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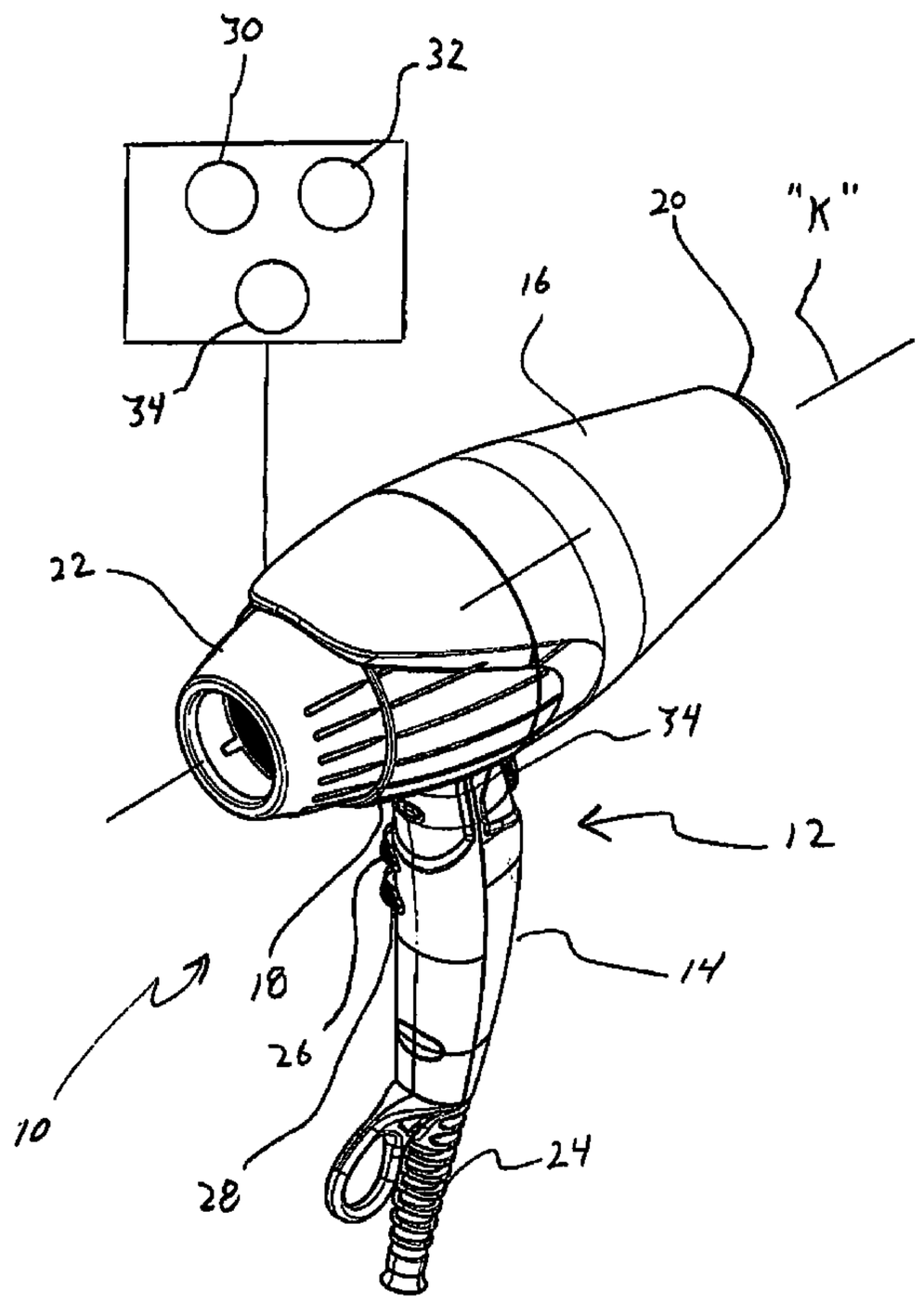
(54) **Titre : APPAREIL SECHE-CHEVEUX COMPORTANT UN EMBOUT DE REDUCTION DE BRUIT**
(54) **Title: HAIR DRYER APPARATUS WITH NOISE REDUCING END CAP**



(57) **Abrégé/Abstract:**
An apparatus for styling hair includes a housing dimensioned to be held in a hand of a user, and having an air inlet and an air outlet, a fan within the housing, a heater for heating air passing from said air inlet to said air outlet and an end cap mounted to the barrel adjacent the air inlet. The end cap includes an end cap frame defining an end cap axis and a reducer mounted within the end cap frame. The reducer is dimensioned to reduce acoustic energy. The end cap may be releasably couplable to the housing.

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(54) **Title**: HAIR DRYER APPARATUS WITH NOISE REDUCING END CAP

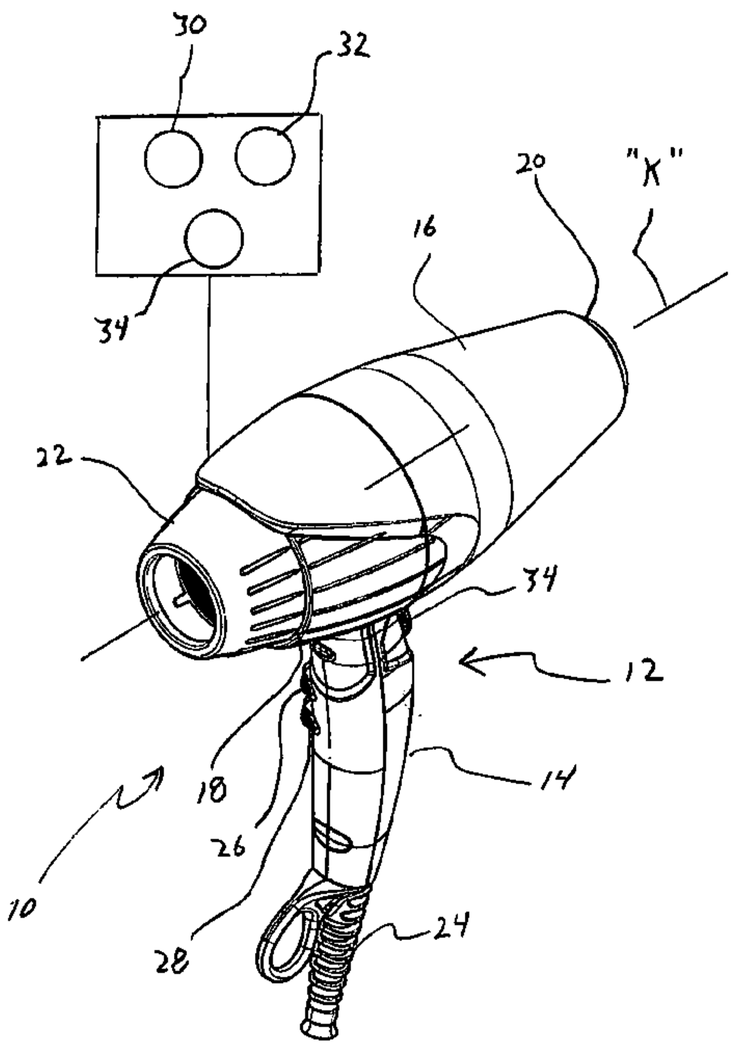

FIG. 1

(57) **Abstract**: An apparatus for styling hair includes a housing dimensioned to be held in a hand of a user, and having an air inlet and an air outlet, a fan within the housing, a heater for heating air passing from said air inlet to said air outlet and an end cap mounted to the barrel adjacent the air inlet. The end cap includes an end cap frame defining an end cap axis and a reducer mounted within the end cap frame. The reducer is dimensioned to reduce acoustic energy. The end cap may be releasably couplable to the housing.

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HAIR DRYER APPARATUS WITH NOISE REDUCING END CAP

BACKGROUND

1. Technical Field

[0001] The present invention relates to an apparatus for treating hair, and, in particular, relates to a hair dryer apparatus including an end cap having filter and noise reducing capabilities.

2. Description of Related Art

[0002] Hair treatment devices such as hairdryers and other appliances are known in the art. A hand held hair dryer or blower incorporates all of the functional components within the housing of the hair dryer, including, e.g., a motor, a blower and heating elements. The air is heated upon contact with the heating elements (generally electrical resistive elements) and then expelled at the opposite end in the form of a stream of hot air via the blower. The outlet end is shaped or may be fitted with removable adapters so as to shape the released stream of hot air.

[0003] The presence of the functional components within the housing increases the noise output of the hair dryer. The mechanical noise, in addition to the noise generated by the circulating airflow, is detracting to the user and the surrounding environment.

SUMMARY

[0004] Accordingly, the present disclosure is directed to a hair dryer apparatus, which addresses the aforementioned disadvantages of conventional hair dryers. In accordance with one embodiment, the apparatus for styling hair includes a housing dimensioned to be held in a hand of a user, and having an air inlet and an air outlet, a fan within the housing, a heater for heating air passing from the air inlet to the air outlet and an end cap mounted to the barrel adjacent the air inlet. The end cap includes an end cap frame defining an end cap axis and a reducer mounted within the end cap frame. The reducer is dimensioned to reduce acoustic energy, sound and/or vibrations associated with operation of the apparatus. The end cap may be releasably couplable to the housing.

[0005] The reducer may comprise an acoustic foam. In one embodiment, the reducer is elongated and/or may be generally frusto-conically shaped. The elongated configuration may assist in reducing the intensity of the acoustic energy, vibration and/or sound by providing a greater surface area for absorption of the energy as it propagates along the reducer. The end cap frame also may be generally frusto-conically shaped. The reducer is dimensioned to extend along a majority of an axial length of the end cap frame.

[0006] In embodiments, the end cap includes a locking ring. The locking ring is dimensioned to couple with the end cap frame to facilitate securement of the reducer. The end cap may include a filter screen, which may be mounted to the end cap frame.

[0006a] In accordance with an aspect of the present invention there is provided an apparatus for styling hair, which comprises:

a housing dimensioned to be held in a hand of a user, said housing having an air inlet and an air outlet wherein air flows downstream from said air inlet to said air outlet;

a fan within said housing;

a heater for heating air passing from said air inlet to said air outlet; and

an end cap configured for releasable coupling to said housing adjacent said air inlet, said end cap comprising:

an end cap frame defining an end cap axis;

a reducer mounted within said end cap frame, said reducer configured and dimensioned to reduce acoustic energy; and

a filter screen coupled within said end cap frame downstream of said reducer.

[0006b] In accordance with a further aspect of the present invention there is provided an apparatus for styling hair, which comprises:

a housing dimensioned to be held in a hand of a user, said housing having an air inlet and an air outlet wherein air flows downstream from said air inlet to said air outlet;

a fan within said housing;

a heater for heating air passing from said air inlet to said air outlet; and

an end cap mounted to said housing adjacent said air inlet, said end cap including:

an end cap frame defining an end cap axis;

a reducer mounted within said end cap frame, said reducer configured and dimensioned to reduce acoustic energy; and

a filter screen coupled within said end cap frame downstream of said reducer.

[0007] Other features and advantages of the hair styling apparatus will be better appreciated by the discussion hereinbelow.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] Various embodiments of the present disclosure are described hereinbelow with references to the drawings, wherein:

[0009] **FIG. 1** is a perspective view of the hair styling apparatus in the form of a blow dryer in accordance with the principles of the present disclosure illustrating the housing and the end cap mounted to the housing;

[0010] **FIG. 2** is a side elevation view of the hair styling apparatus;

[0011] **FIGS. 3-4** are perspective views of the end cap of the hair styling apparatus;

[0012] **FIG. 5** is an exploded perspective view of the end cap of the hair styling apparatus illustrating the end cap frame, reducer, lock ring and the filter;

[0013] **FIG. 6** is side elevation view of the end cap of the hair styling apparatus;

[0014] **FIG. 7** is a side cross-sectional view of the end cap of the hair styling apparatus;

[0015] **FIG. 8** is a cross-sectional illustrating one mechanism for releasably mounting the end cap to the barrel; and

[0016] **FIG. 9** is a side cross-sectional view of the end cap with the lock ring and the filter removed illustrating absorption and reflection of the acoustic energy within the reducer.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0017] **FIG. 1** is a perspective view of one illustrative embodiment incorporating the features of the present disclosure and, in the form of a hair styling apparatus **10**. The hair styling apparatus **10** includes a housing **12** having a handle frame or hand grip **14** and a barrel **16** depending from the handle frame **14.** The hand grip **14** and the barrel **16** may define a pistol configuration. Other configurations including linear are also envisioned**.** The barrel **16** defines a longitudinal barrel axis "k" and has an air inlet end **18** and an air outlet end **20**. The apparatus **10** further includes an end cap **22**, which is coupled to the handle frame **12**. Specifically, the end cap **22** is mounted adjacent the air inlet end **18** of the barrel **14** in longitudinal opposed relation to the air outlet end **20.** A power lead **24** extends from the handle frame **14** to power the apparatus.

[0018] The handle frame **12** includes a plurality of switches or control elements for controlling the functioning of the apparatus **10**. The switches or control elements may include a master switch such as a power on/off switch and/or at least one or two or more control elements or switches **26, 28**. The first control element **26** may control the resistor or heater elements **30** which heat the air entering the air inlet end **18** and emitted by the air outlet end **20**. For example, the first control element **26** may be in electrical communication with a rheostat or variable resistor to control the heat setting and level of heat applied to the air. Multiple heat settings, e.g. three, are contemplated. The second control element **28** may adjust the speed of the airflow leaving the blower or fan **32**, e.g., by varying the rotational speed of the blower **32** between a multiple of speed settings, e.g., two settings. The hair styling apparatus **10** may include a button or switch **34**, which is selectively toggled to deactivate the heater elements **30** to provide a prolonged blast of

cold air to the hair, i.e., a cold shot button **34**. Other switches or control elements for controlling auxiliary functioning of the apparatus **10** are also envisioned. The resistor or heater elements **30,** blower or fan **32**, and the motor **34** for operating the fan **32** are depicted schematically in **FIG. 1**.

[0019] Referring now to **FIGS. 3-7**, the end cap **22** connected to the air inlet end **18** of the barrel **16** will be discussed. The end cap **22** may include four components, namely, an end cap frame **36** defining an end cap axis **"m"**, a reducer **38**, a lock ring **40** and a filter **42**. The end cap frame **36** may be generally conical in configuration defining an elongated body, which reduces in cross-section away from the air inlet end **18**. The longitudinal length **"L_E"** of the end cap frame **32** ranges from about 35mm. The diameter of the end cap frame **32** is about 66 millimeters (mm) **("E_{D1}")** and reduces to about 52 millimeters (mm) **("E_{D2}")**. The end cap frame **36** defines an air intake opening **44** for reception of ambient air and is in fluid communication with the air inlet end **18** of the barrel **16** to convey the ambient air.

[0020] As best depicted in **FIGS. 5** and **7**, the reducer **38** is also frusto-conical in configuration, and may generally correspond in dimension to the internal boundary of the end cap frame **36**. The reducer **38** defines a longitudinal length **"L_R"** extending more than half the length, e.g., a majority of the length, of the end cap frame **36**. In embodiments, the length of the reducer **38** is about 59.4 millimeters (mm) adjacent the air inlet end **18 ("R_{D1}")** of the barrel **16**, and reduces to about 49 millimeters (mm), remote from the barrel **16 ("R_{D2}").** Other dimensions of the variations of the end cap **22** and the reducer **38** are also envisioned while maintaining the general relative geometry and tapers of the components.

[0021] The reducer **38** is dimensioned to reduce acoustic energy, sound and/or vibration associated with operation of the apparatus **10**. In embodiments, the reducer **38** includes a noise and/or vibration reducing material such as an acoustic foam ring. The foam ring is adapted to remove residual sound and vibrations within the end cap frame **32**. For example, the foam ring is characterized by having very low reflecting capabilities coupled with high absorption capabilities to absorb acoustic or sound energy. Suitable acoustic foam materials include any commercially-available acoustic open cell foam. In addition, the elongated axial length of the reducer **38** increases the surface area to which the acoustic, sound and/or vibration waves are exposed during propagation through the end cap **36** thereby further facilitating absorption within the foam of the reducer **38**. In addition, the conical shape of the reducer **38** may further facilitate noise reduction by increasing the distance of travel of the propagating waves not absorbed by the foam of the reducer **38**, including, longitudinal and radial relative components of direction, relative to the end cap axis **"m"**.

[0022] The reducer **38** may be mounted within the end cap frame **32** through any conventional arrangement. In one embodiment, the lock ring **40** is assembled within the end cap frame **36** in a manner securing the reducer **38** between the components. For example, the lock ring **40** may include an inner annular ledge **46** which is received within a corresponding annular locking recess **48** of the end cap frame **36** in snap relation therewith thereby securing the lock ring **40** to the end cap frame **36** with the periphery of the reducer **38** disposed therebetween. Other arrangements are envisioned including with the use of cements, adhesives or the like.

[0023] The lock ring **40** further includes at least two spacers **50** which engage the inner surface of the reducer **38** and at least three locking detents **52**. The spacers maintain **50** the positioning of the reducer **38** relative to, or against, the inner wall of the end cap frame **36** to, e.g., prevent migration relative to the end cap frame **36**. The locking detents **52** engage a corresponding annular recess **54** within the barrel **16** adjacent the air inlet end **18** to secure the end cap **22** to the barrel **16** in snap relation therewith. **FIG. 8** is a partial view in cross-section illustrating engagement of one locking detent **52** with the edge defining the inner annular locking ledge **54** within the barrel **16.** The lock ring **40** further includes an internal annular shelf **56,** which receives the periphery of the filter **42** thereby securing the filter **42** relative to the end cap **22**. The filter **42** may be any known screen style filter, which traps lint, dust and hair or the like. In one embodiment, the filter **42** is removable from the internal annular shelf **56** to be cleaned and/or replaced.

[0024] The end cap **22** is selectively releasable relative to the barrel **16**. For example, removal of the end cap **22** may be affected through engagement of the end cap frame **36**, and directing an outward force away from the barrel **16** causing the locking detents **52** to temporarily be displaced in the direction of inward arrow **"t"** (**FIG. 8**) to permit release from the annular recess **54** within the barrel **16**. The end cap **22** may be mounted to the barrel **16** by advancing the end cap frame **36** toward the air inlet end **18** of the barrel **16** whereby the locking detents **52** deflect inwardly whereby upon encountering the locking ledge **54** return outwardly to secure the end cap frame **36** relative to the barrel **16**. The filter **42** may be selectively released from the end cap frame **36**, i.e., with the end cap **22** removed from the barrel **16**, for cleaning and/or replacement.

[0025] During use, the apparatus **10** is activated. Air is drawn within the into the air intake opening **44** of the end cap **22**. As depicted in **FIG. 9**, acoustic energy or waveforms, noise and/or vibration **"e"** associated with operation of the motor and fan, in addition to noise generated by the intake of air the air intake is minimized, reduced and/or absorbed by the reducer **38**. In **FIG. 9**, the lock ring **40** and the filter **42** are removed for clarity. The acoustic foam of the reducer **38** absorbs at least some or most of the acoustic energy or at least partially reflects the acoustic sound waves. As hereinabove discussed, the elongated axial length, e.g., frusto-conical shape, of the reducer **38** increases the surface area upon which the acoustic, sound or vibration waves contacts thereby further facilitating absorption within the foam of the reducer **38**. Any residual energy waves not absorbed by the reducer **38** is, in effect, dampened due to the open cell and soft surface of the foam thereby further facilitating noise reduction.

[0026] Although the illustrative embodiments of the present disclosure have been described herein with reference to the accompanying drawings, the above description, disclosure, and figures should not be construed as limiting, but merely as exemplifications of particular embodiments. It is to be understood, therefore, that the disclosure is not limited to those precise embodiments, and that various other changes and modifications may be effected therein by one skilled in the art without departing from the scope or spirit of the disclosure.

WHAT IS CLAIMED IS:

1. An apparatus for styling hair, which comprises:

a housing dimensioned to be held in a hand of a user, said housing having an air inlet and an air outlet wherein air flows downstream from said air inlet to said air outlet;

a fan within said housing;

a heater for heating air passing from said air inlet to said air outlet; and

an end cap configured for releasable coupling to said housing adjacent said air inlet, said end cap comprising:

an end cap frame defining an end cap axis;

a reducer mounted within said end cap frame, said reducer configured and dimensioned to reduce acoustic energy; and

a filter screen coupled within said end cap frame downstream of said reducer.

2. The apparatus according to claim 1, wherein said reducer comprises acoustic foam.

3. The apparatus according to claim 2, wherein said reducer is an elongated ring.

4. The apparatus according to claim 3, wherein said reducer is substantially frusto-conically shaped.

5. The apparatus according to claim 4, wherein said end cap is substantially frusto-conically shaped.

6. The apparatus according to claim 5, wherein said reducer is dimensioned to extend along a majority of an axial length of said end cap frame.

7. The apparatus according to claim 4, wherein said end cap includes a locking ring, said locking ring dimensioned to couple with said end cap frame to facilitate securement of said reducer.

8. The apparatus according to any one of claims 1 to 7 wherein said filter screen is releasable mounted to said locking ring.

9. The apparatus according to claim 8, wherein said locking ring includes a plurality of spacers, said spacers engageable with interior surface portions of said reducer to secure said reducer relative to said end cap frame.

10. The apparatus according to claim 8, wherein said lock ring includes an internal annular shelf configured for at least partial reception of said filter screen.

11. The apparatus according to claim 8, wherein said filter screen is configured to trap one of dust, lint or hair.

12. An apparatus for styling hair, which comprises:

a housing dimensioned to be held in a hand of a user, said housing having an air inlet and an air outlet wherein air flows downstream from said air inlet to said air outlet;

a fan within said housing;

a heater for heating air passing from said air inlet to said air outlet; and

an end cap mounted to said housing adjacent said air inlet, said end cap including:

an end cap frame defining an end cap axis;

a reducer mounted within said end cap frame, said reducer configured and dimensioned to reduce acoustic energy; and

a filter screen coupled within said end cap frame downstream of said reducer.

13. The apparatus according to claim 12, wherein said end cap frame and said housing includes cooperating mounting structure configured to releasably couple to releasable mount said end cap to said housing.

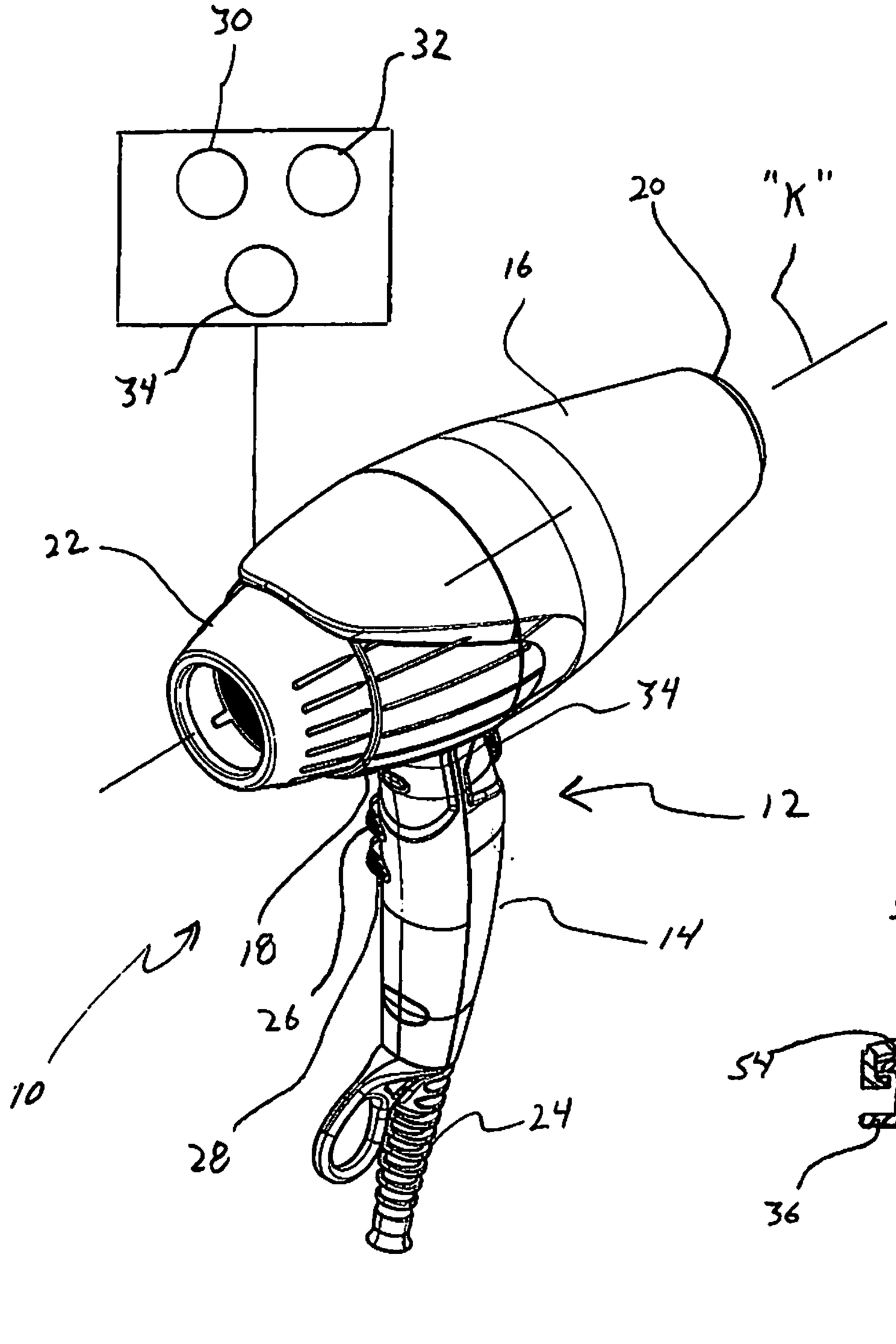


FIG. 1

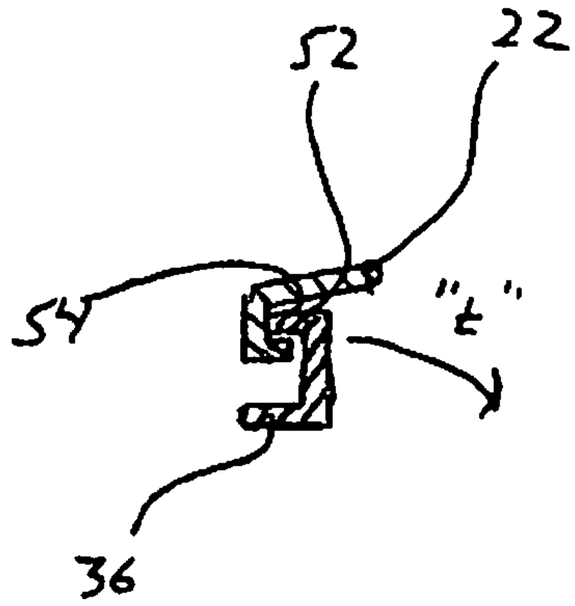


FIG. 8

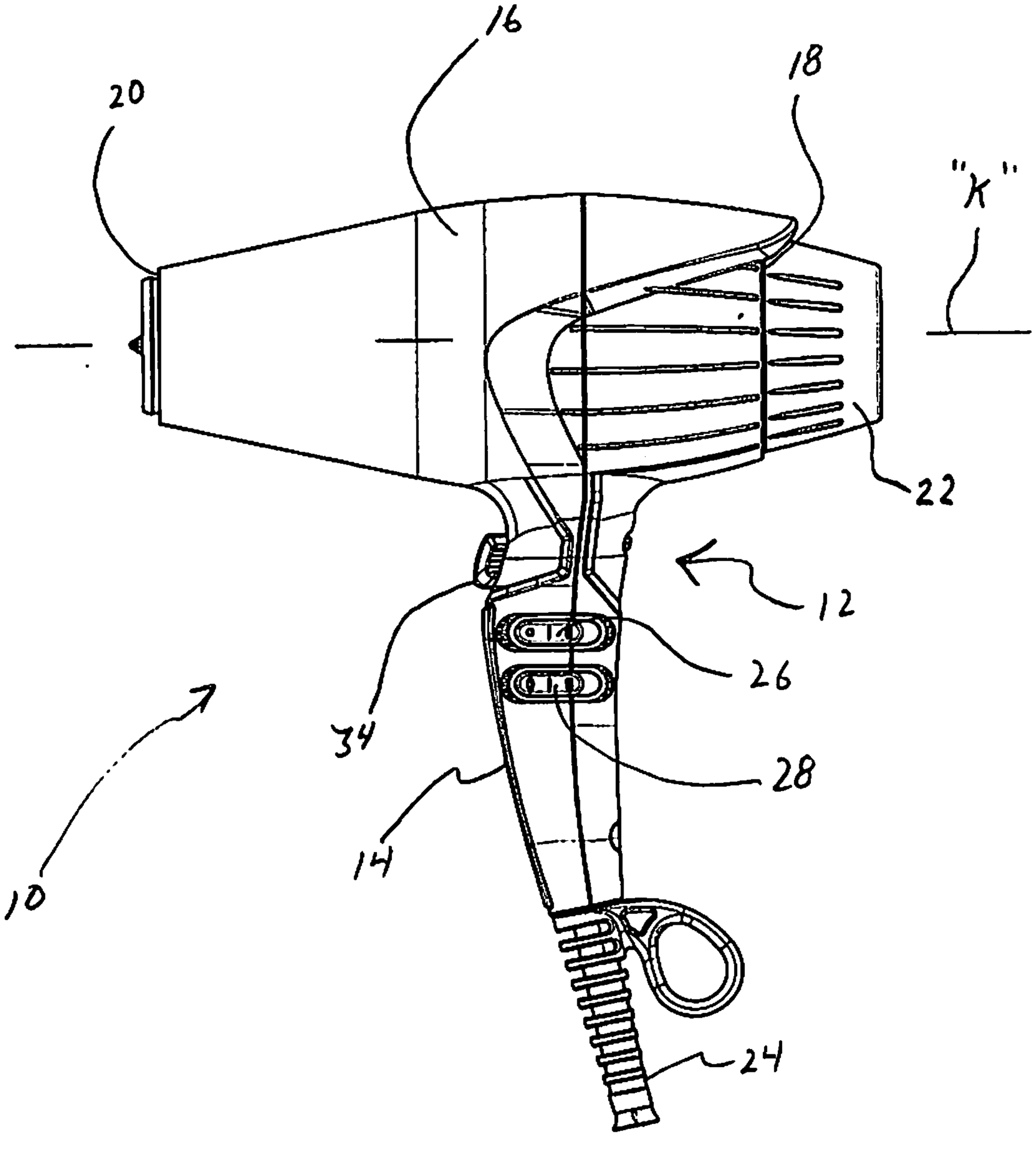


FIG. 2

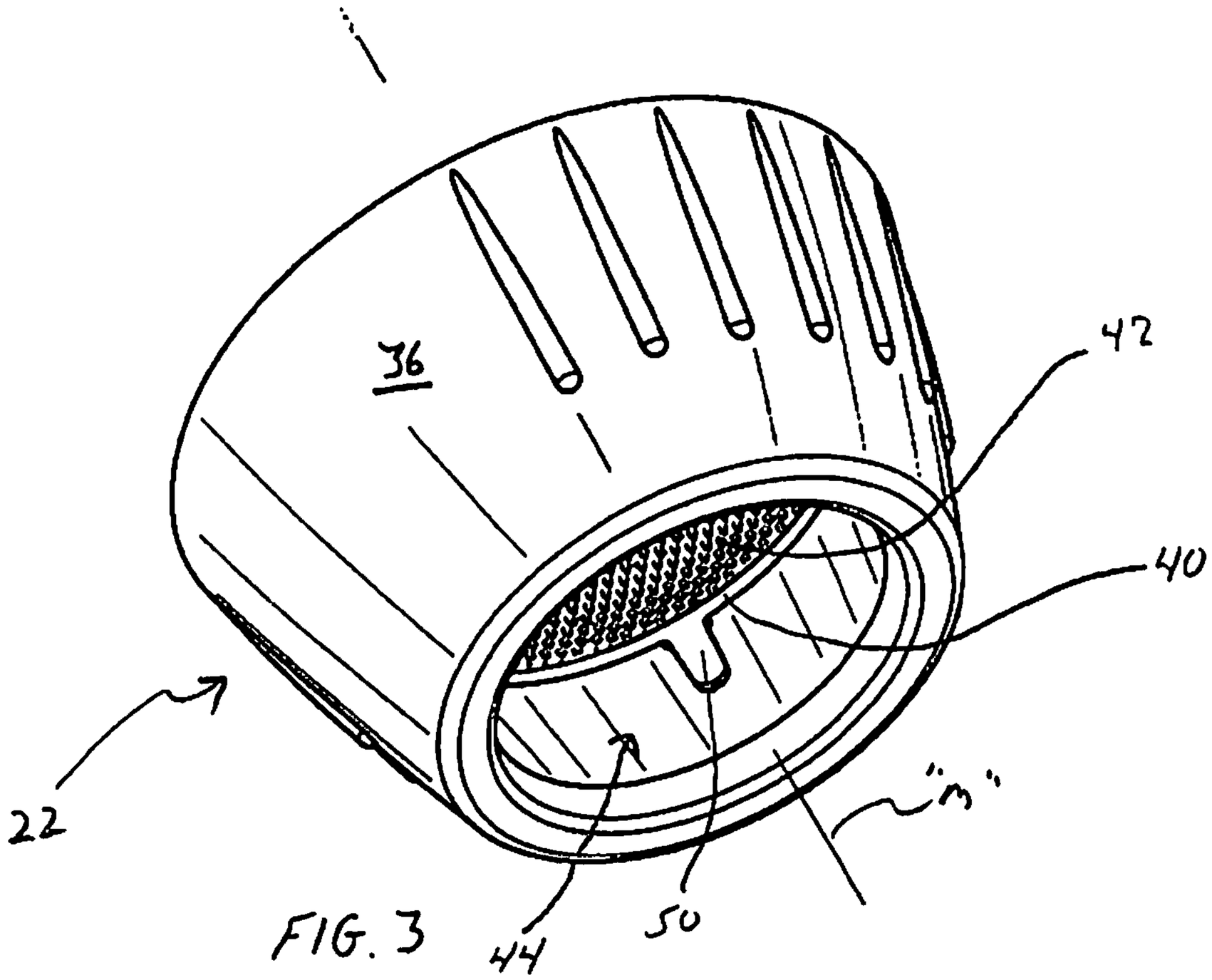


FIG. 3

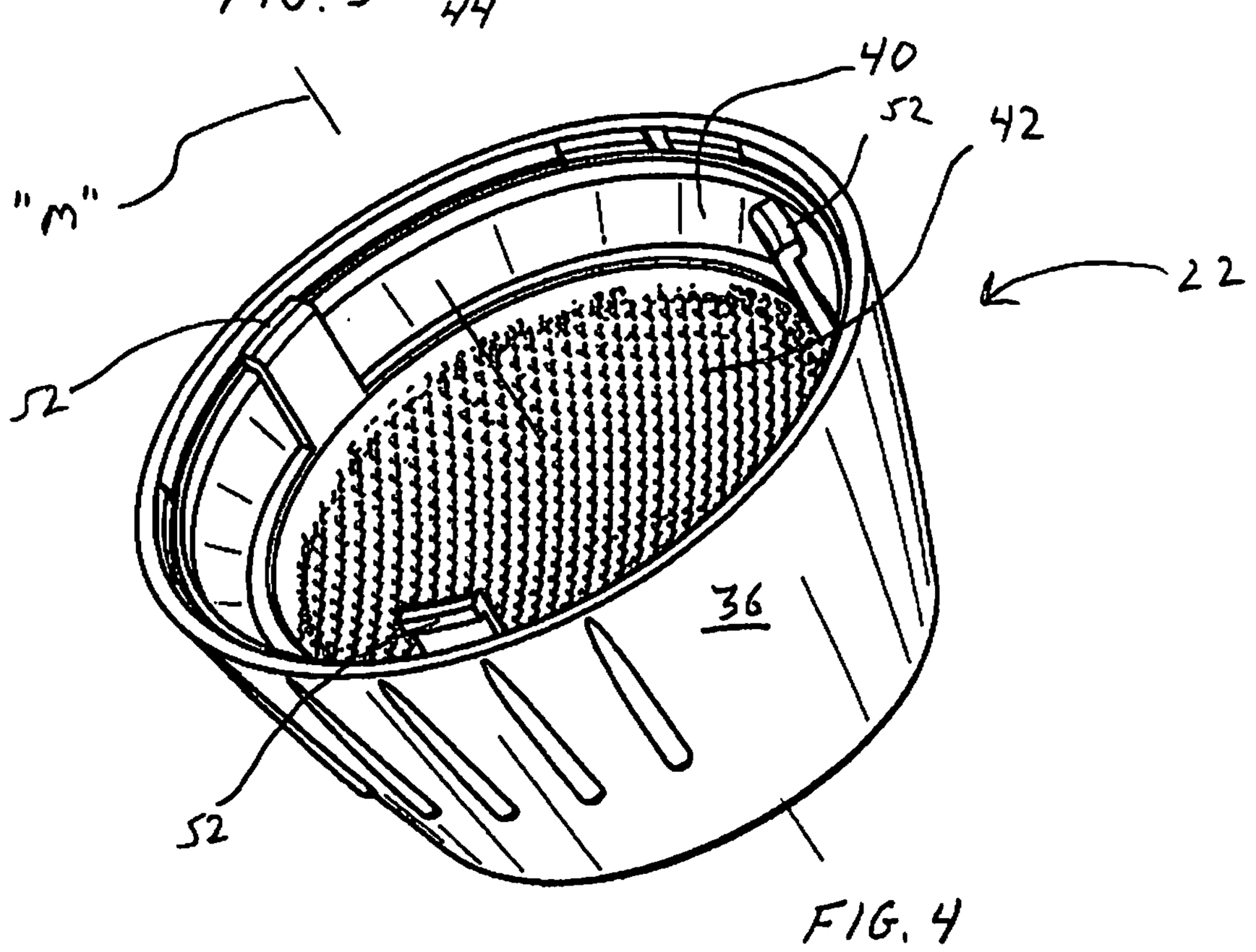


FIG. 4

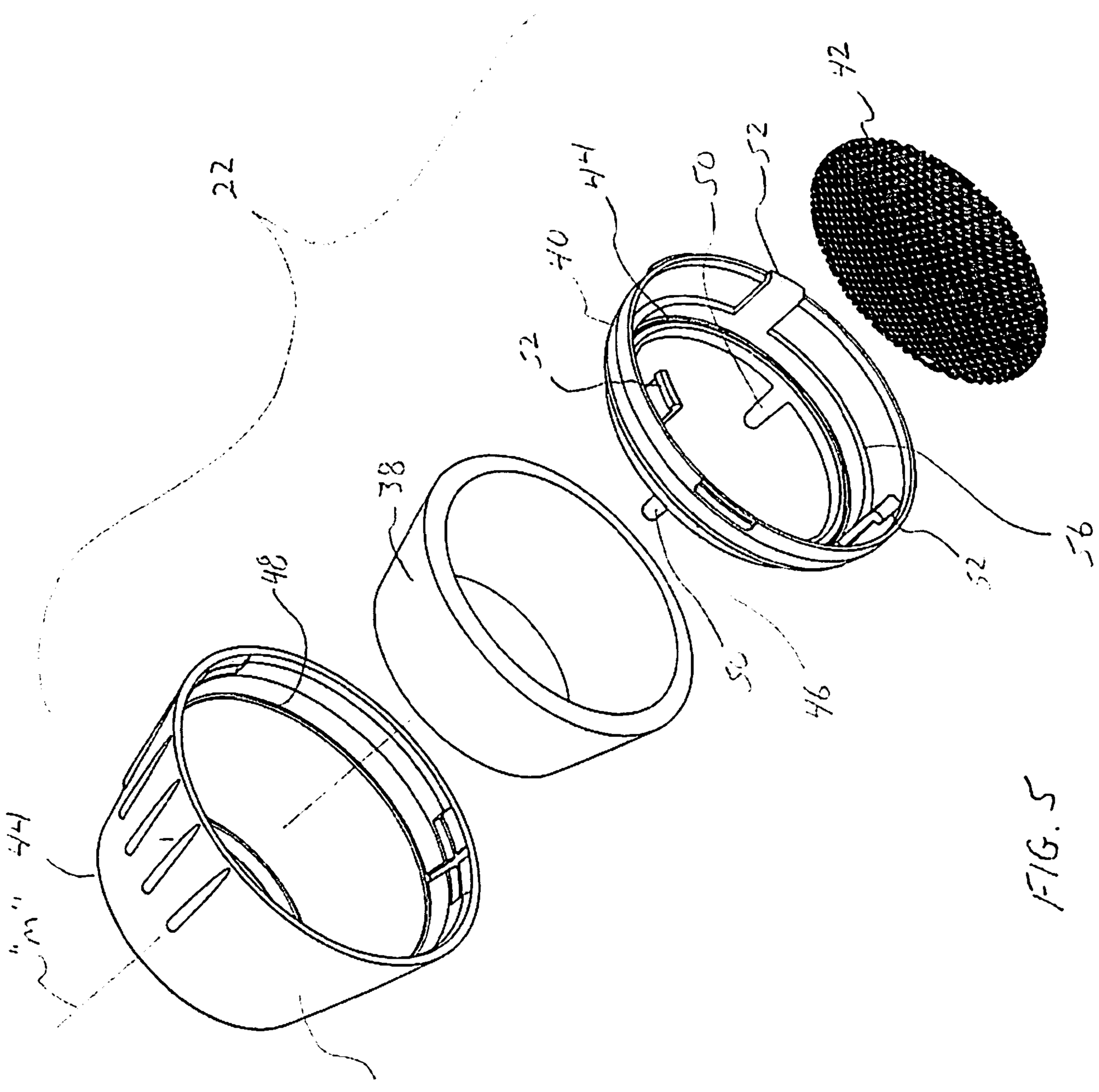


FIG. 5

FIG. 6

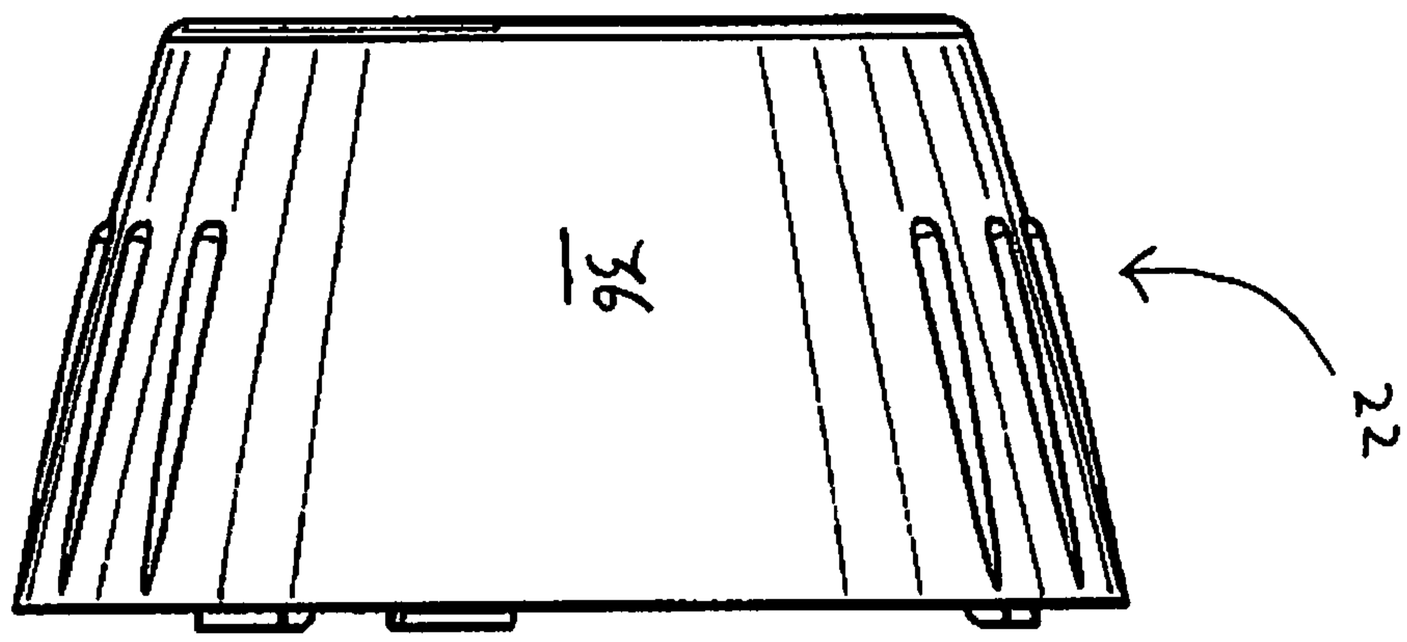
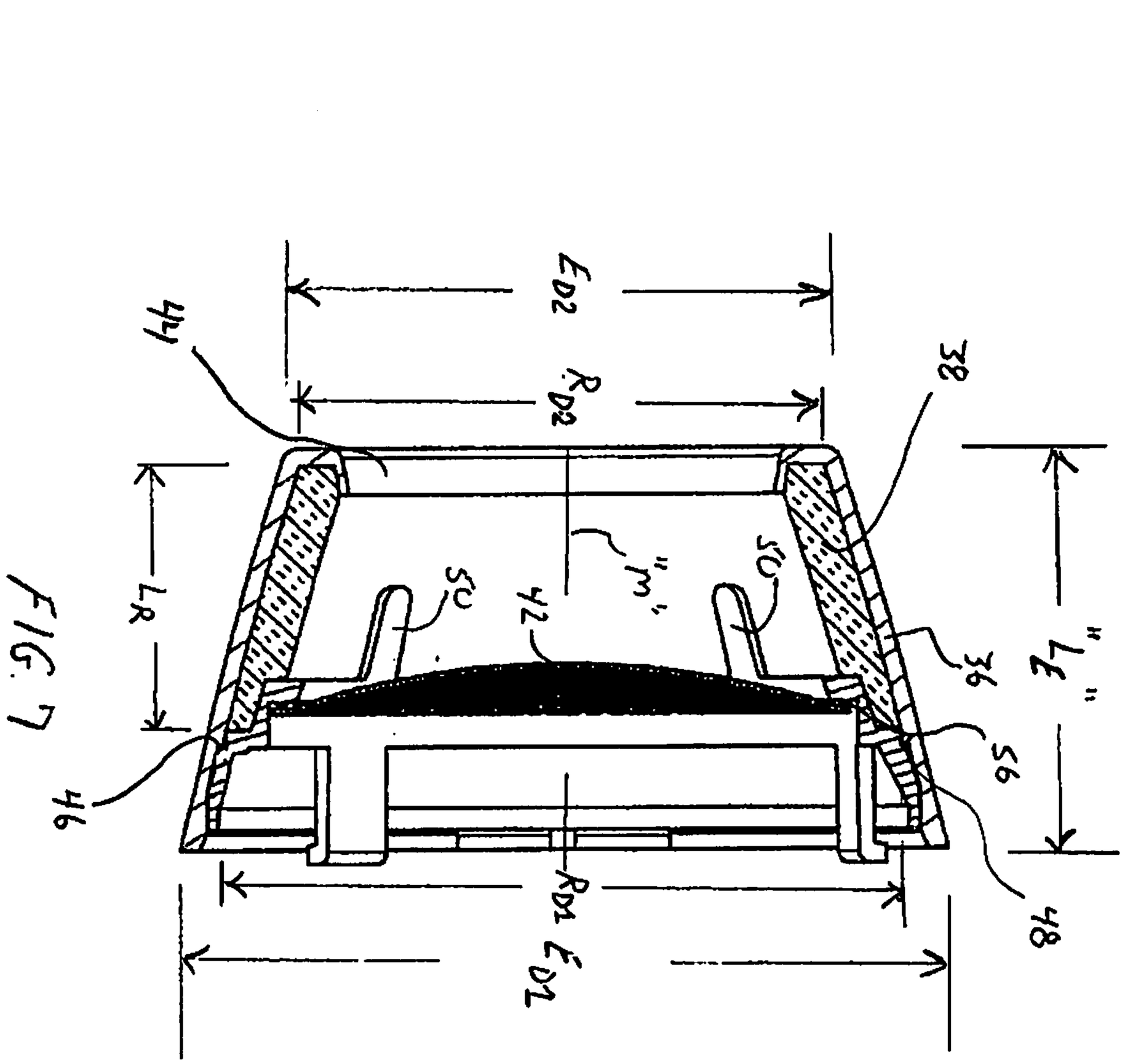


FIG. 7



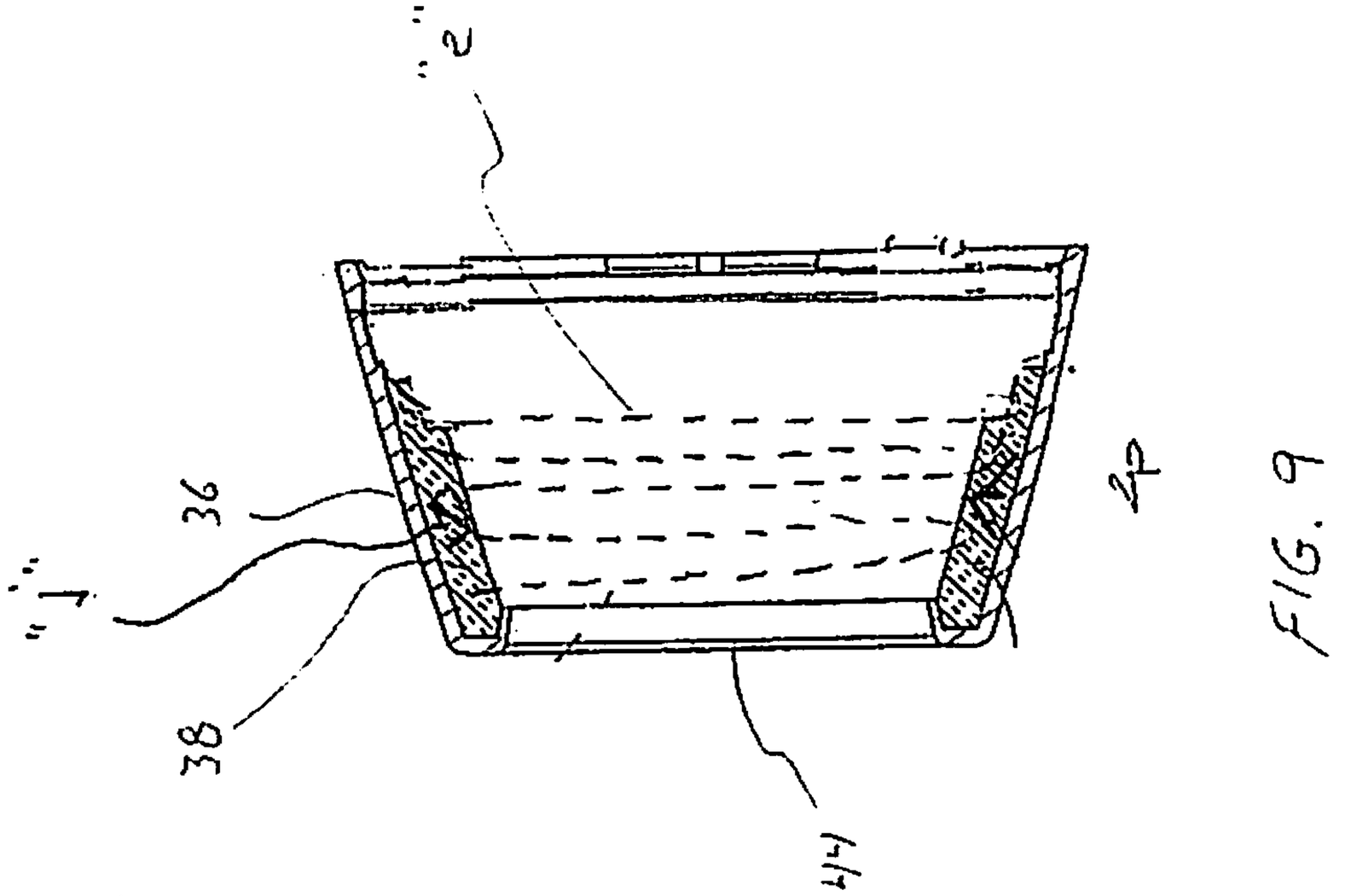
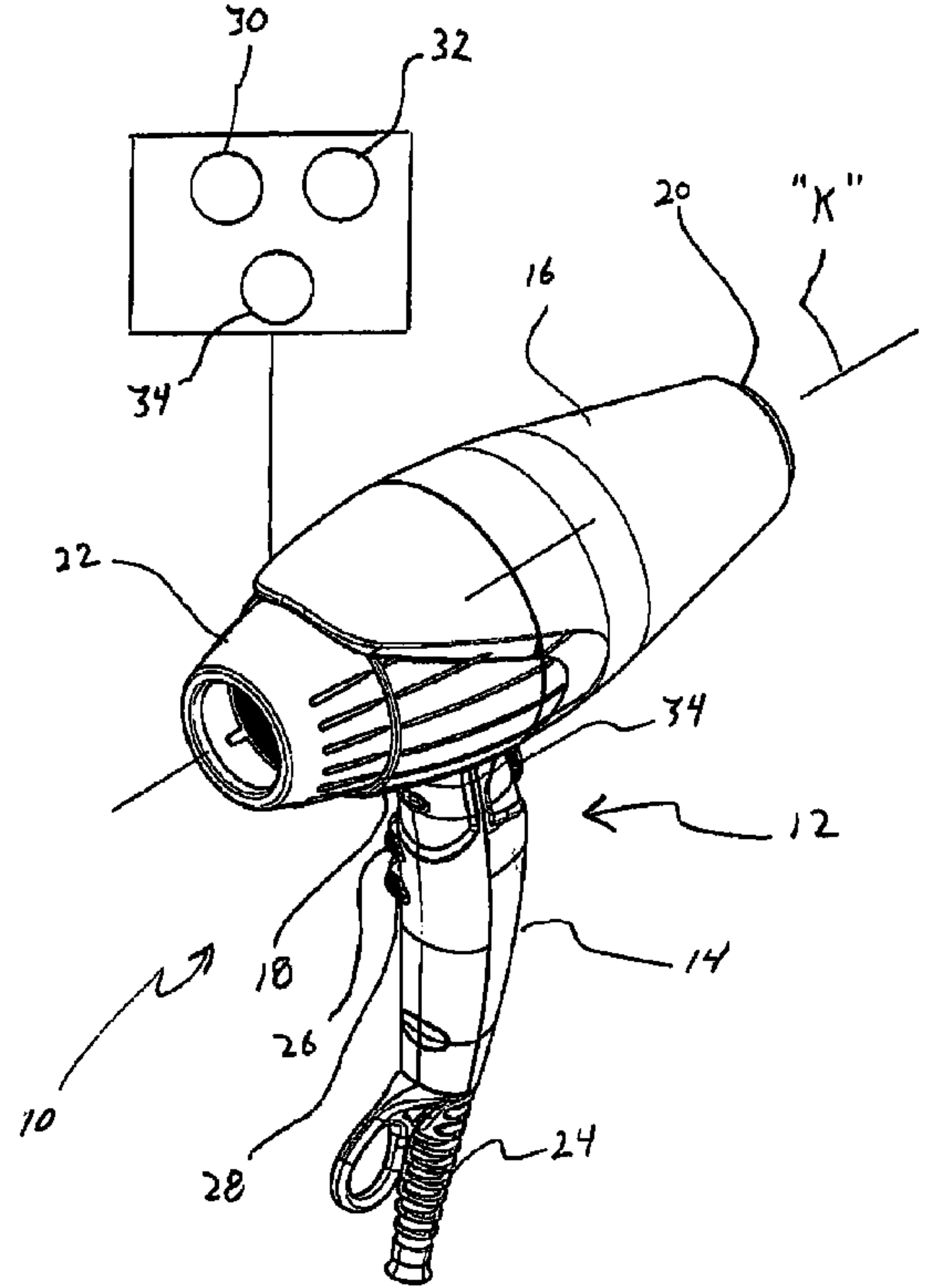


FIG. 9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