spring extending longitudinally in and along said circular passageway,
- (2) spring-stopping means
- (a) providing a pair of stationary abutments mounted on the lower stationary plate,
- (1) one abutting the lower half of one end of said spring and
- (2) the other abutting the lower half of the other end of said spring, and
- (3) spring-compressing means
- (a) providing a pair of actuating abutments mounted on the upper rotary plate for movement therewith,
- (1) one abutting the upper half of said one end of said spring and being operative, when said rotary plate is moved in one direction out of its neutral position, to compress said spring against said other stationary spring-stop abutment, and
- (2) the other abutting the upper half of said other end of said spring and being operative, when said rotary plate is moved in the other direction out of its neutral position, to compress said spring against said one stationary spring-stop abutment.
6. The swivel of claim 5 wherein:
- (A) in the neutral position of said swivel, said spring is partially compressed between said stationary abutments; and

- (B) one of said swivel plates has an access opening for the insertion and removal of said spring,
- (1) said access opening being located adjacent one end of said spring when the swivel is in its neutral position.
7. The swivel of claim 6 wherein:
- (A) said spring-stopping means on the lower plate is located at the neutral position of said swivel; and
- (B) when said upper plate is in its neutral position, said spring extends continuously approximately 360° from one side of said spring-stopping means to the other side thereof.
8. The swivel of claim 7 wherein:
- (A) when said upper plate is in its neutral position, said spring-compressing means is vertically aligned with and vertically spaced from said spring-stopping means.
9. A self-return swivel of the opposed plate type having an elongate helical spring for urging the rotary plate toward and yieldably holding it in a neutral position, comprising:
- (A) a lower horizontal stationary plate;
- (B) an upper horizontal rotary plate;
- (C) means rotationally mounting said upper plate on, and in vertically spaced relationship relative to said lower plate for limited horizontal rotary movement about a vertical axis of rotation in either direction out of a neutral position;
- (D) means providing the inner faces of said lower and upper plates with opposed grooves cooperatively forming between them a longitudinal passageway which extends circularly about said axis;
- (E) spring-stopping means
- (1) providing a pair of stationary abutments mounted on the lower stationary plate,
- (a) one to abut the lower half of one end of a spring in said passageway, and
- (b) the other to abut the lower half of the other end of said spring; and
- (F) spring-compressing means
- (1) providing a pair of actuating abutments mounted on the upper rotary plate for movement therewith,
- (a) one to abut the upper half of said one end of a spring in said passageway and being operative, when said rotary plate is moved in one direction out of its neutral position, to compress said spring against said other stationary spring-stop abutment, and
- (b) the other to abut the upper half of the other end of a spring in said passageway and being operative, when said rotary plate is moved in the other direction out of its neutral position, to compress said spring against said one stationary spring-stop abutment.
10. The swivel of claim 9 wherein:
- (A) one of said swivel plates has an access opening to facilitate the insertion and removal of said spring,
- (1) said access opening being located adjacent one end of said passageway when the swivel is in its neutral position.

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