US010385978B2

(12) **United States Patent**
Hernandez

(10) **Patent No.: US 10,385,978 B2**
(45) **Date of Patent: Aug. 20, 2019**

(54) **CARTRIDGE ASSEMBLY FOR REGULATING FLOWS**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 178 days.

(21) Appl. No.: **15/789,982**

(22) Filed: **Oct. 21, 2017**

(65) **Prior Publication Data**

US 2019/0120390 A1 Apr. 25, 2019

(51) **Int. Cl.**
F16K 3/08 (2006.01)
F16K 11/00 (2006.01)
E03C 1/04 (2006.01)

(52) **U.S. Cl.**
CPC ***F16K 3/085*** (2013.01); ***E03C 1/0403*** (2013.01); ***F16K 19/006*** (2013.01); *Y10T 137/86823* (2015.04)

(58) **Field of Classification Search**
CPC Y10T 137/86823; Y10T 137/86558
USPC 137/625.41
See application file for complete search history.

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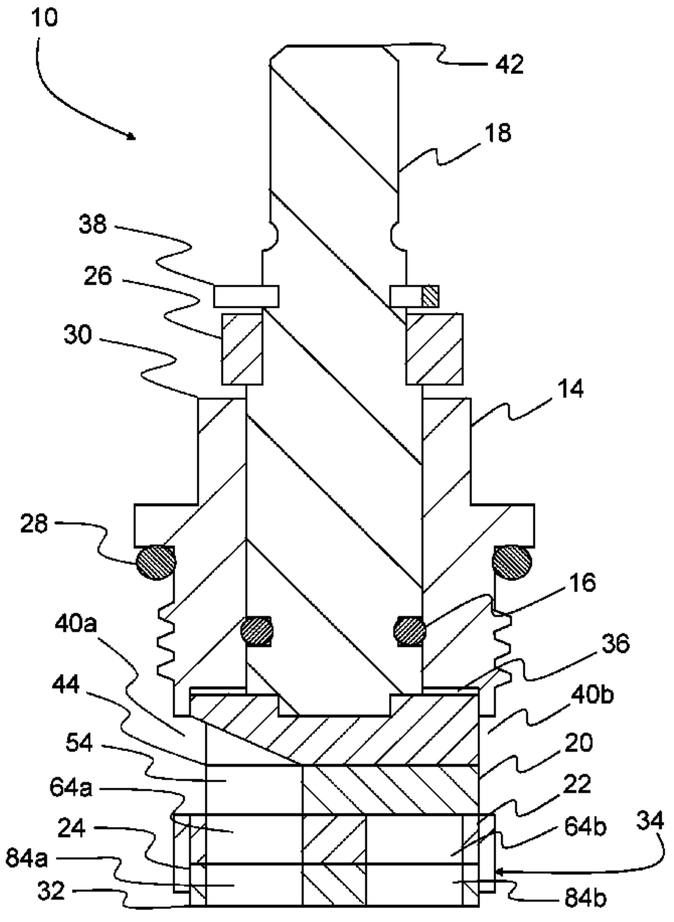
Primary Examiner — John Fox

(57) **ABSTRACT**

The present invention provides a cartridge assembly for a faucet. The cartridge assembly permits flows from a first flow source and a second flow source to flow through the cartridge assembly and to be regulated through the faucet without permitting flows from the two sources to flow simultaneously through the cartridge assembly.

4 Claims, 9 Drawing Sheets



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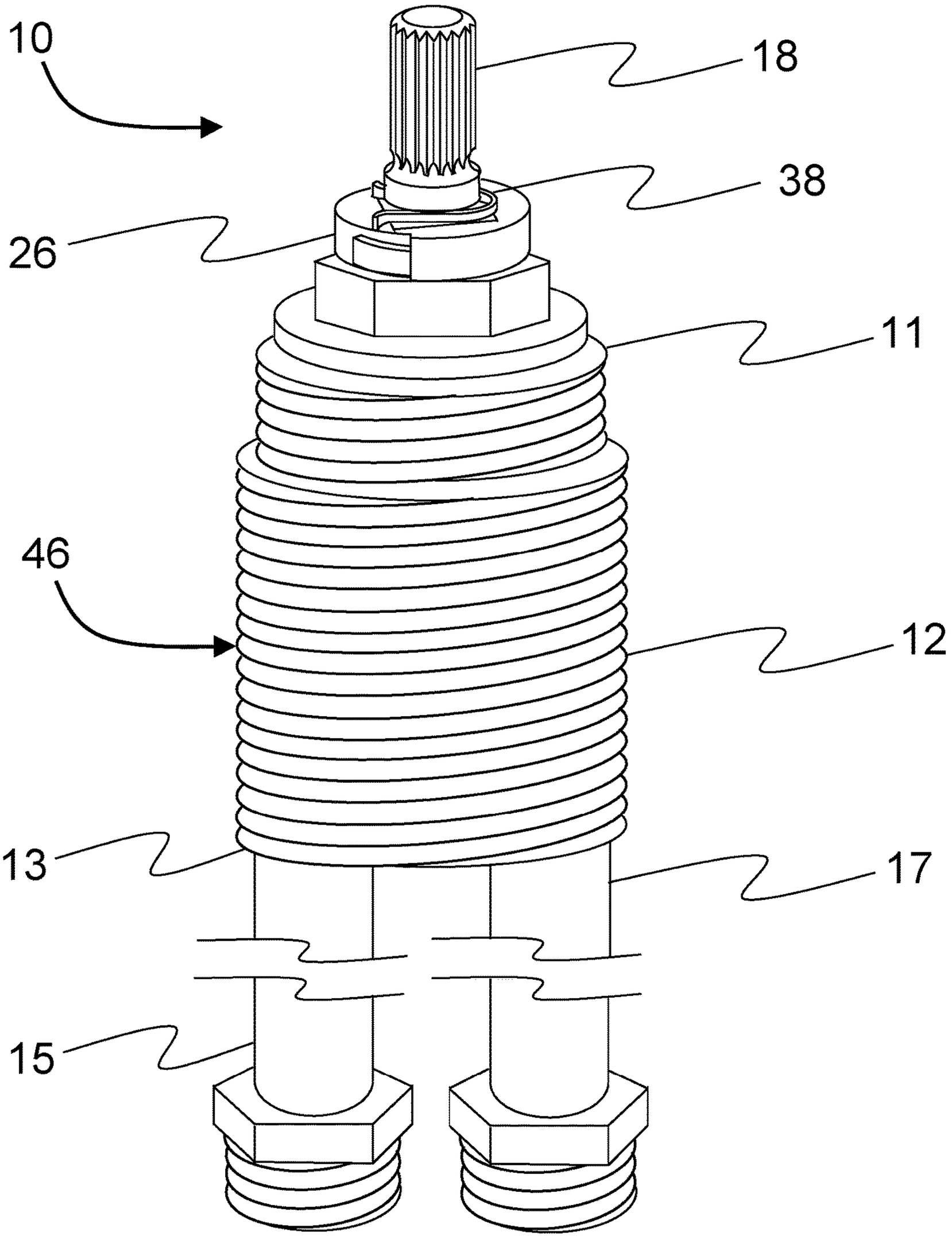

FIG. 1

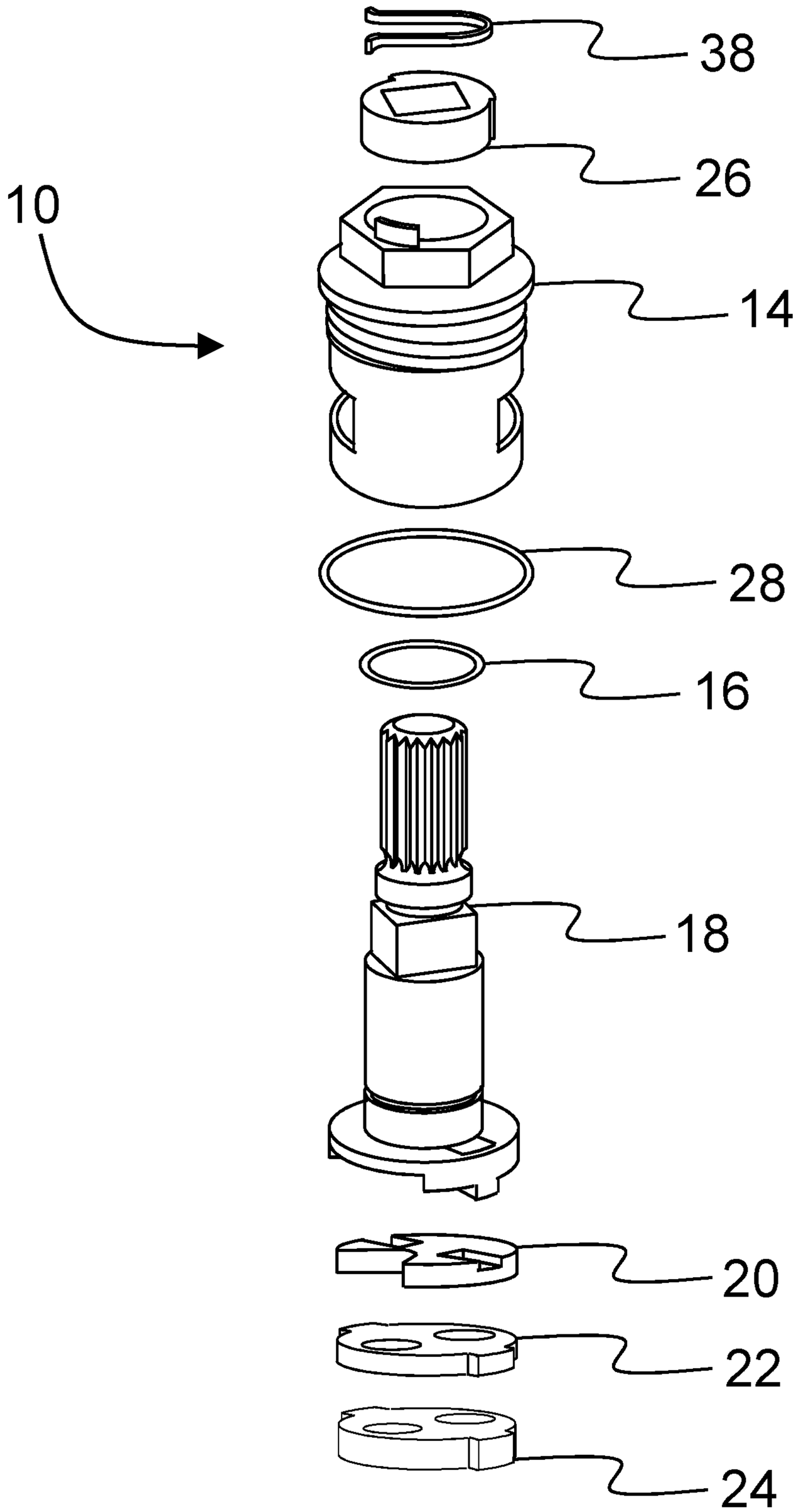

FIG. 2

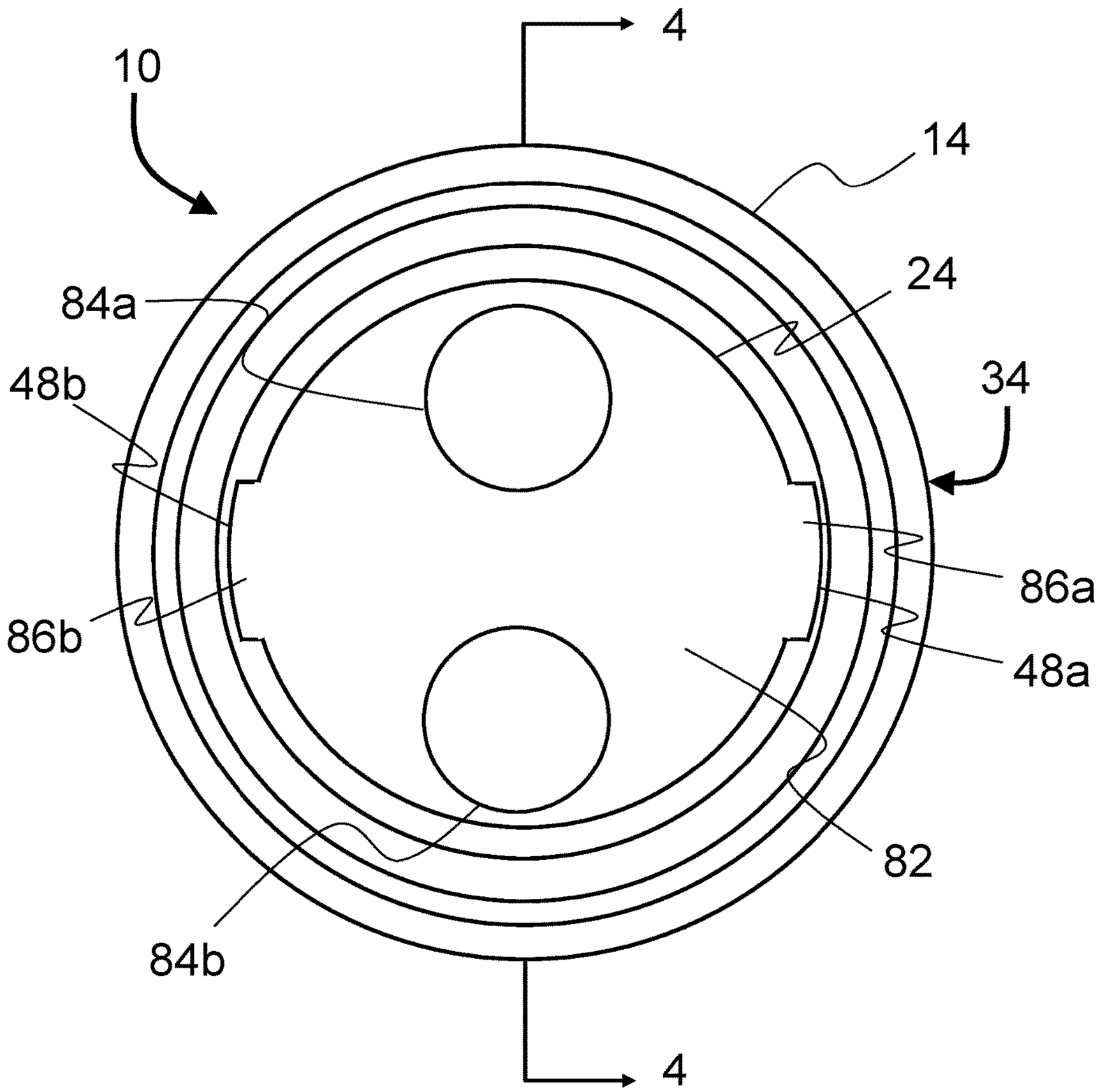

FIG. 3

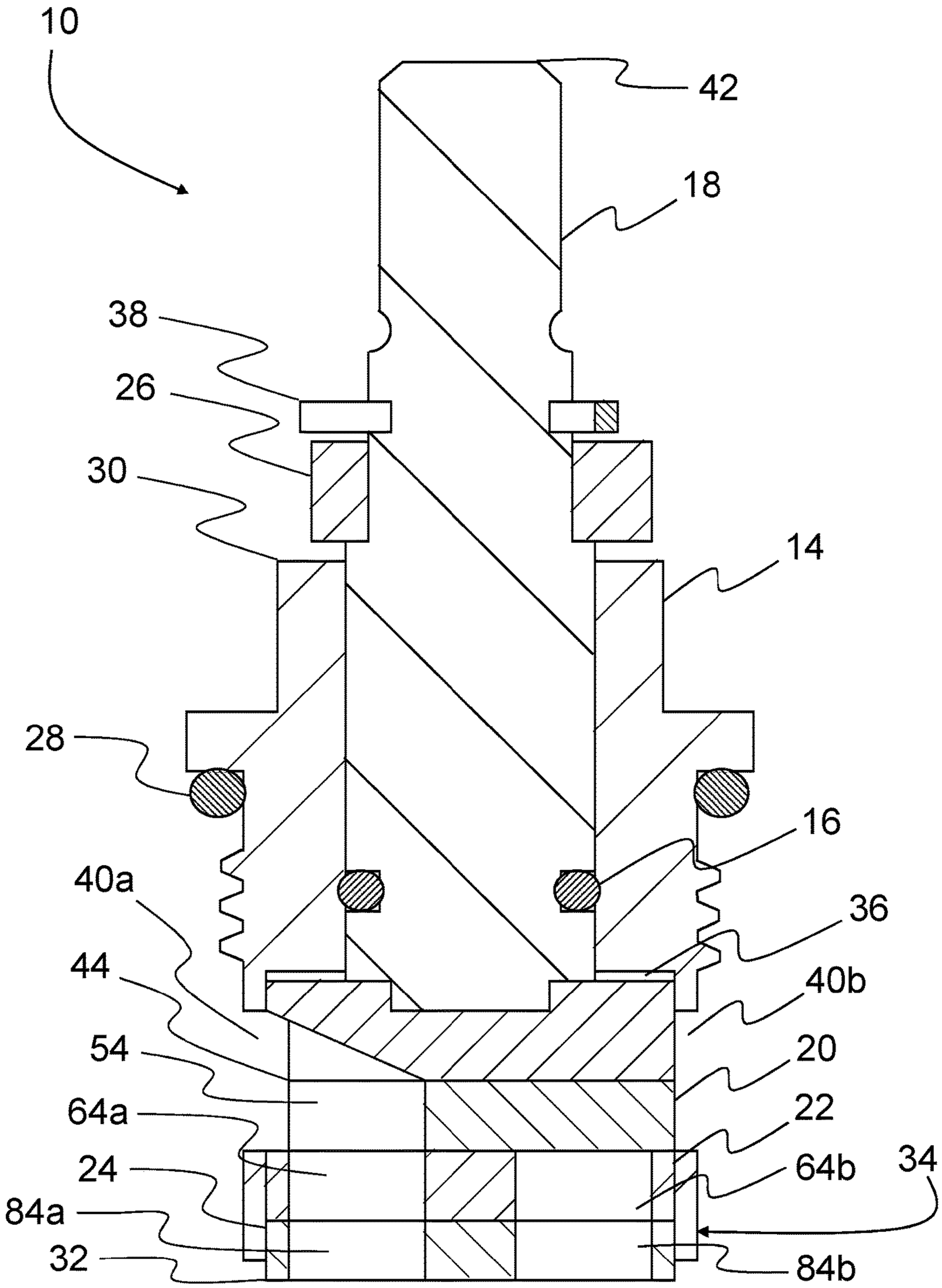
10
42
18
38
26
30
14
28
16
40a
36
44
40b
54
20
64a
22
24
64b
34
84a
32
84b

FIG. 4

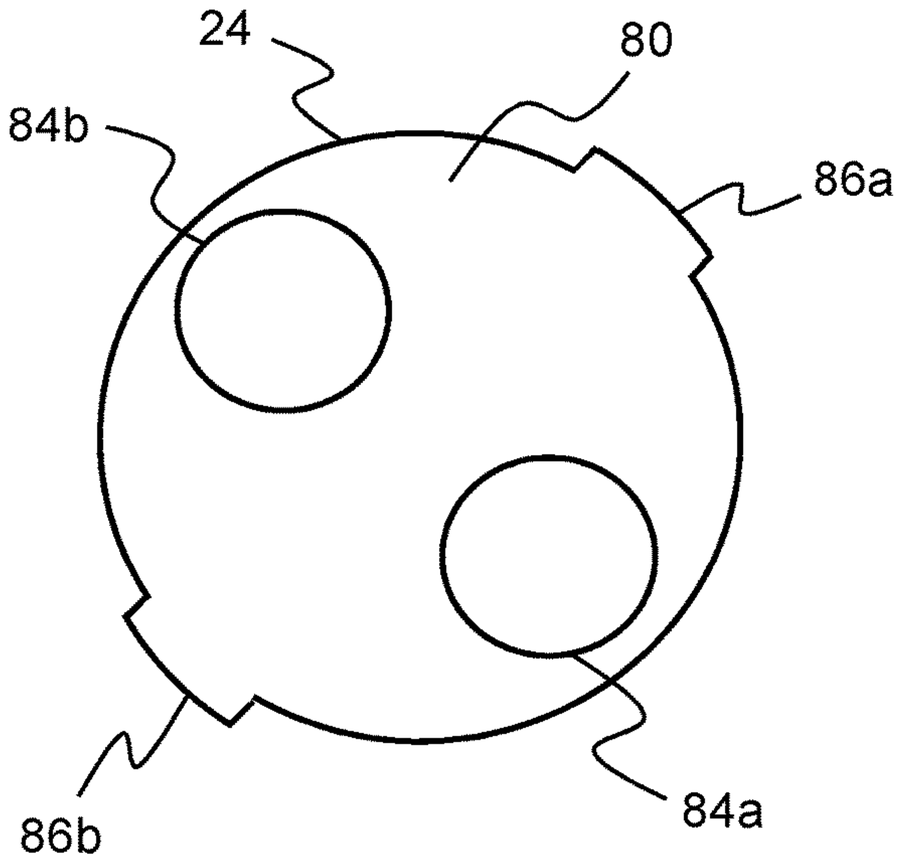

FIG. 5A

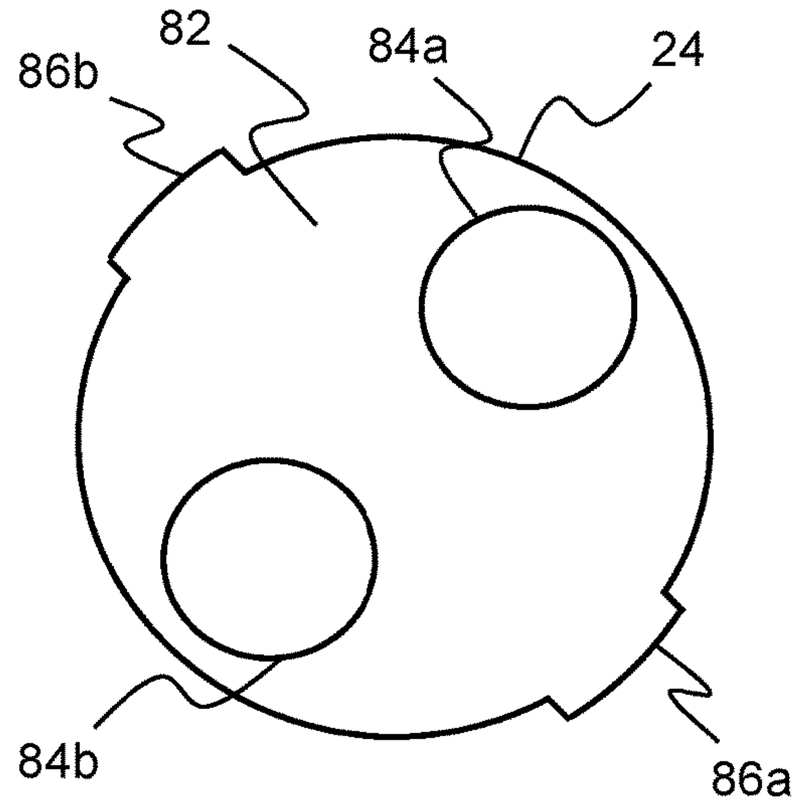

FIG. 5B

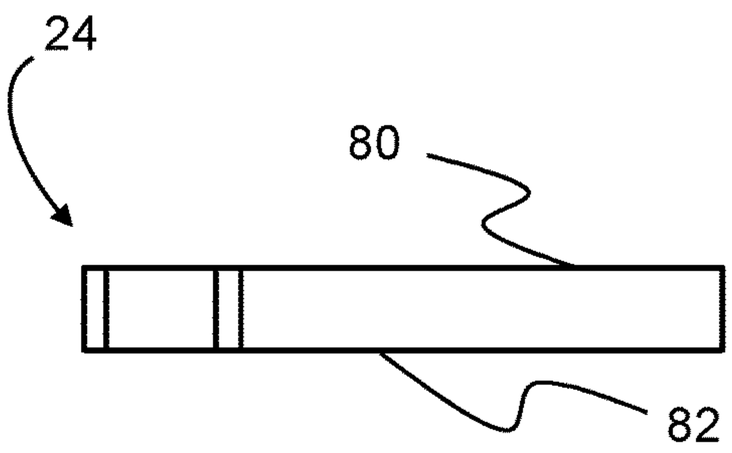

FIG. 5C

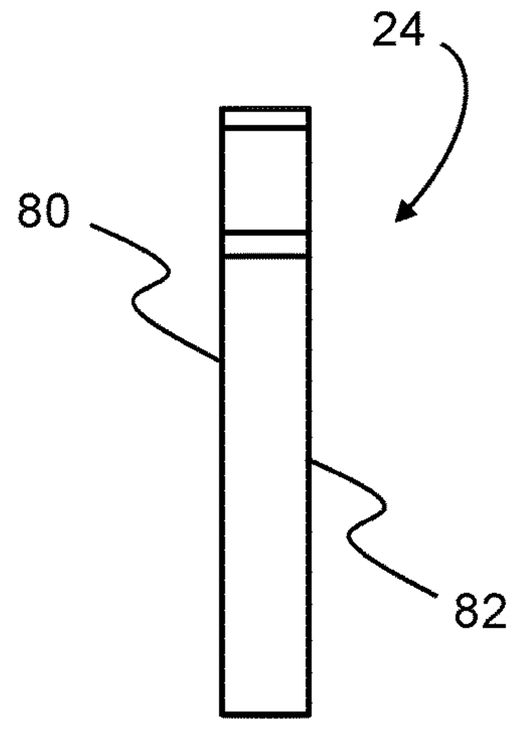

FIG. 5D

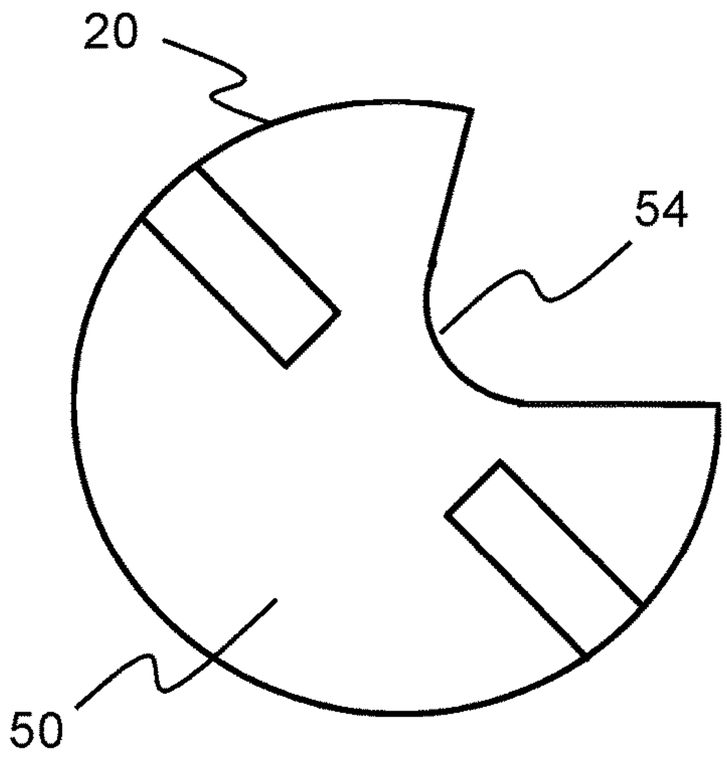

FIG. 6A

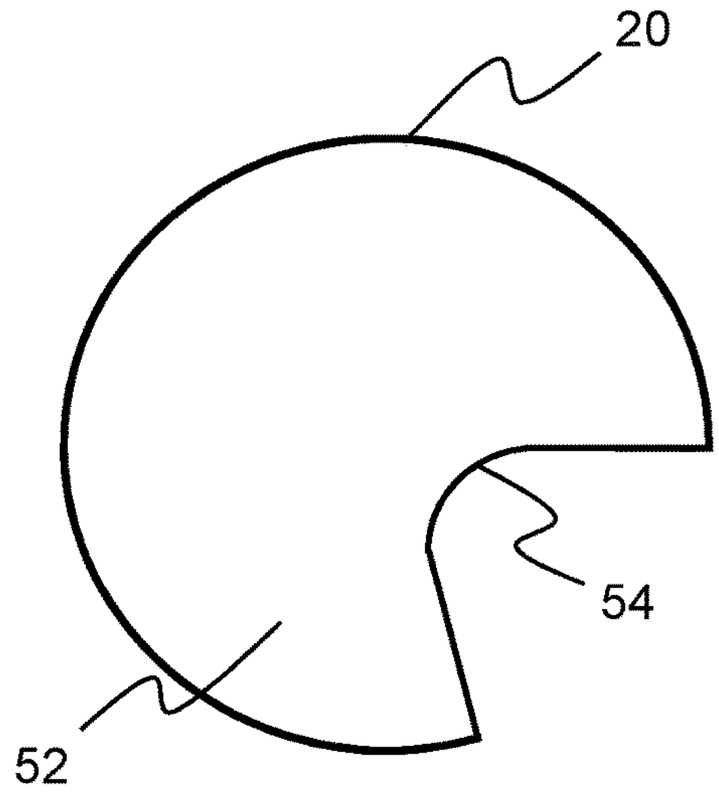

FIG. 6B

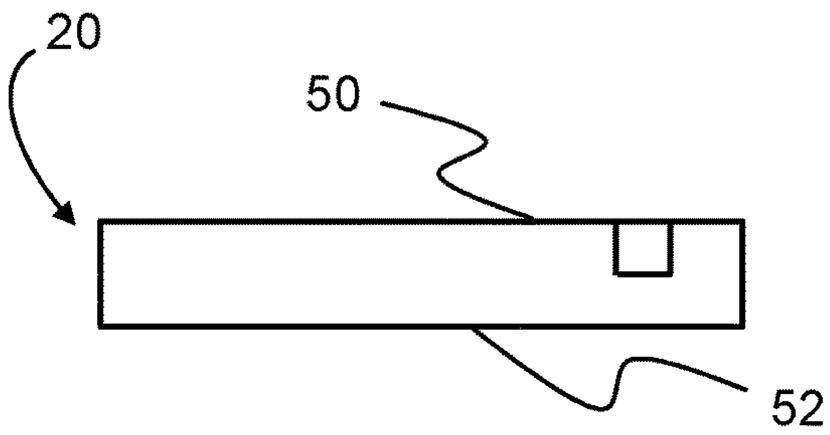

FIG. 6C

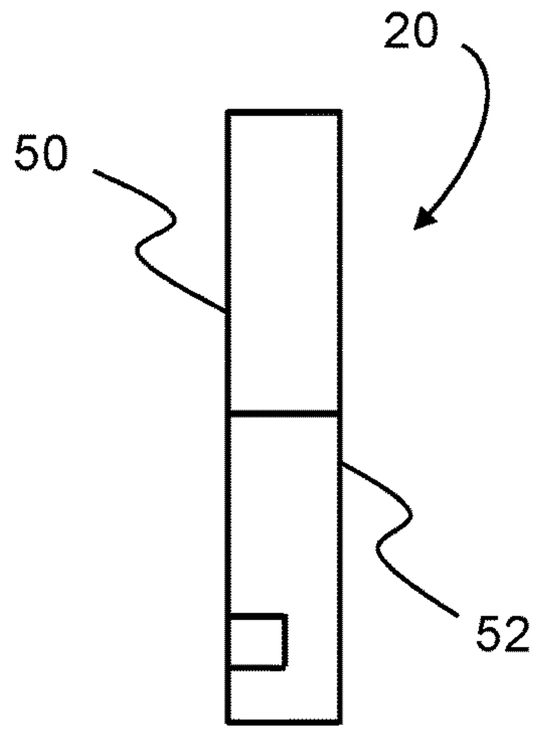

FIG. 6D

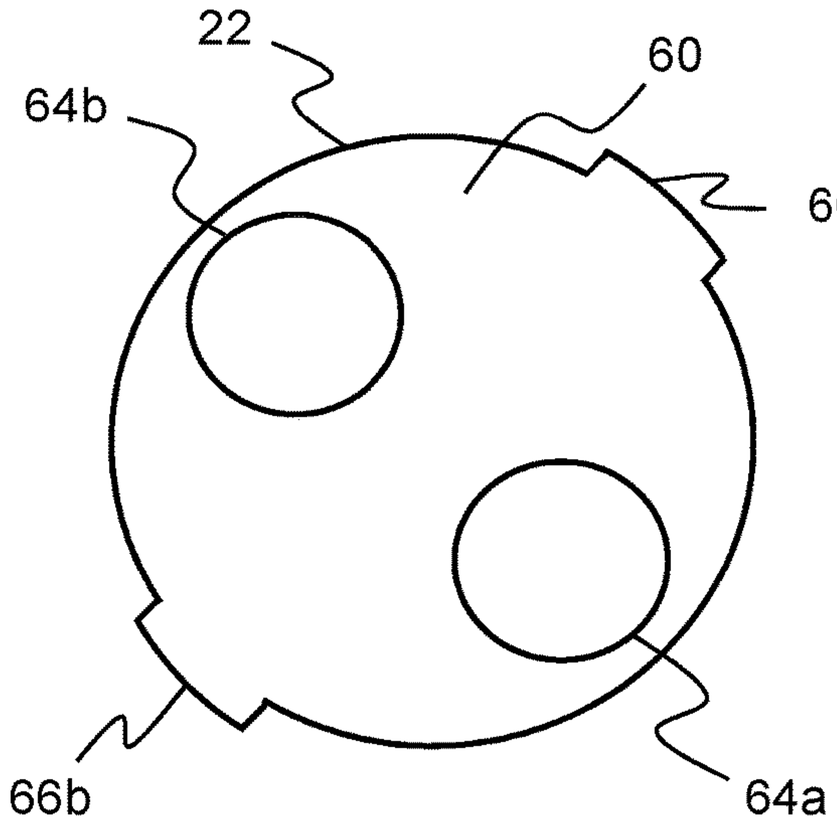

FIG. 7A

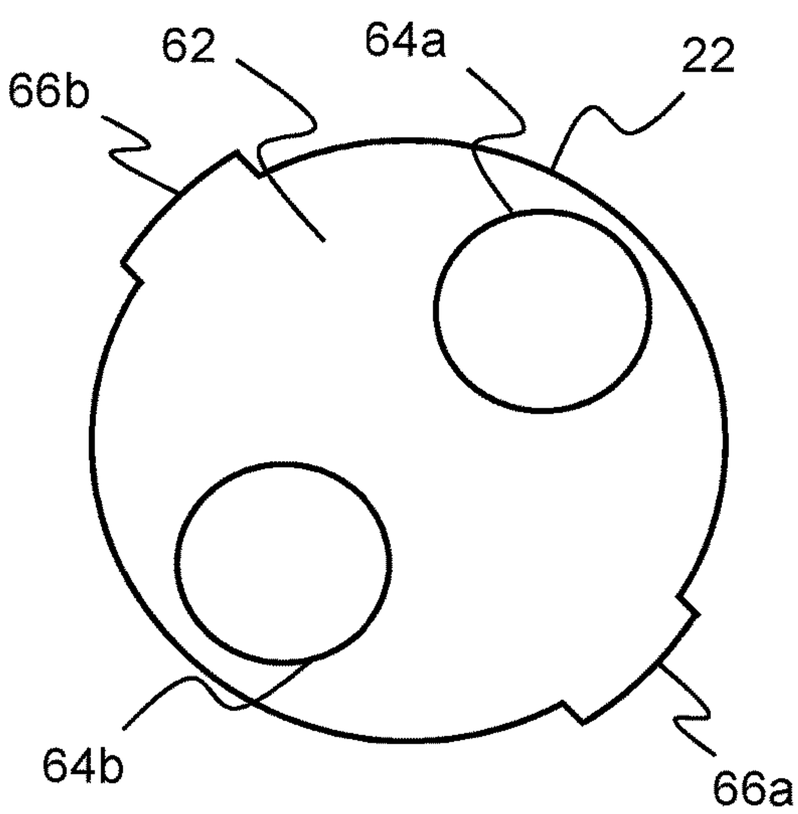

FIG. 7B

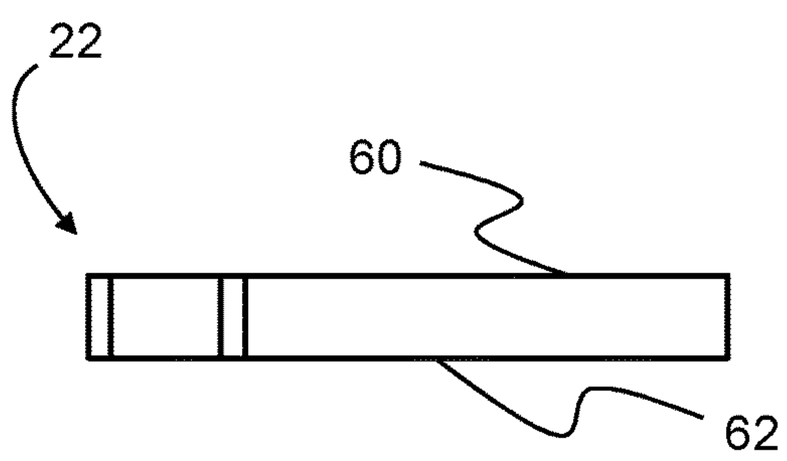

FIG. 7C

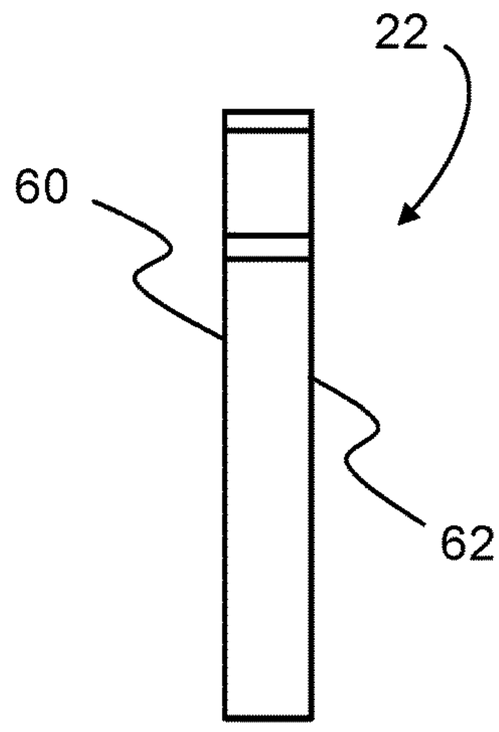

FIG. 7D

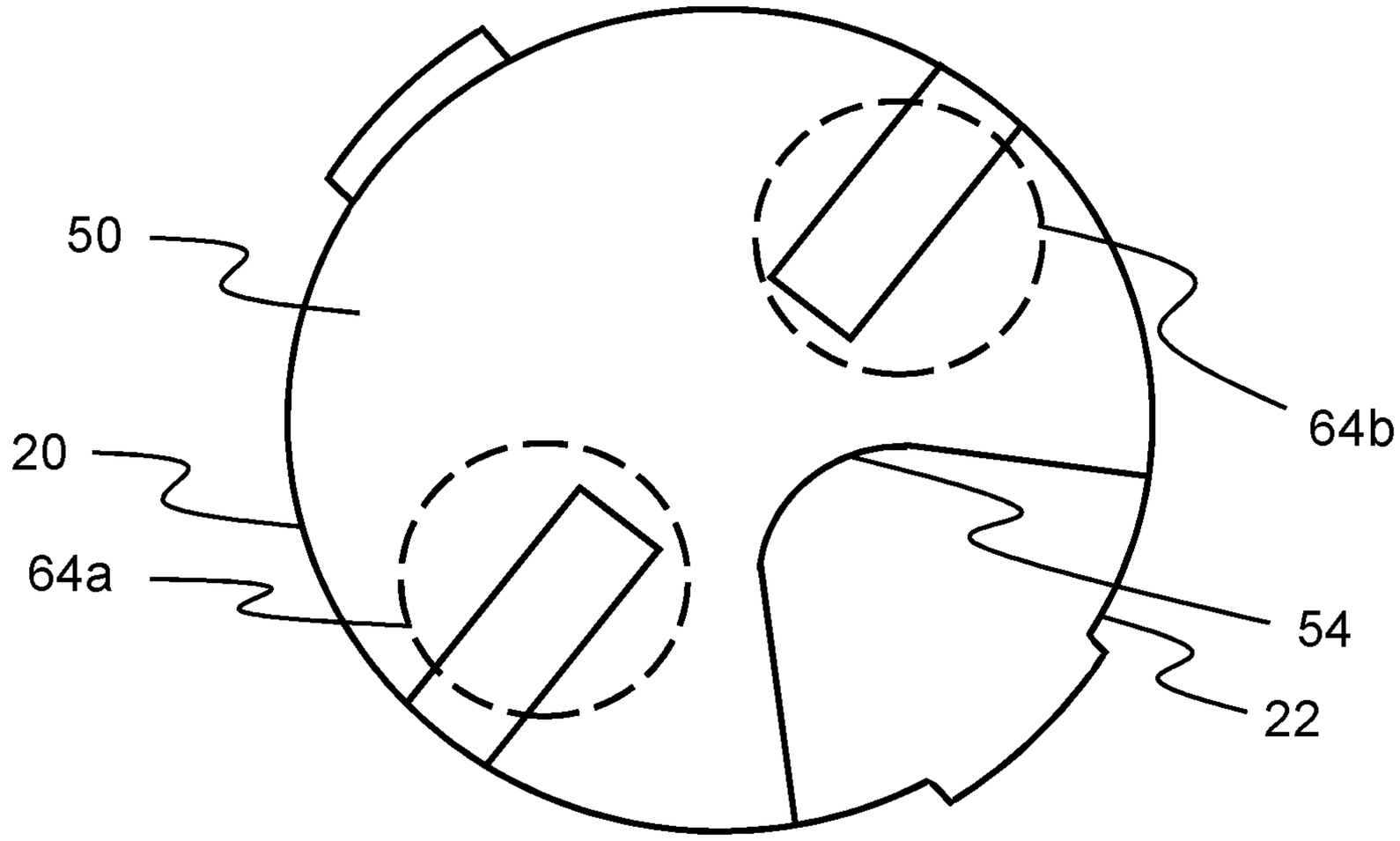

FIG. 8A

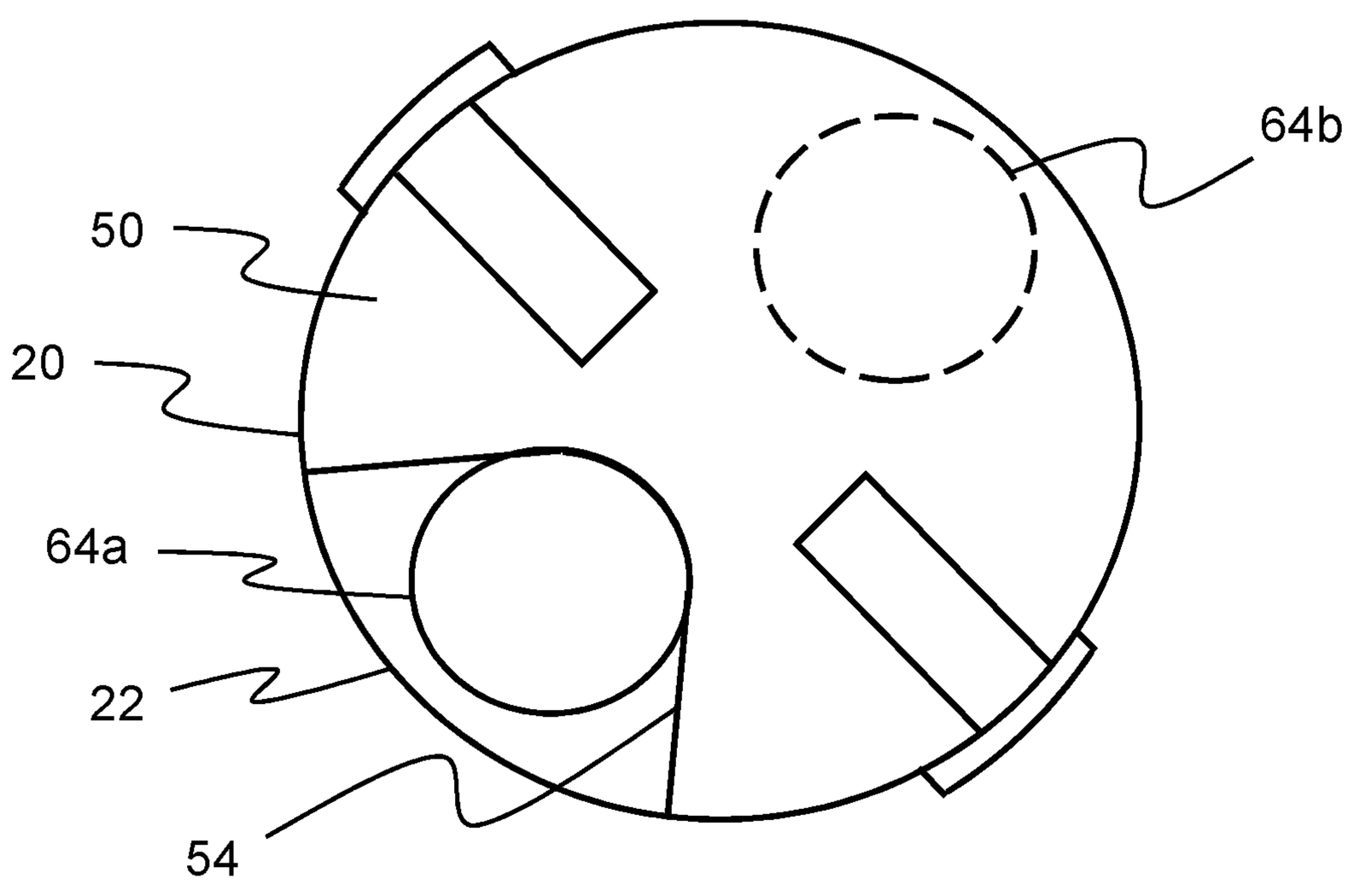

FIG. 8B

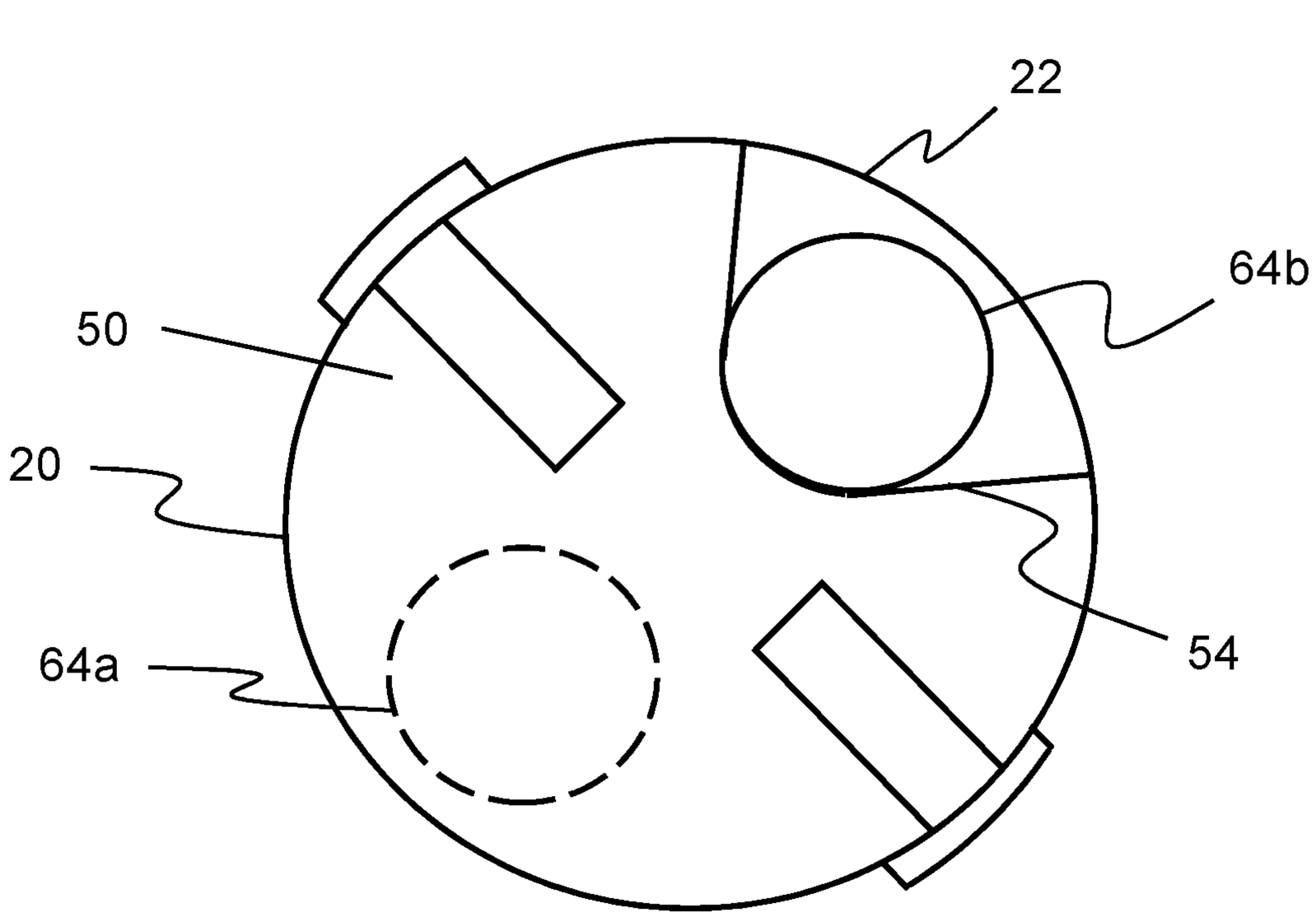

FIG. 8C

CARTRIDGE ASSEMBLY FOR REGULATING FLOWS

CROSS-REFERENCE TO RELATED APPLICATIONS

Not Applicable

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

Not Applicable

REFERENCE TO SEQUENCE LISTING, A TABLE, OR A COMPUTER PROGRAM LISTING COMPACT DISC APPENDIX

Not Applicable

BACKGROUND OF THE INVENTION

Water-filtering systems for the home fall under two basic categories: Point of Entry (POE) and Point of Use (POU). A POE system filters water as it enters the home, providing filtered water to every faucet and water outlet fixture. A POU system filters water at a specific faucet or water outlet fixture in the home, providing filtered water only at that specific location. One popular location for installing a POU system in the home is under the kitchen sink. A dedicated faucet to dispense filtered water from this type of system is usually necessary and can be fitted through an available opening in the sink usually reserved for a liquid soap dispenser. Where a dedicated faucet is not necessary, the POU system requires a separate control apparatus with a control unit fitted through the sink opening to switch between dispensing cold water and filtered water through the existing faucet. Installation of a POU system at other locations within the home, such as under a bathroom sink, although possible, is not typical. One reason for this may be the additional effort required to drill a hole through the bathroom sink or to replace the sink with one having a pre-drilled hole, since most bathroom sinks do not typically have an existing hole for a liquid soap dispenser. Another reason may be due to aesthetics. A separate dispensing faucet or control unit may detract from the desired appearance of the bathroom decor if it does not match the style of the existing bathroom faucet.

BRIEF SUMMARY OF THE INVENTION

The present invention provides a cartridge assembly for a faucet. The cartridge assembly permits flows from a first flow source (such as a cold-water source) and a second flow source (such as a filtered-water source) to flow through the cartridge assembly and to be regulated through the faucet without permitting flows from the two sources to flow simultaneously through the cartridge assembly. With the present invention, filtered water from a POU system may be dispensed from the same faucet that dispenses domestic cold and hot water, without the need for a separate, dedicated faucet or control unit to dispense the filtered water.

In an exemplary embodiment of the present invention, a cartridge assembly for a right-hand installation in a two-handle faucet shall be described. The cartridge assembly includes a cartridge shell. The cartridge shell includes two openings, a first opening and a second opening. The cartridge assembly includes a stem. The stem is operable to be at least partially disposed within the cartridge shell. The

cartridge assembly includes a moveable disk. The moveable disk is operable to be disposed within the cartridge shell. The moveable disk includes one opening. The cartridge assembly includes a fixed disk. The fixed disk is operable to be disposed within the cartridge shell. The fixed disk includes two openings, a first opening and a second opening.

In the exemplary embodiment of the present invention, the moveable disk abuts the fixed disk. The stem is operable to be connected to the moveable disk so that rotation of the stem causes rotation of the moveable disk relative to the fixed disk. Flow through the cartridge assembly either flows through the first opening in the fixed disk and through the opening in the moveable disk and exits through the first opening in the cartridge shell or flows through the second opening in the fixed disk and through the opening in the moveable disk and exits through the second opening in the cartridge shell.

In the exemplary embodiment of the present invention, the moveable disk and the fixed disk are configured such that movement of the moveable disk relative to the fixed disk creates a first zone of control and a second zone of control. Under the first zone of control, a flow of cold water is regulated through a range of stem rotation from a completely-closed position, which does not permit any flow of the cold water through the cartridge assembly, to a completely-open position at a clockwise rotation of the stem of ninety degrees (90°), which permits a maximum flow of the cold water through the cartridge assembly. Under the second zone of control, a flow of filtered water is regulated through a range of stem rotation from a completely-closed position, which does not permit any flow of the filtered water through the cartridge assembly, to a completely-open position at a counterclockwise rotation of the stem of ninety degrees (90°), which permits a maximum flow of the filtered water through the cartridge assembly. Under the first zone of control, the flow of cold water is regulated through the cartridge assembly from the cold-water source through the first opening in the fixed disk and through the opening in the moveable disk and through the first opening in the cartridge shell. Under the second zone of control, the flow of filtered water is regulated through the cartridge assembly from the filtered-water source through the second opening in the fixed disk and through the opening in the moveable disk and through the second opening in the cartridge shell.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

FIG. **1** is a perspective view of a cartridge assembly installed in a valve body according to an exemplary embodiment of the present invention;

FIG. **2** is an exploded perspective view of the cartridge assembly of FIG. **1**;

FIG. **3** is a bottom plan view of the cartridge assembly of FIG. **2**;

FIG. **4** is a cross-sectional view of the cartridge assembly of FIG. **3** along the line **4**-**4**, rotated clockwise ninety degrees (90°);

FIGS. **5**A-**5**D are views of the base seal of FIG. **2**-FIG. **5**A is a top plan view, FIG. **5**B is a bottom plan view, FIG. **5**C is a front elevational view, and FIG. **5**D is a side elevational view;

FIGS. **6**A-**6**D are views of the moveable disk of FIG. **2**-FIG. **6**A is a top plan view, FIG. **6**B is a bottom plan view, FIG. **6**C is a front elevational view, and FIG. **6**D is a side elevational view;

FIGS. **7**A-**7**D are views of the fixed disk of FIG. **2**-FIG. **7**A is a top plan view, FIG. **7**B is a bottom plan view, FIG. **7**C is a front elevational view, and FIG. **7**D is a side elevational view;

FIGS. **8**A-**8**C are top plan views of the moveable disk of FIG. **2** in operable relation to the fixed disk of FIG. **2**-FIG. **8**A is a view of the moveable disk and the fixed disk in a completely-closed position, FIG. **8**B is a view of the moveable disk and the fixed disk in a completely-open position at ninety degrees (90°) clockwise rotation of the moveable disk relative to the fixed disk; and FIG. **8**C is a view of the moveable disk and the fixed disk in a completely-open position at ninety degrees (90°) counterclockwise rotation of the moveable disk relative to the fixed disk.

DETAILED DESCRIPTION OF THE INVENTION

An exemplary embodiment of a cartridge assembly **10** of the present invention for a right-hand installation of a two-handle faucet is shown in FIGS. **1**-**4**. As illustrated in FIG. **1**, the cartridge assembly **10** is installed in a valve body **12**. As illustrated in FIGS. **2** and **4**, the cartridge assembly **10** includes a cartridge shell **14**, a stem **18**, a stem seal **16**, a stem collar **26**, a retaining clip **38**, a moveable disk **20**, a fixed disk **22**, a base seal **24**, and a cartridge shell seal **28**. Cartridge assemblies and valve bodies are well known in the art; therefore, only the relevant components of the cartridge assembly **10** and the valve body **12** will be described in greater detail.

In the exemplary embodiment, as illustrated in FIG. **4**, the cartridge shell **14** includes a first end **30** and a second end **32**. The cartridge shell **14** has an exterior surface **34** with a generally cylindrical shape. The cartridge shell **14** has an interior **36**. The cartridge shell **14** includes a first opening **40***a* and a second opening **40***b*, both openings extending from the interior **36** through the exterior surface **34** between the first end **30** and the second end **32** of the cartridge shell **14**. Additionally, the cartridge shell **14** includes two recesses **48***a*, **48***b* arranged one hundred eighty degrees (180°) apart on the inner periphery of the cartridge shell **14**, as shown in FIG. **3**. The cartridge shell **14** can be formed of plastic, metal, or any other suitable material.

In the exemplary embodiment, as illustrated in FIG. **1**, the valve body **12** includes a first end **11** and a second end **13**. The valve body **12** includes a first inlet tube **15** and a second inlet tube **17**. The inlet tubes **15**, **17** are connected to the second end **13** of the valve body **12**. The valve body **12** has an exterior surface **46** with a generally cylindrical shape. The valve body **12** has an interior surface (not shown) with a generally cylindrical shape. The interior surface of the valve body **12** generally corresponds to the exterior surface **34** of the cartridge shell **14**. The valve body **12** can be formed of plastic, metal, or any other suitable material.

In the exemplary embodiment, as illustrated in FIGS. **3** and **5**A-**5**D, the base seal **24** includes a top side **80** and a bottom side **82**. The base seal **24** includes a first opening **84***a* extending from the top side **80** through the bottom side **82**. The base seal **24** includes a second opening **84***b* extending from the top side **80** through the bottom side **82**. Additionally, the base seal **24** includes two lugs **86***a*, **86***b* arranged one hundred eighty degrees (180°) apart on the periphery of the base seal **24** for engagement with the recesses **48***a*, **48***b* on the inner periphery of the cartridge shell **14**. The base seal **24** can be formed of neoprene or any other suitable material.

In the exemplary embodiment, as illustrated in FIGS. **6**A-**6**D, the moveable disk **20** includes a top side **50** and a bottom side **52**. The moveable disk **20** includes one opening **54** extending from the top side **50** through the bottom side **52**. The opening **54** is configured such that the moveable disk **20** presents an open-mouth shape when viewed in plan view, as illustrated in FIGS. **6**A and **6**B. The moveable disk **20** can be formed of ceramic material or any other suitable material.

In the exemplary embodiment, as illustrated in FIGS. **7**A-**7**D, the fixed disk **22** includes a top side **60** and a bottom side **62**. The fixed disk **22** includes a first opening **64***a* extending from the top side **60** through the bottom side **62**. The fixed disk **22** includes a second opening **64***b* extending from the top side **60** through the bottom side **62**. Additionally, the fixed disk **22** includes two lugs **66***a*, **66***b* arranged one hundred eighty degrees (180°) apart on the periphery of the fixed disk **22** for engagement with the recesses **48***a*, **48***b* on the inner periphery of the cartridge shell **14**. The fixed disk **22** can be formed of ceramic material or any other suitable material.

In the exemplary embodiment, as illustrated in FIG. **4**, the stem **18** includes a first end **42** and a second end **44**. A handle (not shown) is connected to the first end **42** of the stem **18**. The second end **44** of the stem **18** is operably connected to the top side **50** of the moveable disk **20**. The bottom side **52** of the moveable disk **20** abuts the top side **60** of the fixed disk **22**. The bottom side **62** of the fixed disk **22** abuts the top side **80** of the base seal **24**. The first opening **84***a* in the base seal **24** is aligned with the first opening **64***a* in the fixed disk **22**. The second opening **84***b* in the base seal **24** is aligned with the second opening **64***b* in the fixed disk **22**.

In the exemplary embodiment, a cold-water source is connected to the first inlet tube **15** of the valve body **12**. The first inlet tube **15** abuts the first opening **84**A in the base seal **24**. A filtered-water source is connected to the second inlet tube **17** of the valve body **12**. The second inlet tube **17** abuts the second opening **84**B in the base seal **24**. Rotation of the handle causes rotation of the stem **18**. Rotation of the stem **18** causes rotation of the moveable disk **20**. Rotation of the moveable disk **20** relative to the fixed disk **22** permits either cold water from the first inlet tube **15** or filtered water from the second inlet tube **17** to flow through the cartridge assembly **10** but does not permit the cold water and the filtered water to flow simultaneously through the cartridge assembly **10**.

In the exemplary embodiment, as illustrated in FIG. **4**, clockwise rotation of the handle causes the opening **54** in the moveable disk **20** to overlap the first opening **64***a* in the fixed disk **22**. The cold water entering the first opening **84***a* in the base seal **24** flows through the first opening **64***a* in the fixed disk **22** then flows through the opening **54** in the moveable disk **20**. The cold water then exits through the first opening **40***a* in the cartridge shell **14**. Counterclockwise rotation of the handle causes the opening **54** in the moveable disk **20** to overlap the second opening **64***b* in the fixed disk **22**. The filtered water entering the second opening **84***b* in the base seal **24** flows through the second opening **64***b* in the fixed disk **22** then flows through the opening **54** in the moveable disk **20**. The filtered water then exits through the second opening **40***b* in the cartridge shell **14**.

In the exemplary embodiment, as illustrated in FIG. **8**A, when the handle and the stem **18** are in a completely-closed position, the opening **54** in the moveable disk **20** does not align with either the first opening **64***a* or the second opening **64***b* in the fixed disk **22** nor does the opening **54** in the moveable disk **20** overlap either the first opening **64***a* or the second opening **64***b* in the fixed disk **22**. In the completely-closed position, the handle, stem **18**, and moveable disk **20**

are at zero degrees (0°) of rotation. As the handle and the stem **18** are rotated in a clockwise direction from the completely-closed position, the opening **54** in the moveable disk **20** begins to overlap the first opening **64***a* in the fixed disk **22**. As the handle and the stem **18** are further rotated, the amount of overlap increases. When the handle and the stem **18** are rotated to a completely-open position at a handle and stem **18** rotation of approximately ninety degrees (90°) in the clockwise direction, the opening **54** in the moveable disk **20** is aligned with the first opening **64***a* in the fixed disk **22**, as illustrated in FIG. **8**B.

In the exemplary embodiment, as the handle and the stem **18** are rotated in a counterclockwise direction from the completely-closed position, the opening **54** in the moveable disk **20** begins to overlap the second opening **64***b* in the fixed disk **22**. As the handle and the stem **18** are further rotated, the amount of overlap increases. When the handle and the stem **18** are rotated to a completely-open position at a handle and stem **18** rotation of approximately ninety degrees (90°) in the counterclockwise direction, the opening **54** in the moveable disk **20** is aligned with the second opening **64***b* in the fixed disk **22**, as illustrated in FIG. **8**C.

In the exemplary embodiment, the moveable disk **20** and the fixed disk **22** are configured to create two (2) zones of control for flows through the cartridge assembly **10**. Under the first zone of control, the flow of cold water is regulated through a range of stem **18** rotation from the completely-closed position to a completely-open position at the clockwise rotation of the stem **18** of ninety degrees (90°). The first zone of control regulates the cold water through the first opening **64***a* in the fixed disk **22** and through the opening **54** in the moveable disk **20** and through the first opening **40***a* in the cartridge shell **14**. Under the second zone of control, the flow of filtered water is regulated through a range of stem **18** rotation from the completely-closed position to a completely-open position at the counterclockwise rotation of the stem **18** of ninety degrees (90°). The second zone of control regulates the filtered water through the second opening **64***b* in the fixed disk **22** and through the opening **54** in the moveable disk **20** and through the second opening **40***b* in the cartridge shell **14**.

One of ordinary skill in the art will now appreciate that the present invention provides a cartridge assembly for a faucet. The cartridge assembly permits flows from a first flow source and a second flow source to flow through the cartridge assembly and to be regulated through the faucet without permitting flows from the two sources to flow simultaneously through the cartridge assembly. Although the present invention has been shown and described with reference to a particular embodiment, equivalent alterations and modifications are within the scope of the present invention. The present invention is limited only by the scope of the following claims in light of their full scope of equivalent alterations and modifications.

I claim:

1. A cartridge assembly for a faucet, the cartridge assembly comprising:

a cartridge shell, the cartridge shell including a first end and a second end, the cartridge shell having an exterior surface, the cartridge shell having an interior, the cartridge shell including at least one opening extending from the interior through the exterior surface between the first end and the second end;

a stem, the stem operable to be at least partially disposed within the cartridge shell;

a moveable disk, the moveable disk operable to be disposed within the cartridge shell;

and

a fixed disk, the fixed disk operable to be disposed within the cartridge shell;

wherein flows through the cartridge assembly flow through one end of the cartridge shell and exit through at least one opening in the cartridge shell;

wherein the moveable disk is operable to abut the fixed disk;

wherein the stem is operably connected to the moveable disk so that movement of the stem causes movement of the moveable disk relative to the fixed disk;

wherein the moveable disk and the fixed disk are configured such that movement of the moveable disk relative to the fixed disk creates zones of control;

wherein a first zone of control regulates flow from a first flow source through a range of movement of the stem from a completely-closed position, which does not permit any flow from the first flow source through the cartridge assembly, to a completely-open position, which permits a maximum flow from the first flow source through the cartridge assembly;

wherein a second zone of control regulates flow from a second flow source through a range of stem movement from a completely-closed position, which does not permit flow from the second flow source through the cartridge assembly, to a completely-open position, which permits a maximum flow from the second flow source through the cartridge assembly; and

wherein the moveable disk and the fixed disk are further configured such that movement of the moveable disk relative to the fixed disk does not permit flow from the first flow source and flow from the second flow source to be regulated simultaneously through the cartridge assembly.

2. The cartridge assembly of claim **1**, wherein movement of the moveable disk relative to the fixed disk is rotational.

3. The cartridge assembly of claim **1**, wherein the moveable disk is of generally circular shape, the moveable disk including a top side and a bottom side, the moveable disk including one opening extending from the top side through the bottom side.

4. The cartridge assembly of claim **3**, wherein the opening of the moveable disk is configured such that the moveable disk presents an open-mouth shape when viewed in plan view.

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