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PISTON SPRING RETURN ASSEMBLY FOR AUTOMATIC TRANSMISSION

Abstract

A spring assembly for the clutch of an automatic transmission includes a plurality of springs residing between upper and lower retaining rings which are secured together with a plurality of fasteners. The spring assembly is compressed against the force of the springs when the clutch piston is applied to engage the clutch, and then expanded when the clutch piston is released to disengage the clutch. The fasteners of the spring assembly eliminate radial movement of the rings relative to one another and control the axial movement of either of the upper and lower spring retaining rings.

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Background/Summary

TECHNICAL FIELD

[0001] The invention is directed toward a spring retainer assembly for use with a clutch piston of an automatic transmission.

BACKGROUND

[0002] Conventional automatic transmissions have a clutch which can be engaged and disengaged. A clutch piston moves between the released position wherein the clutch is disengaged and an applied position when the clutch is engaged. A spring assembly surrounding the clutch hub urges the piston to the released position. The factory install spring assembly is retained on the clutch hub by a snap ring. These OEM spring assemblies have upper and lower rings with springs sandwiched between the rings. The upper and lower rings have alternating tabs extending into the springs to prevent rotation of the rings about their central axis. However, the OEM spring assembly does not have any structure to hold the snap ring in place, which sometimes leads to the snap ring popping out. There are aftermarket parts for the factory spring assembly, which is a top ring with a shoulder to retain the snap ring. But these aftermarket upper rings do not have tabs to prevent turning of the rings, which leads to roll over of the springs, which can lead to the clutch failing to properly disengage due to lack of sufficient spring biasing force.

[0003] Accordingly, a primary objective of the present invention is the provision of an improved spring retainer assembly for the clutch of an automatic transmission with overcomes the problems of the prior art.

[0004] A further objective of the present invention is the provision of a spring retainer assembly for an automatic transmission clutch, wherein the upper and lower rings of the assembly are bolted together to prevent rotation of the rings relative to one another.

[0005] Another objective of the present invention is the provision of a spring retainer assembly which includes upper and lower rings with recesses to receive and hold the opposite ends of the springs.

[0006] A further objective of the present invention is the provision of a spring retainer assembly for a transmission clutch wherein the springs are held in place without internal structures.

[0007] Yet another objective of the present invention is the provision of an automatic transmission having a clutch with an improved spring assembly to return the clutch to a disengaged state.

[0008] These and/or other objects, features, advantages, aspects, and/or embodiments will become apparent to those skilled in the art after reviewing the following brief and detailed descriptions of the drawings. The present disclosure encompasses (a) combinations of disclosed aspects and/or embodiments and/or (b) reasonable modifications not shown or described.

SUMMARY

[0009] A spring retainer assembly is provided for the clutch of an automatic transmission to bias the clutch to a released state or condition whereby the clutch is disengaged. When the clutch moves to an applied state or condition, the spring retainer assembly is compressed, and the clutch engages. The spring retainer assembly includes a first or upper ring and a second or lower ring, between which a plurality of springs are sandwiched. First and second rings each have a plurality of recesses which receive the opposite ends of each spring, thereby retaining the springs between the rings and assuring that the springs remain properly aligned. The rings are secured together with fasteners, such as shoulder bolts, which allow the lower or bottom ring to move axially toward and away from the stationary upper or top ring, in response to movement of the clutch piston.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] FIG. **1** is a perspective view of the return spring assembly of the present invention.

[0011] FIG. **2** is a side elevation view of the assembly shown in FIG. **1**, with the retainer rings in

the maximum spaced apart orientation.
[0012] FIG. **3** is a top plan view of the assembly shown in FIG. **1**.
[0013] FIG. **4** is an exploded plan view of the retainer rings and shoulder bolts, and showing recesses of the rings.
[0014] FIG. **5** is a plan view of the disassembled ring showing the opposite sides of the rings from FIG. **4**
[0015] FIG. **6** is a sectional view of the spring retainer assembly taken along lines **6**-**6** of FIG. **3**.
[0016] FIG. **7** is a sectional view of the spring retainer assembly taken along line **7**-**7** of FIG. **3**.
[0017] FIG. **8** is a sectional view showing the spring assembly mounted on a transmission clutch hub, and showing the shoulder bolts when the spring assembly is in a released or expanded, neutral state.
[0018] FIG. **9** is a view is a sectional view similar to FIG. **8**, with the spring assembly in an applied or compressed state.
[0019] FIG. **10** is a sectional view showing the spring retainer assembly mounted on a transmission clutch hub, and showing the springs in a released, neutral state.
[0020] FIG. **11** is a sectional view similar to FIG. **10**, with the springs in an applied, compressed state.
[0021] FIG. **12** is an enlarged view taken along line **12** of FIG. **8**.
[0022] FIG. **13** is an enlarged view taken from line **13** of FIG. **9**.
[0023] FIG. **14** is an enlarged view taken along line **14** FIG. **10**.
[0024] FIG. **15** is an enlarged view taken along line **15** of FIG. **11**.
DETAILED DESCRIPTION
[0025] The spring assembly **10** is intended for use with the clutch of an automatic transmission to urge the clutch piston from an applied state wherein the clutch is engaged to a released state wherein the clutch is disengaged. The spring assembly **10** resides around the inside the clutch housing **11**, as shown in FIGS. **8**-**11**. One end of the spring retainer assembly **10** engages the clutch piston **14**, with the clutch plates **16** extending around the spring retainer assembly **10**. A retaining ring **18** secures the spring retainer assembly **10** to the clutch housing **11**.
[0026] The spring retainer assembly **10** includes first and second, or top and bottom, annular rings **20**, **22**. A plurality of springs **24** are sandwiched between the rings **20**, **22**. The rings **20**, **22** are secured together by a fastener **26**, such as a shoulder bolt, which allows the rings **20**, **22** to move axially relative to one another. FIG. **3** shows the use of two shoulder bolts **26**, though three or more shoulder bolts can be used to connect the upper and lower rings **20**, **22**. Preferably, the fasteners **26** are equally spaced around the rings **20**, **22**. As best seen in FIGS. **12** and **13**, the top ring **20** has a large diameter recess **28** to receive the head **30** of the shoulder bolt **26**, and a smaller diameter hole **32** through which the unthreaded shaft **34** of the shoulder bolt extends. The lower threaded end **36** of the bolt **26** is received in a threaded hole **38** of the bottom ring **22**. The bolts prevent rotation of the rings about their central axis, while allowing longitudinal axial movement of the rings relative to one another.
[0027] Each ring **20**, **22** includes a plurality of recesses or pockets **40** to receive the upper and lower ends of the springs **24**, respectively. The number of springs **24** and recesses **40** may be more or less than that is shown in the drawings. Preferably, the springs **24** and recesses **40** are spaced equally around the top and bottom rings **20**, **22**.
[0028] As best seen in FIGS. **14** and **15**, the top ring **20** has a notch **42** formed on the upper, inner peripheral edge to contain the retaining ring **18**. The clutch housing **11** also has a groove **44** into which the retaining ring **18** extends. In the preferred embodiment, the ring **18** is tight to the inner diameter of the groove **44**, and the top of the spring assembly creates a fence around the ring **18** to prevent any outward movement of the ring, such that the retaining ring **18** is secured in the groove **14**. Thus, the retaining ring **18** cannot pop out of the assembly **10**, as in OEM spring assemblies. While the drawings show the rings **20**, **22** and springs **24** being pre-assembled as a unit to be

installed on the piston, in another embodiment, one of the rings may be attached to the piston, or formed into the piston, before the springs and second ring are assembled onto the first ring.
[0029] In operation, when the clutch piston **14** is in the released state such that the clutch is disengaged, the springs **24** of the assembly **10** are at rest, or decompressed, as shown in FIGS. **8**, **10**, **12** and **14**. When the clutch piston **14** is applied to engage the clutch, the bottom or second ring **22** is moved toward the top or first ring **20** so as to compress the springs **24**, as seen in FIGS. **9**, **11**, **13**, and **15**. When the clutch is to be disengaged, the spring assembly **10** urges the piston **14** back to the released state or condition. Thus, when the clutch activating force is applied, spring assembly **10** is compressed, and when the clutch activating force is released, the spring assembly **10** is expanded. The space between the top and bottom rings **20**, **22** is decreased when the springs **24** are compressed and is increased when the springs **24** expand. In the preferred embodiment, the top ring **20** is stationary, and the lower ring **22** is movable. The shoulder bolts **26** guide the movement of the bottom ring **22** relative to the top ring **20** during compression and expansion, while preventing turning or rotation of the rings. The recesses **40** of the rings **20**, **22** prevent roll over of the springs.
[0030] The “scope” of the present disclosure is defined by the appended claims, along with the full scope of equivalents to which such claims are entitled. The scope of the disclosure is further qualified as including any possible modification to any of the aspects and/or embodiments disclosed herein which would result in other embodiments, combinations, subcombinations, or the like that would be obvious to those skilled in the art. It is understood that “top” and “bottom” are relative terms used to describe the drawings, and do not limit the orientation of the clutch and/or the spring assembly in use.

Claims

1. A spring assembly for a clutch of an automatic transmission, comprising: a first ring; a second ring; a plurality of springs sandwiched between the first and second rings; the first and second rings each having recesses surrounding opposite ends of the springs so as to contain the springs between the first and second rings; and the rings being movable between an expanded position when the springs are in a neutral position and a compressed position when the springs are compressed.
2. The spring assembly of claim 1, wherein the first and second rings are secured together with a plurality of fasteners which allow the rings to move axially relative to one another.
3. The spring assembly of claim 2, wherein the fasteners are shoulder screws.
4. The spring assembly of claim 1, wherein each of the springs is retained between the rings without any structure extending into the spring.
5. The spring assembly of claim 1, wherein the rings are operatively connected to a piston of the clutch.
6. The spring assembly of claim 1, wherein the recesses are spaced apart from one another and extend 360° around the rings.
7. The spring assembly of claim 1, wherein the recesses are a series of circular recesses each having a diameter to receive one of the ends of the springs.
8. The spring assembly of claim 1, wherein the springs normally bias the first and second rings apart.
9. The spring assembly of claim 1, wherein the ends of the springs reside within the recesses of the first and second rings, respectively.
10. (canceled)
11. The spring assembly of claim 1, wherein the first and second rings, alone, engage the springs to retain the springs in aligned orientations.
12. The spring assembly of claim 1, wherein the first ring has a lower surface and the recesses extend upwardly from the lower surface, and the second ring has an upper surface, and the recesses extend downwardly from the upper surface.

13. The spring assembly of claim 1, wherein the recesses have a larger diameter than the spring diameter so that the spring fits into the recess.
14. An automatic transmission having a clutch and a piston to move the clutch between engaged and disengaged positions, and the transmission further comprising: a spring assembly for urging the clutch to the disengaged position; the spring assembly having first and second rings and a plurality of springs between the rings; the first and second rings each having recesses; the springs each having opposite ends extending into the recesses to retain the springs between the rings; and fasteners connecting the rings to allow axial movement of the rings relative to one another as the springs are compressed and decompressed.
15. The automatic transmission of claim 14, wherein the springs urge the rings axially outwardly.
16. (canceled)
17. The automatic transmission of claim 14, wherein the recesses are spaced circumferentially around each ring.
18. The automatic transmission of claim 14, wherein the rings each have a planar inner surface and the recesses of the rings extend in opposite axial directions from the inner surfaces.
19. The automatic transmission of claim 14, wherein the fasteners slidably extend through one of the rings and threadably extend into the other of the rings.
20. The automatic transmission of claim 14, wherein the fasteners are shoulder bolts.
21. The automatic transmission of claim 14, wherein the recesses have a diameter larger than diameters of the springs.
22. The automatic transmission of claim 14, wherein the springs are retained between the rings without any structure extending into the springs.