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(71) Applicant *(for all designated States except US)*: **BAUSCH & LOMB INCORPORATED** [US/US]; One Bausch & Lomb Place, Rochester, New York 14604-2701 (US).

(72) Inventor; and
(75) Inventor/Applicant *(for US only)*: **FITZPATRICK, Matthew, J.** [US/US]; 2010 Alameda Avenue, St. Louis, Missouri 63143 (US).

(74) Agents: **LARSON, Craig, E.** et al.; BAUSCH & LOMB INCORPORATED, One Bausch & Lomb Place, Rochester, New York 14604-2701 (US).

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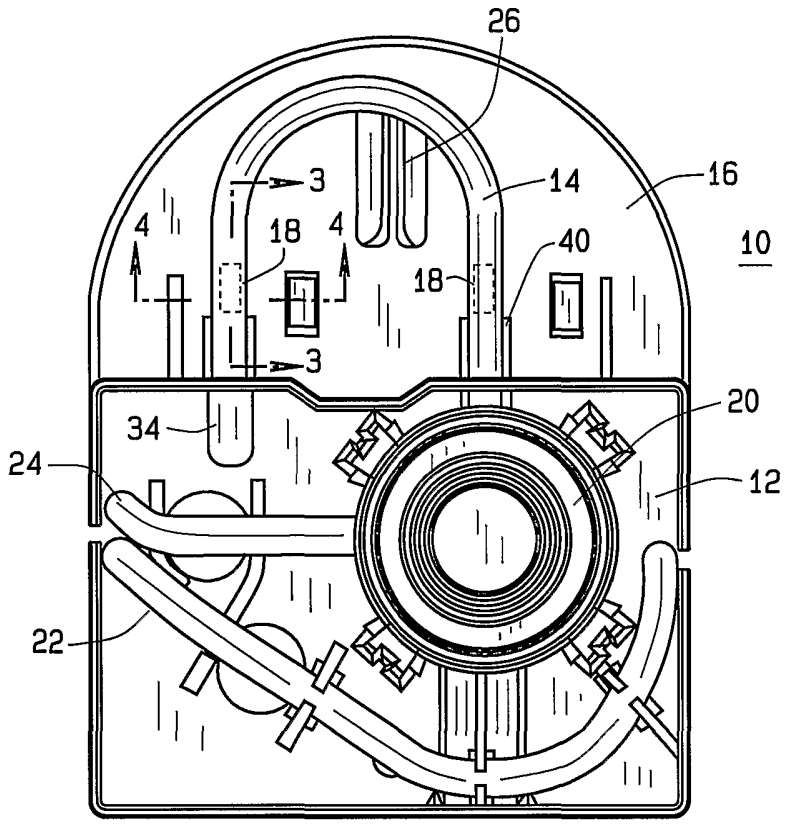
(54) Title: PERISTALTIC PUMP CARTRIDGE WITH TUBE STANDOFF



(57) Abstract: Peristaltic pump cartridge (10) includes a housing (12) and a length of tubing (14) connected to the housing for engagement with a pump roller head (42). A cover plate (16) is connected to the housing (12) and oriented essentially parallel to the length of tubing (14). At least one standoff tab (18) is connected to the cover plate (16) to ensure that the length of tubing (14) is at least a known distance from the cover plate (16) to facilitate engagement of the tubing (14) with the pump roller head (42).

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— *as to the identity of the inventor (Rule 4.17(i))*

Published:

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— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

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PERISTALTIC PUMP CARTRIDGE WITH TUBE STANDOFF

Background of the Invention

1. Field of the Invention

The present invention relates to peristaltic pump cartridges and more specifically, to pump cartridges having a loop of tubing material for engagement with a peristaltic pump head.

2. Description of Related Art

Peristaltic pump cartridges are well known in the art. Peristaltic pumps and the related pump cartridges for collecting aspirant from surgical sites are well known in many areas of surgery, including ophthalmic surgery.

Typically, a peristaltic pump cartridge includes some sort of housing with one or more lengths of tube for engagement with a peristaltic pump roller head. Upon operation of the peristaltic pump head, aspirant fluid is then pumped from the surgical site through tubing of the cartridge and into a collection bag or reservoir.

It is very important for the tubing and the pump cartridge to properly engage with the peristaltic pump roller head, so that the tubing is completely pinched-off at intervals by the rollers of the pump head. If proper engagement of the cartridge tubing with the pump head does not occur, then little or no aspirant will be pumped from the surgical site into the collection bag.

There have been many prior attempts to ensure that the tubing is properly engaged with the pump head. Getting the tubing between the pump head and a backing plate and to be properly engaged has typically been achieved in one of three ways. The first method is to manually thread the tubing between the head and the backing plate. This is somewhat cumbersome, time consuming, and inconvenient for a user. The second and third methods include the use of a cartridge that has a length of tubing exposed. The second method includes a threading member or finger that extends beyond the pump head, and as the pump head rotates, the finger threads the tubing onto the pump head. This requires a specially designed threading finger, but generally results in an easy to load pump. The third method includes a cartridge with a portion of the cartridge forming the backing plate. The cartridge is then urged toward the pump head. This method is also convenient for the user, but has a potential drawback in that the backing plate of the cartridge typically does not cooperate with the pump head over a sufficiently large radius. This relatively small radius of interaction can lead to unwanted pulsation and aspirant flow through the system.

Yet another prior art peristaltic pump does not use any backing plate at all. Instead, a cartridge with a loop of tubing is placed around a pump head and a cartridge holder is then moved away from the pump head until the tubing loop is sufficiently stretched, such that the rollers of the pump head pinch close the tubing without a backing plate. The extent to which the tubing must be stretched is a cause for concern. Also, without a backing plate, unwanted pulsation is likely to occur. This pulsation can result in dangerous and undesirable

intraocular pressure in the eye and may also affect chamber stability during surgery.

Yet another inventive peristaltic pump system has been disclosed and is commonly assigned to Bausch & Lomb Incorporated. This inventive pump head was described in U.S. Patent Application 10/673,969 filed on 29 September 2003, and is entitled "A Peristaltic Pump Cartridge Including An Aspirant Collection Bag For Use In Ophthalmic Surgery". This application is hereby incorporated in its entirety by reference and describes in detail the operation of the peristaltic pump and the related cartridge. This peristaltic pump includes a moveable pump head which drops down, such that the loop of tubing for use with the pump head surrounds the pump head and then the pump head is then moved upwardly to engage the loop of material against the backing plate. This system requires that the loop of tubing material be in a relatively precise known location in order for the tubing material to properly engage with the pump head.

Therefore it would be desirable to have a feature of the cartridge which ensures the alignment of the tubing loop of the cartridge with the roller pump head.

Brief Description of Drawings

FIG. 1 is an elevation view of a peristaltic pump cartridge in accordance with the present invention;

FIG. 2 is a side elevation view of FIG. 1;

FIG. 3 is a partial cut-away view of FIG. 1 taken along line 3-3;

FIG. 4 is a partial cut-away view of FIG. 1 taken along line 4-4;

FIG. 5 is an isometric perspective view of a peristaltic pump cartridge in accordance with the present invention without the tubing and other parts; and

FIG. 6 is a side elevation view of a peristaltic pump cartridge in accordance with the present invention engaged with a peristaltic pump head.

Detailed Description of the Preferred Embodiment

FIG. 1 shows a peristaltic pump cartridge 10, in accordance with the present invention. Cartridge 10 includes a housing 12 having a collection chamber or bag (not shown in this view) attached for holding aspirant from a surgical site. A length of tubing 14 connected to the housing 12 for engagement with a roller pump head is more particularly described in the above-referenced co-pending patent application. A cover plate 16 is connected to the housing 12 and oriented essentially parallel to the length of tubing 14. At least one and preferably two standoff tabs 18, shown as dashed lines, are connected to the cover plate 16. The standoff tabs 18 ensure that the length of tubing 14 is at least a known distance from the cover plate 16 to facilitate engagement of the tubing 14 with the pump roller head. Preferably the housing and cover plate are molded and formed of ABS (acrylonitrile butadiene styrene) thermoplastic resin. It is noted that because of the design of the pump head it does not matter if the tubing 14 becomes bent away from cover plate 16 because tubing will still properly engage with the pump head. The standoff tabs 18 ensure that the

tubing 14 is sufficiently surrounding the pump head when the cartridge 10 is loaded into the pump.

While the operation of the peristaltic pump and cartridge is more particularly described in the above-referenced co-pending patent application, the pump cartridge preferably includes a pressure transducer 20, irrigation fluid tubing 22, and fluid vent tubing 24, as well as handle 26.

Referring to FIG. 2, pump cartridge 10 is shown from the side without a collection bag attached. Typically, a collection bag is hung from a tab or hook 32 and connected to the tubing loop 14 via nipple 34. Fitment 28 connects fluid vent line 24 and irrigation line 22 to irrigation source line 30. As can be easily seen, standoff tabs 18 ensure that tubing 14 stands up essentially parallel to cover plate 16, so that proper engagement is made with a peristaltic pump roller head. It has been experienced that without such standoff tabs 18 during other handling, tube 14 may be displaced towards cover plate 16, such as that shown by dashed line 36. If tubing 14 is displaced, such as shown by dashed line 36, then a pump roller head will not engage the tubing and the pumping system will not operate. This simple and elegant solution of providing the standoff tabs 18 has been shown to provide a proper standoff distance to ensure that tubing 14 engages with a pump roller head when inserted into a pump system.

FIG. 3 shows a partial cut-away view detail of standoff tabs 18 taken along line 3-3 of FIG. 1. As can be seen, tab 18 is connected to cover plate 16 either by molding or by some other well known attachment mechanism, such as adhesive or connection means.

FIG. 4 is another partial cut-away detail, showing standoff tab 18 connected to cover plate 16 and holding tube 14 in its proper location. As can best be seen in FIG. 4, tabs 18 preferably include a concave surface 38 for mating with the curvature of tubing 14 to ensure that the tubing 14 seats against tabs 18. Referring back to FIG. 1, the length of tubing 14 includes a first end connected to an inlet 40 and a second end connected through outlet 34 to a collection chamber, not shown.

FIG. 5 shows a perspective view with the tubing 14, 22, and 24 removed, as well as the pressure transducer 20 removed. FIG. 5 clearly shows standoff tabs 18 connected against cover plate 16, as well as the concave surface 38.

FIG. 6 is a side elevation view, essentially the same as that shown in FIG. 2, with the addition of a partial view of a pump roller head 42 connected to the tubing 14. As can be seen, if tubing 14 were in its position shown by dashed line 36, engagement with the pump roller head 42 would be impossible. Therefore, the addition of the standoff tabs 18 help to ensure that tubing 14 remains properly oriented for engagement with pump roller head 42.

Thus has been described a simple, elegant, and inexpensive manner to ensure the proper alignment of peristaltic pump cartridge tubing with a peristaltic pump roller head. Other embodiments and variations of the embodiment described above may occur to those skilled in the art and still be within the scope of the present invention.

I Claim:

1. An ophthalmic pump cartridge comprising:

a housing including a collection chamber for holding aspirant from a surgical site;

a length of tubing connected to the housing for engagement with a pump roller head;

a cover plate connected to the housing and oriented essentially parallel to the length of tubing; and

at least one standoff tab connected to the cover plate for ensuring that the length of tubing is at least a known distance from the cover plate to facilitate engagement of the tubing with the pump roller head.

2. The cartridge of claim 1, wherein the housing is formed of thermoplastic resin.

3. The cartridge of claim 1, wherein the length of tubing includes a first end connected to an inlet and a second end connected to the collection chamber.

4. The cartridge of claim 1, wherein the cover plate includes a handle.

5. The cartridge of claim 1, wherein the cartridge includes a pair of standoff tabs and wherein the tabs include a concave end for mating with the tubing.

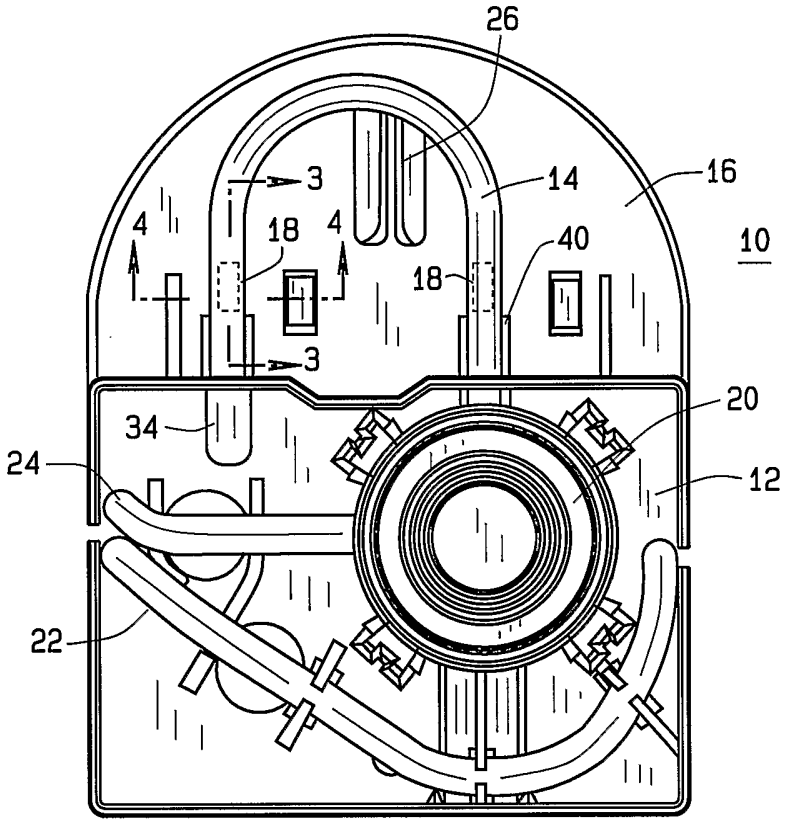

FIG. 1

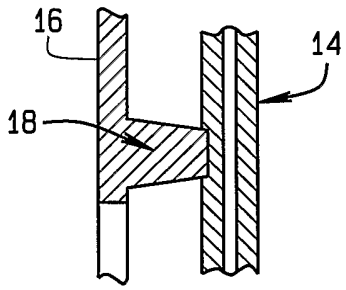

FIG. 3

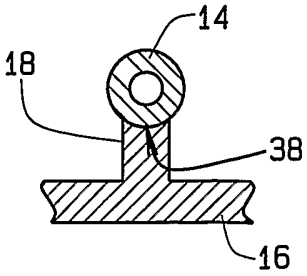

FIG. 4

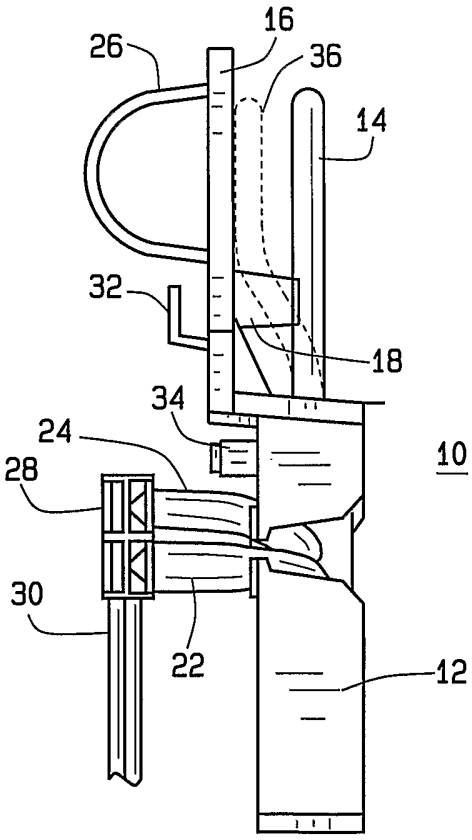

FIG. 2

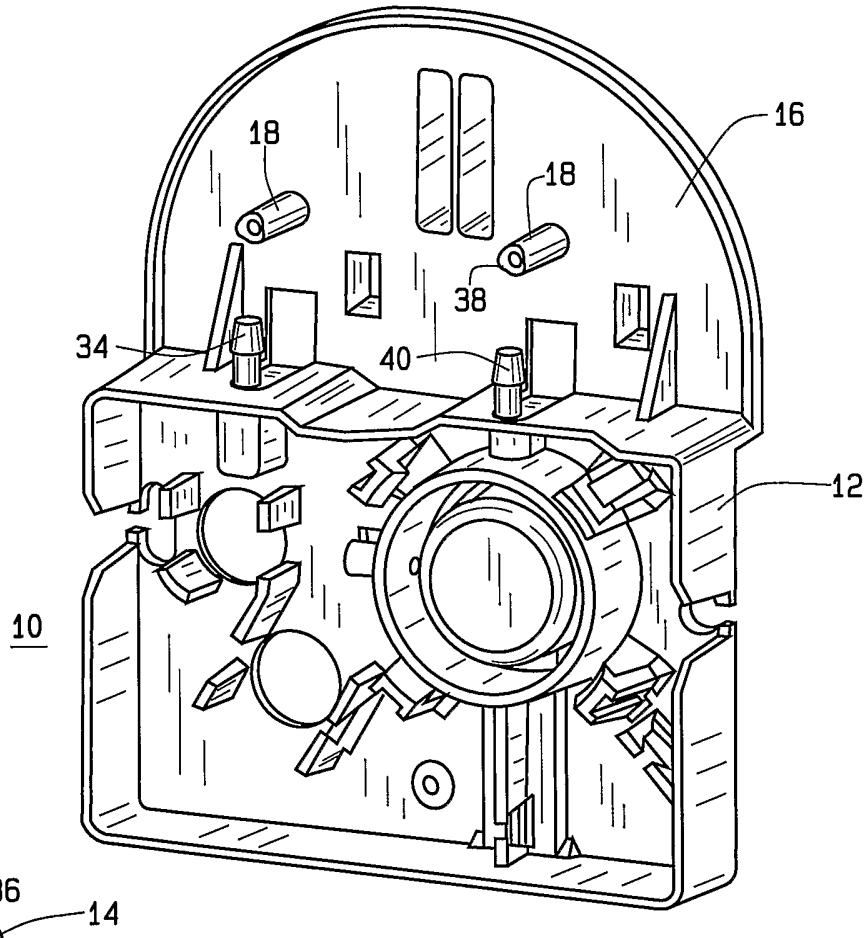

FIG. 5

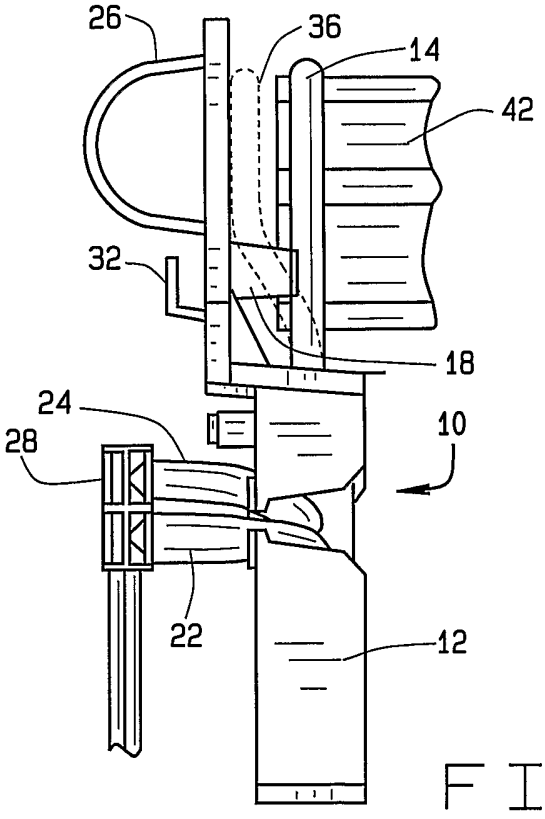

FIG. 6

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2005/045014

A. CLASSIFICATION OF SUBJECT MATTER
A61F9/007 F04B43/12 A61M1/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A61F F04B A61M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 106 366 A (STEPPE ET AL) 21 April 1992 (1992-04-21) figure 3 column 3, line 35 - column 4, line 37 column 5, lines 23-43	1-3
Y		4,5

X	US 4 713 051 A (STEPPE ET AL) 15 December 1987 (1987-12-15)	1
Y	figures 2,3,7 column 5, line 42 - column 7, line 24	5

Y	US 2003/190244 A1 (DAVIS SHERMAN G ET AL) 9 October 2003 (2003-10-09) figure 10 paragraph [0026]	4

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
4 April 2006	25/04/2006

Name and mailing address of the ISA/	Authorized officer
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INTERNATIONAL SEARCH REPORT

International application No
PCT/US2005/045014

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Form PCT/ISA/210 (continuation of second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
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