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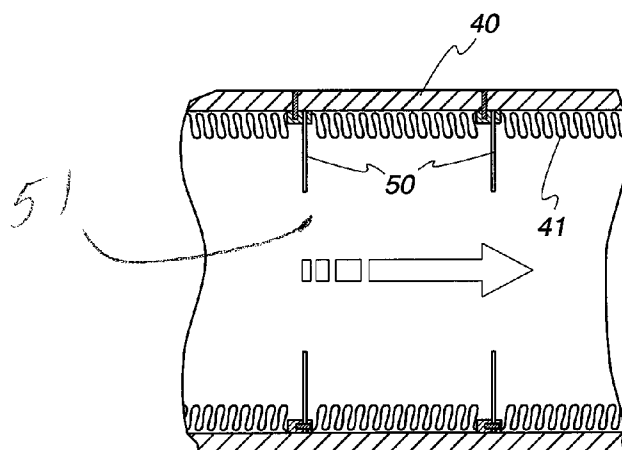


Fig. 6

(57) Abstract: A device for transporting articles is disclosed. In the illustrated and described embodiment of the invention, the articles are fruit such as apples, and the articles can be transported from a picking location on a fruit tree to a collection bin or other site. The device includes a tube member adapted to receive and transport the articles, and a plurality of deformable baffles at spaced-apart locations within the tube. Each baffle defines an aperture which permits the article to engage and deform the baffle and aperture so as to move through the aperture and down the tube. The article is urged through the tube by a pressure differential created across the article. In the described and illustrated embodiment of the invention, this pressure differential is a pneumatic pressure differential.

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TRANSPORT SYSTEM FOR FRUIT AND LIKE OBJECTS

This application claims priority from U.S. provisional patent application 60/920,069 filed March 26, 2007; and from U.S. provisional patent application serial number 60/949,630 filed July 13, 2007.

5 BACKGROUND OF THE INVENTION

This invention relates generally to systems for transporting small objects, and more particularly relates to pneumatic transport systems.

Presently in the fruit industry, most specifically in the apple industry, fruit is traditionally handpicked. The pickers carefully place the fruit in apple bags which are worn on the shoulders of the pickers, extending downward over the chest and abdomen to the groin. The pickers then gently release the fruit into large bins for later transport to a packing or processing plant. This technique provides for the “on-tree” selection by the picker of the appropriate fruit (apples) for picking utilizing the visually discernible criteria of color size and quality. Good pickers remove the fruit from the tree while keeping the stem intact on the fruit so as to maintain the integrity of the following years fruiting bud on the tree. On occasion, the picking operations must contend with the clipping of overly stiff or long stems; the gentle placement of the fruit into the picking bag to prevent bruising; and the transfer and delivery of the fruit to a larger size container better adapted for truck transport. Fruit located on high limbs may require that the picker climb a ladder or stand on a scaffold to reach the fruit. The fruit bins are usually placed in the row between tree lines and spaced so that they can be filled by apples transferred from the picker's bag within the shortest walking distance. The bins are then picked up by an apple trailer pulled by a tractor and taken to a common holding site awaiting forklift placement onto a flatbed truck.

25 This fruit picking process results in about 30% of the picker's time actually picking fruit, with the remaining 70% of the time gently placing the fruit into bags or bins after having clipped the stems when required, moving and climbing up and down ladders, carrying fruit from one place to another, then walking to and carefully releasing the picker's bag load of apples into the collecting bin taking special care not to cause a

30 blemish or bruise on the fruit by rough handling. The picker's bag load may weigh 40 pounds or more leading to fatigue of the picker and a reduction in efficiency.

Due to the seasonal nature of the fruit harvest, fruit pickers are frequently found amongst migrant worker groups often from countries outside the United States. As a result of stringent U.S. immigration policies, a sufficient numbers of pickers may not be
35 available to pick the fruit at harvest time. Due to the slowness of the fruit handpicking process, large numbers of pickers are required when the fruit reaches the proper point of ripeness. Since individual productivity is low when fruit is handpicked, wages remain low for the individual picker. This in turn results in the propagation of a population of below average wage earners.

40 It is an objective of this invention to improve the productivity of the individual picker while maintaining the advantages of the hand picking process, namely: selectivity of fruit to be picked, gentleness to prevent bruising at all stages of movement and packing and stem trimming when needed is desirable.

To accomplish this objective, a system involving specially modified and
45 augmented pneumatic tubes is presented.

DESCRIPTION OF THE DRAWINGS

Figure 1 is an elevational view showing an exemplary apple picker who is picking apples from a tree and depositing the apples in an embodiment of the invention for transport to an apple collection bin.

50 Figure 2 is an elevational view showing a tractor and trailer upon which are mounted apple picking stations being used by apple pickers who are depositing the picked apples in an embodiment of the invention for transport to an apple collection bin.

Figure 3 is an elevational view similar to Figure 1 but showing typical apple pickers and a trailer as they appear from the rear of the trailer.

55 Figure 3a is an elevational view showing a typical apple picker and his apple picking station, and suggesting how the station can be moved relative to the platform upon which the station is mounted.

 Figure 4 is an elevational view of a typical baffle found within a transport tube.

 Figure 5 is a sectional view of a typical transport tube and, mounted therein, the
60 baffles of Figure 4.

 Figure 6 is a sectional view of a typical transport tube similar to Figure 5 but showing resilient material mounted between the baffles.

 Figure 7 is a sectional view similar to figure 6 but showing a different form of resilient material mounted between the baffles

65 Figure 8 is a sectional view similar to Figures 5, 6 and 7 showing a typical conical or windsock-shaped baffle.

 Figure 9 is an elevational view of the baffle shown in figure 8.

 Figure 10 is an elevational view of an alternate form of a baffle.

 Figure 11 is a fragmentary view showing, in section, an alternate arrangement of
70 the tube and baffles shown in Figures 7 or 8 and 10.

 Figure 12 is an enlarged fragmentary view showing in further detail the arrangement of a baffle and air holes shown in Figure 11.

 Figure 13 is a fragmentary sectional view showing an embodiment of the invention including an outer tube, an inner transport tube, air movement spaces between
75 the tubes, and baffles.

 Figure 14 is a sectional view of the tube and baffle arrangement shown in figure
13.

Figure 15 is a fragmentary view in partial section suggesting the movement of typical objects such as apples through the inventive tube and baffles.

80 Figure 16 is an elevational view showing a baffle of the type included in the tube shown in figure 15.

Figure 17 is a fragmentary view in sectional aspect showing conical or windsock baffles within the transport tube.

85 Figure 18 is an isometric view showing how one embodiment of the transport tube and baffles can be assembled.

Figure 18a is an isometric view showing the tube of figure 18 in its assembled configuration.

Figure 19 is in isometric view similar to figure 18 but showing how another embodiment of the transport tube and baffles can be assembled.

90 Figure 19a is an isometric view similar to figure 19 but showing how yet another embodiment of the transport tube and baffles can be assembled.

Figure 20 is in isometric view similar to figures 18 and 19 showing how still another embodiment of the transport tube and baffles can be assembled.

95 Figure 21 is an isometric view showing a spacer which can be positioned between adjacent baffles.

Figure 22 is an isometric view similar to figure 21 but showing a spacer provided with two exhausts or viewing ports.

Figure 23 is an isometric view similar to figure 22 but showing a spacer provided with multiple exhausts or viewing ports.

100 Figure 24 is an isometric exploded view showing the tube, spacers and baffles shown in figures 19-23.

Figure 24a is an elevational view showing a combination spacer and baffle of the type shown in figure 24.

Figure 25 is an isometric view of yet another spacer.

105 Figure 26 is isometric view showing still another spacer.

Figure 27 is a fragmentary sectional view suggesting a structural arrangement which can be used to interconnect various tube sections.

Figure 28 is an elevational view of an air exhaust venturi mechanism.

Figure 29 is a fragmentary sectional view of a portion of figure 28.

110 Figure 30 is a sectional view of a disk-shaped baffle.

Figure 31 is a sectional views similar to figure 30 but showing a conically shaped baffle.

Figure 32 is a sectional view similar to figures 30 and 31 but showing another embodiment of the conical baffle.

115 Figure 33 is a sectional view similar to figures 30-32 but showing yet another embodiment of the baffle.

Figure 34 is an elevational view of the baffle shown in figure 33.

Figure 35 is a fragmentary elevational view showing yet another embodiment of the transport tube and an associated input device.

120 DETAILED DESCRIPTION

While the invention will be described in connection with a preferred embodiment and procedure, it will be understood that it is not intended to limit the invention to this embodiment or procedure. On the contrary, it is intended to cover all alternatives, modifications and equivalents as may be included within the spirit and scope of the

125 invention as defined by the appended claims.

In one embodiment, the transport tube invention and its peripheral equipment are comprised of four parts or subsystems. These four subsystems act together to:

a) surround and contain a selected fruit on the tree, vine or bush; b) release the fruit or other object from the parent tree or plant at the stem's natural point of release or by
130 clipping the stem at a desired length; c) advance (move) the fruit gently yet quickly up and/or down and/or along a rigid or flexible tube pathway, and finally; d) deposit the fruit without bruising into a separate chamber, e.g., a water bath or rigid container.

a) In the "surround and contain" or entry portion of the device, a
pneumatic tube 40 is provided with a rigid or flexible entry portal
135 or input device 35 (figure 35) comprised of plastic, rubber or other
suitable material. This entry device 35 can be of known design, or
it can be a flexible drop chute as disclosed and informally claimed
in co-pending U.S. provisional patent application 60/972,302 filed
September 14, 2007. This entry portal device 35 is placed under
140 and around the fruit from the stemless end to the stem end (figs. 1-
3). When the fruit is picked and separated from the tree, the portal
device 35 receives the fruit from the picker and delivers it to the
transport tube 40 (figures 1-3, 3a). The surrounding chute structure
35 is dimensioned so as to allow entry by any given fruit of any
145 size, is stiff enough so as to not collapse or disfigure the shape of
the tube 40 by the weight or shape of the fruit throughout the
course of its passage, or prolong the passage of the fruit through
the hollow chute and tube structure.

b) The fruit or other objects to be picked are separated from the tree
150 by hand, or with the aid of a clipper or scissors-like device. These
scissors or clippers can be of known design, or they can be of the
sort disclosed and informally claimed in U.S. provisional patent

application serial number 60/921,707 filed April 4, 2007 or U.S. provisional patent application serial number 60/949,533 filed July 13, 2007. As indicated in those applications, the "release or clip" portion of the device can be a common scissor-like device. This clipper can be comprised of one or more partially rotatable, curved, arc-like metal or plastic members, and if desired they can be mounted to the entry portal device or tube near the entry portal.

The rotatable blades may be either blunt or sharp. In one embodiment of the "release or clip" portion of the device, the fruit is separated by cutting the stem when the fruit is contained in the chute of entry portal 35, and the fruit drops down the tube for transport. In another embodiment of the "release or clip" portion of the device the blade members may be sharp and act like a knife to cut the stem at the desired length. In still another embodiment of the "release or clip" portion of the device, multiple blades may act as a scissor to cut the stem. The rotatable blades may be activated by either a visual/manual system or by a mechanical or electronic sensor when the fruit is properly positioned for fruit stem release from the tree stem. The rotatable blades may be powered by manual force, or pneumatic or other mechanically or hydraulically applied mechanisms.

The fruit can be picked by hand, of course -- a lateral force sufficient to break the fruit portion of the stem from the tree can be manually applied.

- c) In the "advance/move" portion of the device, the interior of the hollow or tubular portion 40 of the device can be lined with a soft or readily insertible and replaceable material liner 41 (figure 6), and a series of baffles, as more extensively disclosed and claimed below. Pneumatic pressure can be applied to the fruit or other object to be moved, as more fully described and claimed below.

d) The terminal downstream peripheral “deposit portion” of the tube is configured so as to gently deliver the fruit or other objects into either a water bath or rigid container. The tube downstream end may be directed to different location in a water bath(not shown) by hand or machine, or the tube 40 can be rigidly connected to the water bath container for delivery into a sufficiently deep current of water so that any particular fruit does not contact another fruit or the bottom of the container during the water entry process. In a first embodiment of the “deposit portion” of the device, the terminal portion of the tube is connected to a water bath container. In a second embodiment, the “deposit end” of the device is arranged for delivery of the fruit or other items into a rigid container or water bath, but a terminal baffle or cushion of soft material or inflatable material is positioned so as to absorb the force of the moving fruit without bruising it. Once decelerated, the fruit would exit the flexible tube through a lateral portal, either by moving the tube away from the direction of the fruit exit portal, or by gently pushing the fruit through the portal in the tube side. This pushing action could be provided by an inflatable device triggered mechanically, or it could be triggered electrically by the fruit hitting a terminal deceleration cushion.

PNEUMATIC TUBES FOR MOVING ITEMS

In 19th-century Europe, public and technical interest arose in the idea of so-called atmospheric railways. Original proposals called for the use of pneumatic tubes to carry letters, packages and even passenger trains, cars and freight. The train might be thought of as a series of car capsules or canisters into which people or items of an undetermined shape entered before being moved along as a result of an exterior force applied to the train cars. If a seal were to be created between the canister cars and the interior surface of the tunnel, the canister cars could be moved through the tube by providing relatively

low pneumatic pressure at the forward end of the train and a relatively high pneumatic pressure at the rear end of the train. Later proposals suggested the use of a small pneumatic tube located alongside an ordinary railway track; a piston inside the tube would pull an attached train running on the rails. The ultimately successful alternative of pulling railway trains through tunnels or tubes behind steam locomotives was extensively developed during the same years. See: <http://www.columbia.edu/~brennan/beach/-chapter 2.html>.

In 1840, Samuel Clegg and Jacobs Samuda (British subjects) obtained U.S. Patent No. 1,922 for the Construction of Valves for Pneumatic Railways. Implementation of that patent led to the successful movement of a train on wheels on a track positioned within a tube for a distance of one block. U.S. Patent Nos. 255, 525 and 284, 456 disclose early pneumatic systems for so-called store service carriers.

The fundamental concept common to previous pneumatic systems for movement of items relies on one or more seal members affixed to the moving item. These seal members provide a pneumatic seal between the moving item and the interior surface of the tube. The item to be transported (which may be of any shape) is placed within a canister of predetermined shape. An exterior flange-like seal secured to the canister moves along with the canister through the tube. The seal continuously engages the interior surface of the tube so as to provide an air seal. This air seal permits the development of a pneumatic pressure differential in the tube between the upstream and downstream surfaces of the seal and capsule. The force of this air pressure differential propels the capsule and seal along the tube.

PNEUMATIC TRANSPORT OR MOVEMENT DEVICE

The object of this invention is to rapidly move items through a tube independent of the items' shapes without having to place the items into a capsule or canister of fixed shape. A means to create a seal sufficient to allow the pressurized system to advance the item through the tube is required. An embodiment of the new concept focuses on a sealing arrangement, but the seals do not move along through the tube. The sealing

arrangement nevertheless can maintain a proper environment for effectively providing
240 pneumatically induced movement of the item through the tube.

In accordance with the invention, a series of sealing baffles are affixed to the interior wall of the tube and can accommodate items of different sizes and shapes while maintaining a series of pneumatic seals between the sealing baffles and the items moving down the tube.

245 As suggested in figures 1-3 and 3a, this pneumatic tube system can be used by individual pickers P. Each picker can have an input chute 35, which can be located adjacent the picker's chest. The chute 35 leads to a pneumatic tube 40 which transports the picked fruit to a bin 140 or other collection device. If desired, the tube transport system and the pickers P can be mounted on a trailer 240 pulled by a tractor T as shown
250 in figure 2. Alternatively, the systems and pickers can be mounted on a self-propelled vehicle as indicated in co-pending U.S. provisional patent application serial number 60/026,351 filed February 13, 2008. Or the systems can be mounted on a sled, a movable frame, or even a stationary pad.

To reach apples or other fruit at various heights in the trees, the pickers P can be
255 provided with picking stations or platforms 340 as especially suggested in figure 3a. The positions of these stations 340 can be adjusted by known hydraulic or other systems as suggested by the arrows in figure 3a.

As shown in figures 4-12 and elsewhere, one embodiment of the invention comprises a tube 40 which may be rigid or flexible and made of plastic, metal or other
260 suitable material. The tube can be of circular, and/or any convenient cross-sectional shape. In accordance with the invention, a series of sealing baffles 50 are provided at spaced apart locations within the interior of the tube. Each baffle is affixed to the interior of the tube 40, is aligned in a perpendicular fashion relative to the tube axis, and is made of a resilient smooth-surface material such as a silicon rubber or resilient plastic.
265 Preferably, the spacing between the baffles 50 is selected to be approximately the same as the major dimension of the items to be moved through the transport tubes. The system

will perform but perhaps less effectively if the baffle-to-baffle distance is made to be substantially greater or less than this item's major dimension.

270 In an alternative embodiment of the invention, groups of closely-spaced multiple baffles may be located at major intervals along the tube interior.

Preferably, the baffles each define a central opening or hole 51. The outer periphery of the baffle, and the periphery of the hole 51, can be of any convenient shape such as circular, oval, elliptical, or other shape. As suggested in figure 15, the central opening 51 is of such diameter that an item F greater in diameter than the hole 51 but
275 lesser in diameter than the tube can pass through the tube because of the elasticity of the baffle 50. The baffle 50 may have slits 52 extending from the central opening into the baffle material to facilitate its opening to accommodate a relatively loose item F passing through it. If small items F are to be moved, the slits 52 may not be needed.

Alternatively, the baffles 50 can be inflatable. The material comprising the inflatable
280 baffles can be shaped and arranged so that progressive inflation of the baffle will provide a progressively smaller opening 51, or the shape of the opening 51 will be progressively changed in some other way.

Throughout the time of engagement of the item in the central opening of the baffle, a more or less imperfect pneumatic seal is temporarily made between the object
285 and the baffle surface. When the pneumatic system (vacuum or air pressure) pulls and or pushes it free from an upstream baffle, the item rapidly advances to the next baffle opening where the phenomenon is repeated for the full length of the baffle segmented tube.

To minimize any traumatic effect on the item F being moved through the tube 40
290 in further accordance with the invention, the interior of the tube surface located between the resilient periodic baffle members 50 may be lined with a soft material 41 such as a soft rubber or resilient plastic. Alternatively, a series of many soft cushions such as outcroppings of small flexible finger-like extensions 42 or a soft inflatable air-filled

balloon-like interior wall liner can be provided between the baffles as particularly
295 suggested in figure 6, 7 and 24-26.

An alternatively shaped baffle arrangement is shown in figures 8, 9, and 15-17.
There, conical or windsock-shaped baffles 43 are attached by a fixation device 44 on the
interior surface of the tube. The windsock baffles 43 can be made of a material which
may be woven or formed of a resilient material such as rubber or resilient plastic. The
300 material may be of such a nature that it may collapse onto the surface of the item being
moved through it while at the same time allowing the item to advance with minimal
impedance. These interior windsocks 43 can be spaced apart from one another such that
the item, on leaving one windsock baffle 43, will at that moment be delivered into the
next overlapping windsock baffle 43 in the series as particularly suggested in figure 8,
305 thus maintaining a continuous seal as the item moves down the tube.

Several variations of these baffles 50 are shown in figures 30-34. The baffles 50
may have a disc shape as suggested in figure 30, or it may have a generally conical shape,
as suggested in figure 31. This conical shape will help orient the moving object in the
central axis of the tube and baffle. Alternatively, the baffles 50 may have a modified
310 conical shape as suggested in figure 32. This shape may provide a venturi-like effect to
the airflow passing through the baffles 50. The disc 50 may have guide plates 54 as
suggested in figures 33 and 34.

The tubes 40 illustrated here can comprise an outer tube 45 and a coaxial inner
tube 46 having apertures 47 therein. This tube arrangement permits the creation of an air
315 flow liner 46 thereby facilitating the maintenance of the object moving through the tube
in a more central position in the tube 40, while at the same time placing an axially
extending air space 48 between individual objects F which may be moving through the
tube 40 at the same time. Additionally this arrangement will allow for the effect of either
vacuum or positive air pressure applied to the tube to reach more than one item moving
320 through the tube at the same time.

Other means of achieving similar effect(s) can be accomplished by having air movement portals periodically and circumferentially placed in the tube. As suggested in figures 9-12 and elsewhere, peripheral air movement occurs through the space 48 between the outer tube 40 and the baffle-containing inner tube 49 while at the same time central air movement is occurring through the inner tube 49. These portals may be of the same or different diameters, and aligned either perpendicular to the inner tube surface or at the same or varied angles to achieve the desired effect(s). The tubes 40 and 49 may be rigid or flexible.

A retainer ring 60 is shown in figures 10 and 11, wherein the retainer ring 60 is perforated by peripheral holes 66 which may be of different diameters and either perpendicular to or angled in any direction with relationship to the surfaces of the retainer ring 60. These holes 66 allow for the passage of air from one inter-baffle space to another.

As suggested above, modified airflow and air pressures within the tubes can be provided by an arrangement of a coaxially aligned outer tube 45 and an inner tube 46 (figures 10-14). The toroidal-shaped space 48 between the tubes 45 and 46 allows air to be exhausted along the entire length of a tube line. Portals 47 can be provided to inject or exhaust air so as to provide the desired positive or negative pressures for urging the objects F along the tubes in accordance with the invention. These passages 47 can be formed so as to provide a helical air flow as suggested especially in figure 14. This helical air flow may discourage the moving objects F from violently impacting the inner tube sides and consequently suffering bruising or other damage.

The construction and assembly of the tubes, baffles and inner liners or spacers is suggested in figures 18-26. Tube halves 140, 142, can be formed with mating corrugated shapes 143, and the baffles 50 can be nested at desired spacing within the corrugations as suggested in figure 18. The tube halves can then be assembled and locked together with suitable clamp locks 145 as suggested in figure 18a. Alternatively, unitary tubes 40 can be provided with a spiral corrugation 146 as shown in figure 19, and the spacers 50 can

350 be mounted within the tube by a helical, screwing-like motion. Locking tabs 150 can be provided on the baffles 50 to mate with recesses (not shown) within the tube 40 as suggested in figure 19a. In yet another alternative arrangement, the tube 40 can be provided with an extended series of threads 155, and the baffles 50 can be provided with mating threads 156, as suggested in figure 20.

355 Spacers 80 (figure 21) can be made of soft material and can be located between the baffles 50. These spacers 80 can be provided with ports 82 (figures 22 and 23). If the tube 40 is made of transparent material such as plastic, these ports 82 can be used to view and inspect the interior of the tube system. Alternatively, these ports 82 can provide the desired airflow if the tube system is provided with the coaxial tube arrangement described above. See figure 24. If desired, these spacers and baffles can be made as a
360 single unit. See figure 24a. To mate with a helically corrugated tube, this spacer may be provided with a spring-like helix member 85 as suggested in figure 25.

An alternatively designed spacer 87 is shown in figure 26. This spacer is formed of soft, pliable material which will conform to the inner surface of a tube, whether corrugated or planar. Spaced apart arms 88 prevent the transported object from colliding
365 with the rigid tube wall, but the spacing between these items 88 minimizes impedance to object travel.

Figures 27 - 29 suggest one of several known arrangements for interconnecting tube length modules. The tube sections can be snapped together by hand or with tools to form a flexible tube assembly. The joints 90 are self-sealing but slide to provide
370 flexibility.

If desired, a series of transport tubes can be carried within a relatively large conduit 400, as suggested in figure 35. The conduit 400 can be equipped with a delivery chute 35 so that the picker can place objects of varying sizes in tubes of appropriate and corresponding diameter.

WE CLAIM:

1. A device for transporting articles, comprising, in combination:
a tube member adapted to receive and transport articles; and
a plurality of deformable baffles at spaced-apart locations within the tube,
5 each baffle defining an aperture through which the transported article can pass.
2. A device according to claim 1 wherein the baffle aperture is smaller than the article being transported, but permits the transported article to engage and deform the baffle and aperture so as to permit the article to move through the aperture.
3. A device according to claim 1 further including means for causing a pressure
10 differential across the article being transported as the article moves through the device.
4. A device according to claim 1 further including a cutter for separating the article from a plant.
5. A device according to claim 1 further including means for depositing the article in a predetermined location after the article is delivered to a downstream tube end.
- 15 6. A device according to claim 1 wherein said tube member comprises an inner tube and an outer tube coaxially aligned with but radially spaced apart from the outer tube to provide an air flow space between the tubes.
7. A device according to claim 1 wherein adjacent baffles are spaced apart by a distance approximately equal to the major dimension of the articles to be transported.
- 20 8. A device according to claim 1 further including at least one liner member located between adjacent baffles.
9. A device according to claim 1 wherein the device is mounted upon a mobile trailer.

25 10. A device according to claim 1 wherein the device is mounted upon a self-propelled vehicle.

11. A device according to claim 1 further including a chute mounted at an entry end of said tube member, the chute being adapted to receive an article to be transported and to deliver the article to a tube entry end.

30 12. A device according to claim 11 wherein said chute is flexible and is generally conical in shape.

13. A device according to claim 11 wherein said chute includes means permitting a picker to wear the chute.

14. A device according to claim 1 further including means for decelerating the moving object at the exit end of the tube member.

35 15. A device according to claim 13 wherein the decelerating means includes a water bath.

16. A device according to claim 14 further including means for gently placing the object at a generally predetermined position in a bin.

40 17. A device according to claim 1 wherein said tube member has a corrugated interior surface.

18. A device according to claim 17 wherein said corrugated interior surface is helical.

19. A device according to claim 18 wherein said baffles are adapted to be screwed into said helical corrugation into predetermined positions.

45 20. A device according to claim 1 wherein said tube member comprises two U-shaped tube halves.

21. A device according to claim 20 further including locking means for securing the tube halves together in confronting relationship.

22. A device according to claim 1 further including at least one spacer located between adjacent baffles, the spacer having an aperture permitting the condition of the tube member interior to be viewed.

23. A device according to claim 1 further including at least one inflatable spacer located between adjacent baffles.

24. A device according to claim 1 wherein said baffle is conical in shape.

25. A device according to claim 1 further including a plurality of flexible baffles of generally conical shape and having axial lengths of predetermined extent.

26. A device according to claim 25 wherein said baffles are spaced apart from one another by a distance approximately equal to or greater than the axial length of an individual baffle.

27. A device according to claim 1 wherein said tube member includes at least one rigid section.

28. A device according to claim 1 wherein said tube member includes at least one flexible section.

29. A device according to claim 1 wherein said tube includes a corrugated outer surface and a smooth inner surface.

30. A method of transporting an article through a tube, comprising the steps of:

receiving an article in a tube upstream end;

creating a pressure differential across an article within said tube so as to cause said article to move through said tube; and

depositing the article in a predetermined location after the article is delivered to a downstream tube end.

31. A method of transporting an article through a tube according to claim 5 further

comprising the step of engaging said article by at least one baffle as said article passes through said tube.

32. A method of transporting an article through a tube according to claim 6 further
75 comprising the step of deforming said baffle as said article passes through said baffle.

AMENDED CLAIMS**[received by the International Bureau on 10 September 2008 (10.09.2008)]**

1. (Replaces Claim 1 as filed) A device for transporting articles, comprising, in combination:

a tube member adapted to receive and transport articles;

5 means for causing a pressure differential across the article being transported as the article moves through the device; and

a plurality of deformable baffles at spaced-apart locations within the tube,

each baffle defining an aperture through which the transported article can pass, wherein adjacent baffles are spaced apart by a distance approximately equal to the major
10 dimension of the articles to be transported.

2. (Unchanged) A device according to claim 1 wherein the baffle aperture is smaller than the article being transported, but permits the transported article to engage and deform the baffle and aperture so as to permit the article to move through the aperture.

3. (Cancelled) A device according to claim 1 further including means for causing
15 a pressure differential across the article being transported as the article moves through the device.

4. (Unchanged) A device according to claim 1 further including a cutter for separating the article from a plant.

5. (Unchanged) A device according to claim 1 further including means for
20 depositing the article in a predetermined location after the article is delivered to a downstream tube end.

6. (Unchanged) A device according to claim 1 wherein said tube member comprises an inner tube and an outer tube coaxially aligned with but radially spaced apart from the outer tube to provide an air flow space between the tubes.

AMENDED SHEET (ARTICLE 19)

- 25 7. (Cancelled) A device according to claim 1 wherein adjacent baffles are spaced
apart by a distance approximately equal to the major dimension of the articles to be transported.
8. (Unchanged) A device according to claim 1 further including at least one liner
member located between adjacent baffles.
9. (Unchanged) A device according to claim 1 wherein the device is mounted
30 upon a mobile trailer.

AMENDED SHEET (ARTICLE 19)

10. (Unchanged) A device according to claim 1 wherein the device is mounted upon a self-propelled vehicle.

11. (Unchanged) A device according to claim 1 further including a chute mounted at an entry end of said tube member, the chute being adapted to receive an article to be transported and to deliver the article to a tube entry end.

12. (Unchanged) A device according to claim 11 wherein said chute is flexible and is generally conical in shape.

13. (Unchanged) A device according to claim 11 wherein said chute includes means permitting a picker to wear the chute.

14. (Unchanged) A device according to claim 1 further including means for decelerating the moving object at the exit end of the tube member.

15. (Unchanged) A device according to claim 13 wherein the decelerating means includes a water bath.

16. (Unchanged) A device according to claim 14 further including means for gently placing the object at a generally predetermined position in a bin.

17. (Unchanged) A device according to claim 1 wherein said tube member has a corrugated interior surface.

18. (Unchanged) A device according to claim 17 wherein said corrugated interior surface is helical.

19. (Unchanged) A device according to claim 18 wherein said baffles are adapted to be screwed into said helical corrugation into predetermined positions.

20. (Unchanged) A device according to claim 1 wherein said tube member comprises two U-shaped tube halves.

21. (Unchanged) A device according to claim 20 further including locking means for securing the tube halves together in confronting relationship.

AMENDED SHEET (ARTICLE 19)

22. (Unchanged) A device according to claim 1 further including at least one spacer located between adjacent baffles, the spacer having an aperture permitting the condition of the tube member interior to be viewed.

60 23. (Unchanged) A device according to claim 1 further including at least one inflatable spacer located between adjacent baffles.

24. (Unchanged) A device according to claim 1 wherein said baffle is conical in shape.

25. (Unchanged) A device according to claim 1 further including a plurality of flexible baffles of generally conical shape and having axial lengths of predetermined extent.

65 26. (Unchanged) A device according to claim 25 wherein said baffles are spaced apart from one another by a distance approximately equal to or greater than the axial length of an individual baffle.

27. (Unchanged) A device according to claim 1 wherein said tube member includes at least one rigid section.

70 28. (Unchanged) A device according to claim 1 wherein said tube member includes at least one flexible section.

29. (Unchanged) A device according to claim 1 wherein said tube includes a corrugated outer surface and a smooth inner surface.

75 30. (Replaces Original Claim 30 as Filed) A method of transporting an article through a tube having baffles therein which are spaced apart by a distance approximately equal to the major dimension of the articles to be transported, the method comprising the steps of:

receiving an article in a tube upstream end;

creating a pressure differential across the article within said tube so as to cause said article to move and sequentially engage the baffles through said tube; and

AMENDED SHEET (ARTICLE 19)

80 depositing the article in a predetermined location after the article is delivered to a downstream tube end.

31. (Replaces Original Claim 31 as Filed) A method of transporting an article through a tube according to claim 5 further

AMENDED SHEET (ARTICLE 19)

comprising the step of sequentially engaging said article by one baffle after another as said article passes through said tube.

32. (Unchanged) A method of transporting an article through a tube according to claim 6 further comprising the step of deforming said baffle as said article passes through said baffle.

33. (New Claim - Added Herewith) A bi-ended tube member adapted to receive and transport articles;

means for creating a pressure differential between the tube ends;

and a plurality of apertured deformable baffles at axially spaced-apart locations within the tube;

the baffles being adapted to at least partly engage the surface of an article being transported so as to encourage the development of at least a momentary pressure differential across the article being transported as the article moves through the tube.

34. (New Claim - Added Herewith) A device according to claim 33 wherein at least one said baffle is disk-shaped having an axial dimension less than its radial dimension.

35. (New Claim - Added Herewith) A device according to claim 33 wherein said at least one said baffle is cone-shaped.

September 10, 2008

**VIA FACSIMILE - NO. 41 22 338 82 70
 AND CONFIRMATION VIA AIR MAIL**

The International Bureau of WIPO
 34, chemin des Colombettes
 1211 Geneva 20
 SWITZERLAND

Re: **Letter (Section 205(b) Providing a
 Submission of Statement under Article 19(1) (Rule 46.4)**
 International Application No.: PCT/US 2008/058151
 International Filing Date: 25 March 2008
 Applicant: Picker Technologies LLC
 Title: **TRANSPORT SYSTEM FOR FRUIT AND LIKE OBJECTS**
 Our Ref. No.: 20063.200230 - Note Update

Dear Sirs:

The accompanying replacement sheets are amendments to the claims of the captioned patent application submitted in response to the International Search Report and Written Opinion mailed from the PCT Office on 17 July 2008. This letter provides remarks for consideration regarding the amendments to the claims.

Originally filed claim 1 has been amended by adding to it the substance of original claims 3 and 7. As a result of these amendments, claim 1 now calls for "means for causing a pressure differential across the article being transported as the article moves through the device." Chittenden U.S. Patent No. 2,288,682 does not comprehend any positive air pressure or vacuum; the harvested apples introduced into the Chittenden picker system travel down a tube simply by the influence of gravity. Lucas International Publication No. WO 00/62594 suggests "a suction pressure within the ducts or tubes so as to enable fruit or produce to be harvested from the trees." (*See*, page 5, lines 12-13, etc.).

As amended, claim 1 also now calls for "adjacent baffles (to be) spaced apart by a distance approximately equal to the major dimension of the articles to be transported" along the applicants' tube. The International Search Report and Written Opinion refer to Lucas. A careful study of the text and drawings of Lucas' International Publication No. WO 00/62594 shows that there is no similar teaching or suggestion of this type of baffle spacing anywhere in the text or drawings of that document, or anywhere in the text or drawings of any of the other cited references. It is this spacing that enables applicants' novel fruit transport system to work with surprising alacrity and efficiency.

The International Bureau of WIPO
September 10, 2008
Page 2

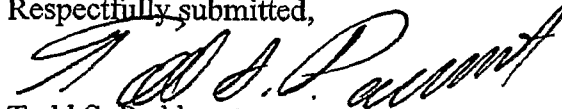
As amended, claim 1 is therefore believed to present patentable subject matter and is therefore believed to be allowable. Claims 2, 4 through 6 and 8 through 29 depend, directly or indirectly, from claim 1 and are thus believed allowable.

Method claim 30 has been amended in a manner similar to that of claim 1 to recite that the transported articles are transported through tubes having "baffles therein which are spaced apart by a distance approximately equal to the major dimension of the articles to be transported," in this patently novel manner. Method claim 30 and depending claims 31 and 32 are thus likewise believed to recite patentable subject matter and are thus allowable.

New claims 33-35 recite that applicant's baffles are "adapted to at least partly engage the surface of an article being transported so as to encourage the development of at least a momentary pressure differential across the article being transported as the article moves through the tube." None of the references teach or suggest this. Again, Chittenden U.S. Patent No. 2,288,682 does not comprehend any positive air pressure or vacuum; the harvested apples introduced into the Chittenden picker system travel down a tube simply by the influence of gravity. Lucas International Publication No. WO 00/62594 suggests "a suction pressure within the ducts or tubes so as to enable fruit or produce to be harvested from the trees." (*See*, page 5, lines 12-13, etc.) but does not recognize or suggest the use of axially spaced-apart baffles or other structure inside the tube to encourage the development of that pressure differential across each article being transported. Lucas has no structure which can accurately be termed baffles; and the structures inside the Lucas tubes are not axially spaced apart from one another.

Applicant respectfully requests consideration of the aforementioned Statement under Article 19(1) (Rule 46.4) and the attached replacement sheets of claims. The International Bureau is invited to call the undersigned attorney to receive American Express payment of any additional claim fee due, or to send a Notification of Additional Fees Due, if appropriate.

Respectfully submitted,



Todd S. Parkhurst
Attorney for Applicant
U.S. Patent and Trademark Office
Reg. No. 26,494

TSP:dmp
Enclosures
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Fig. 1

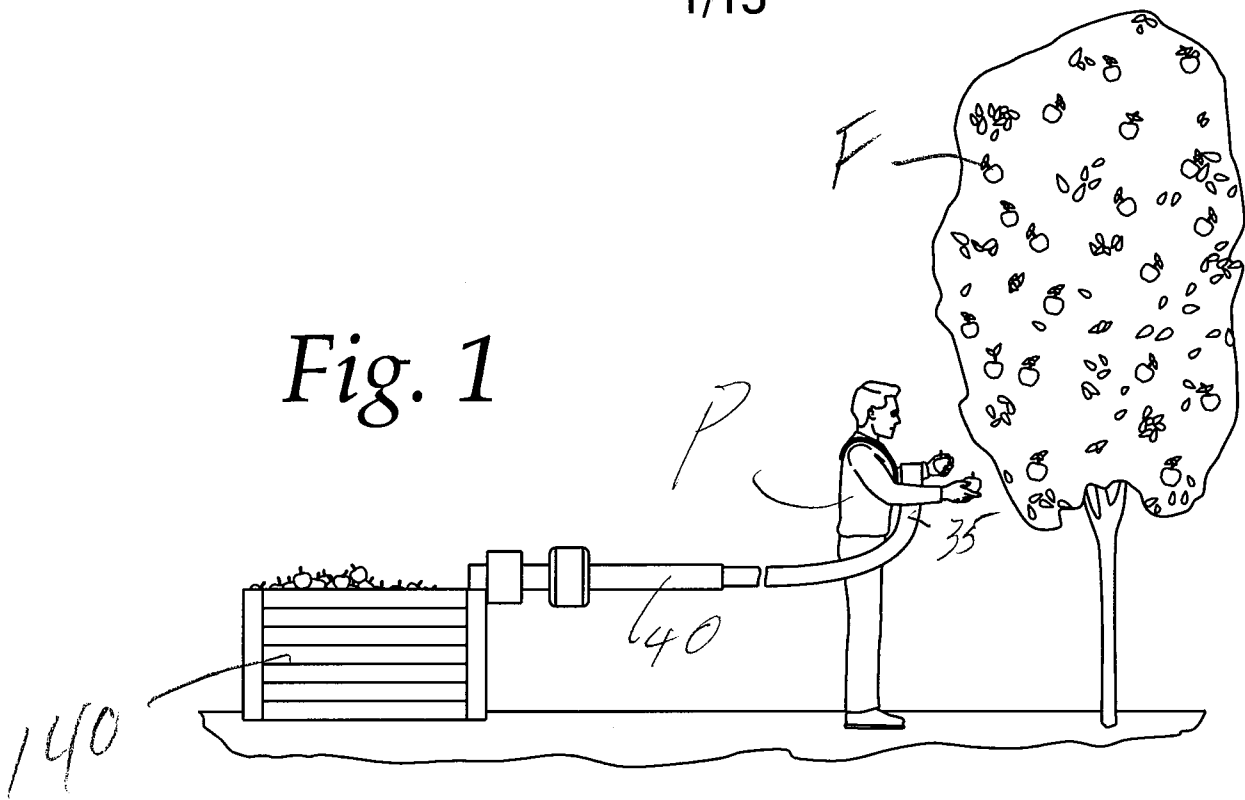
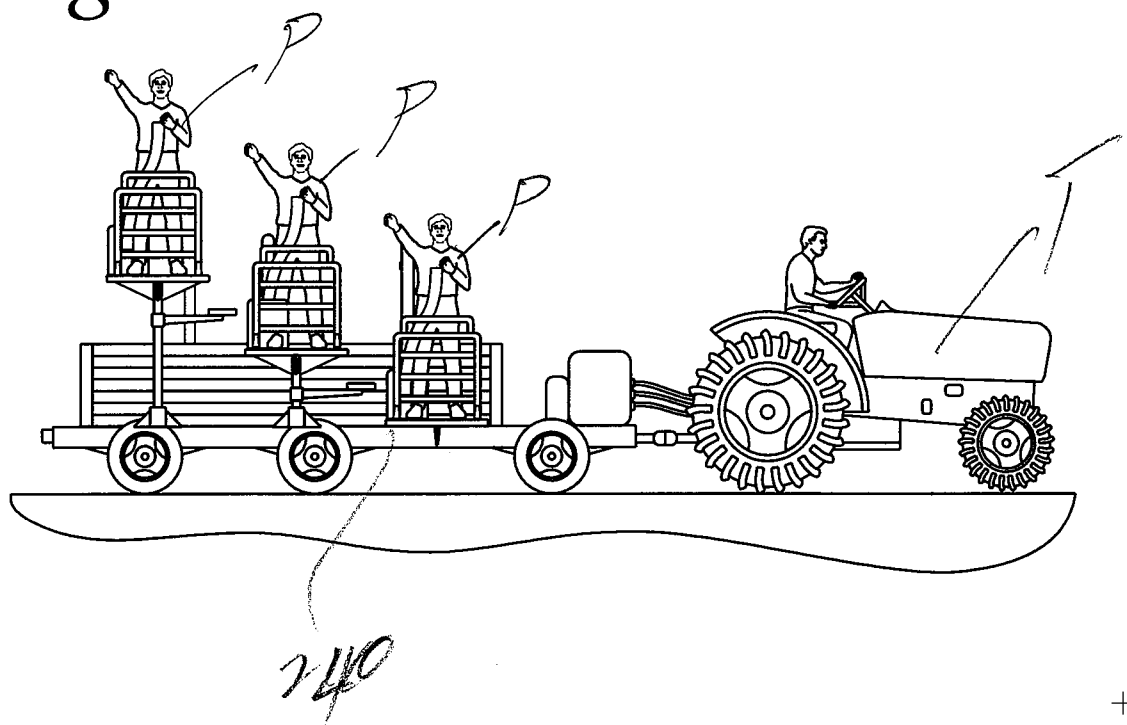


Fig. 2



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Fig. 3a

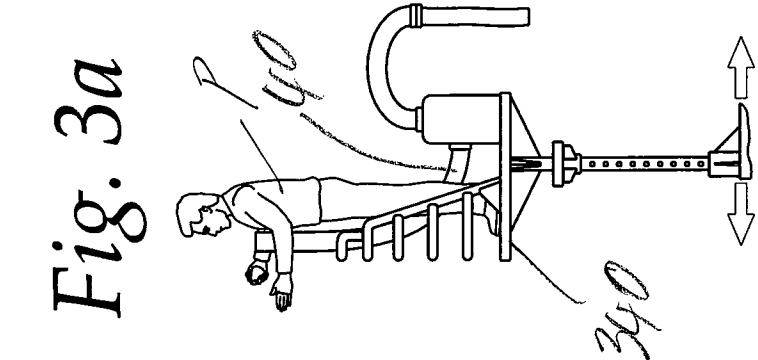
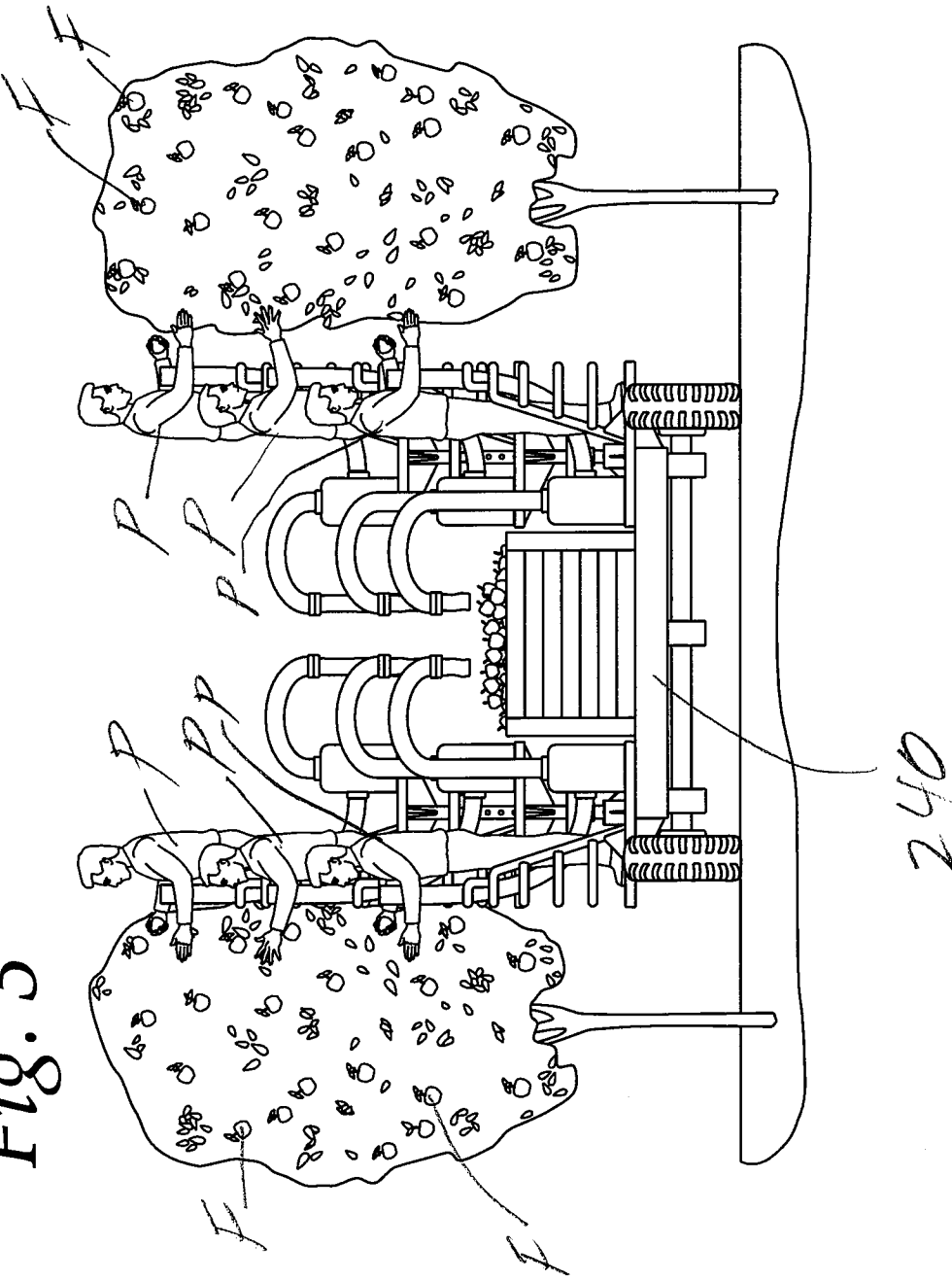
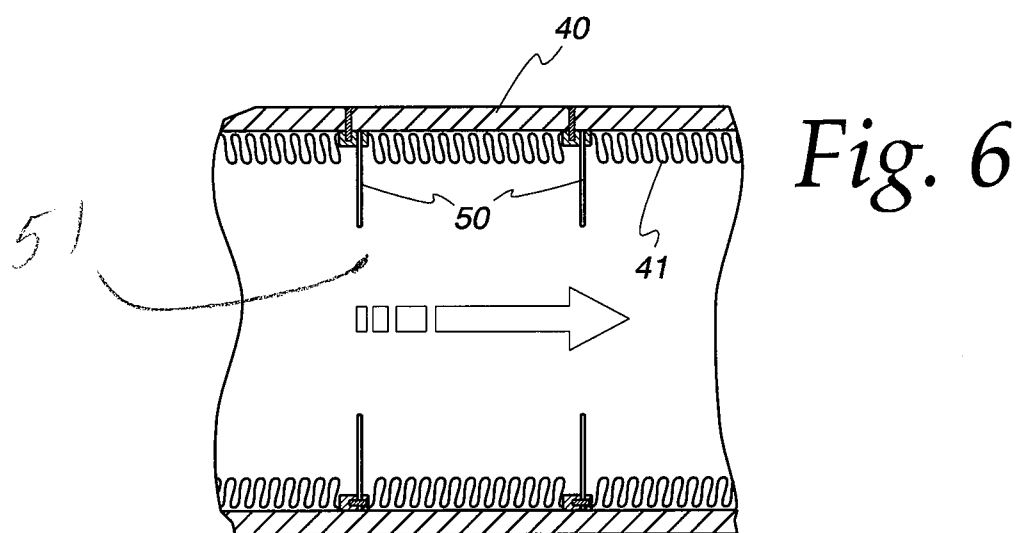
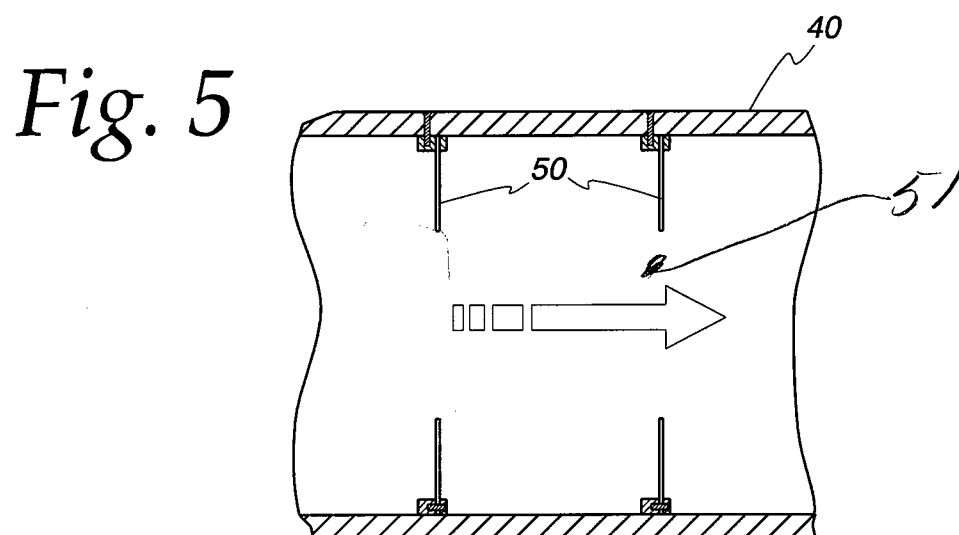
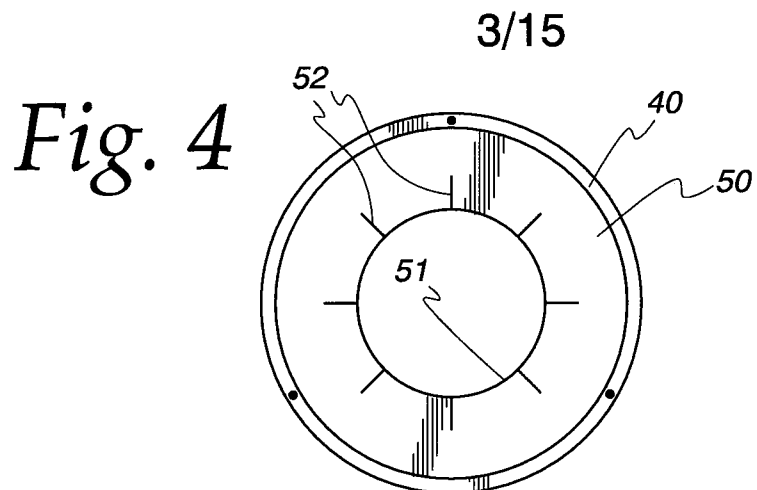


Fig. 3



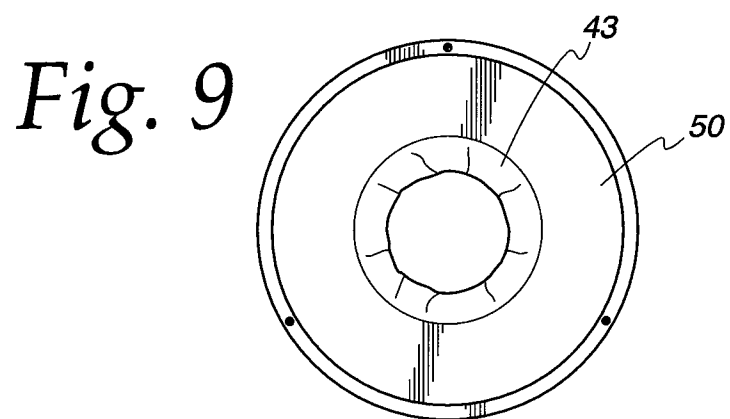
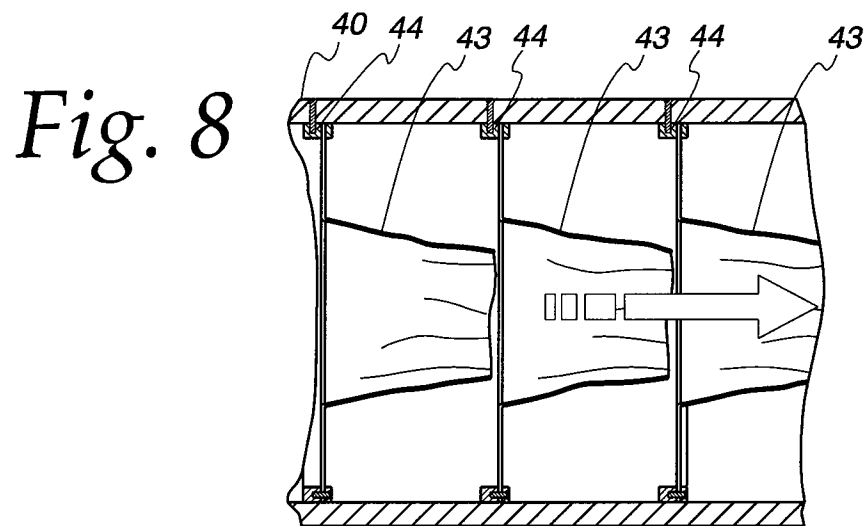
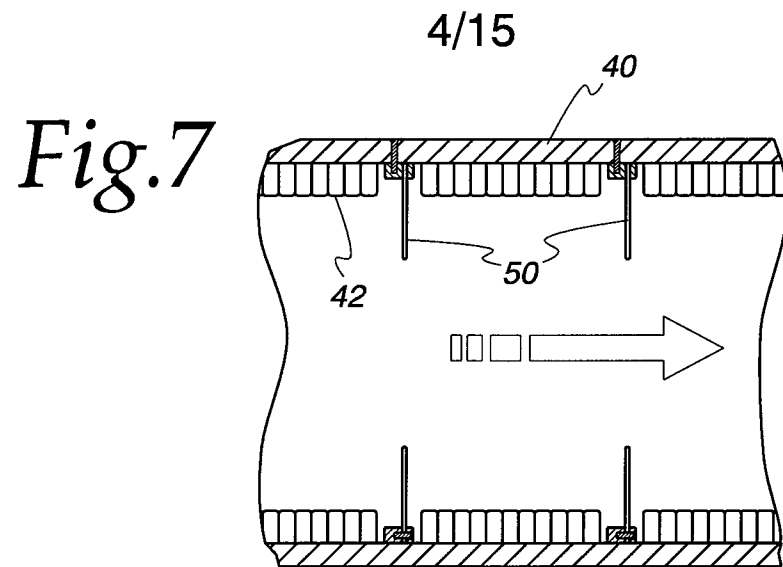
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Fig. 10

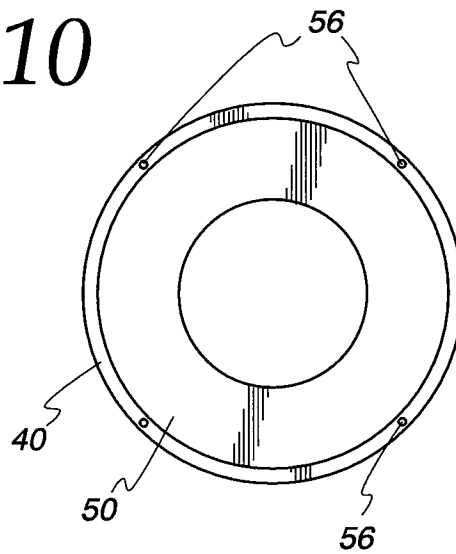


Fig. 11

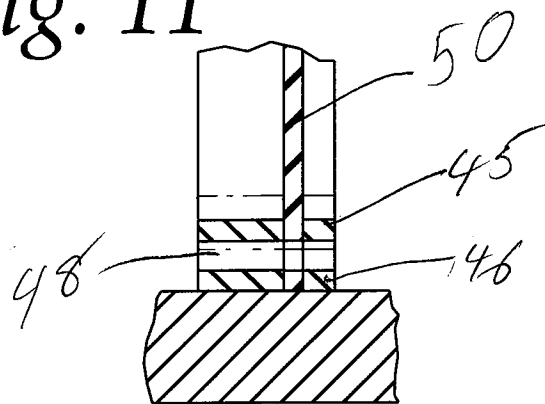
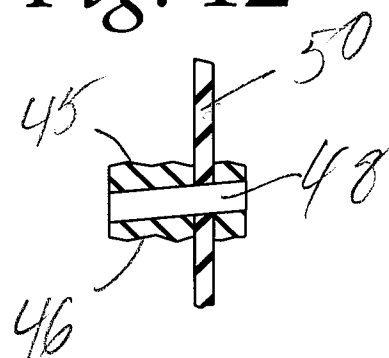


Fig. 12



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Fig. 13

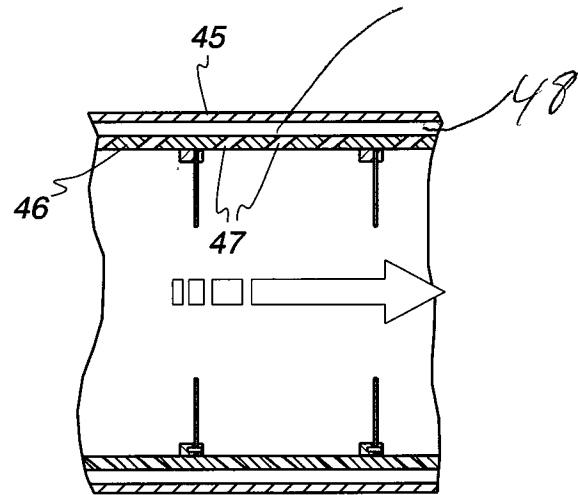


Fig. 14

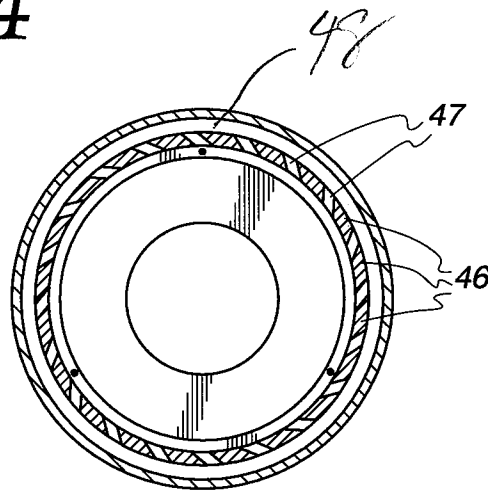
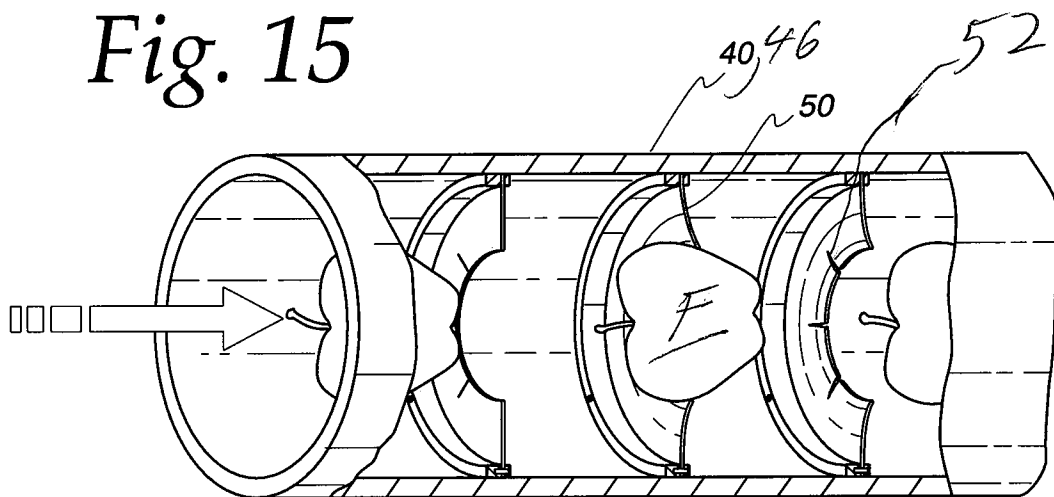


Fig. 15



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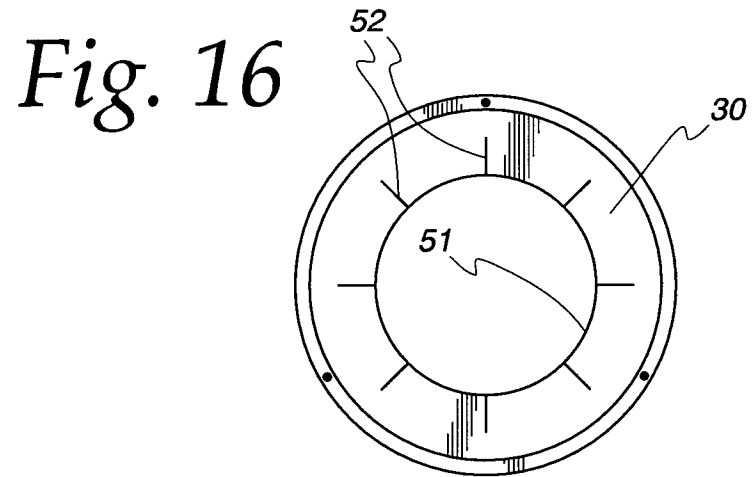
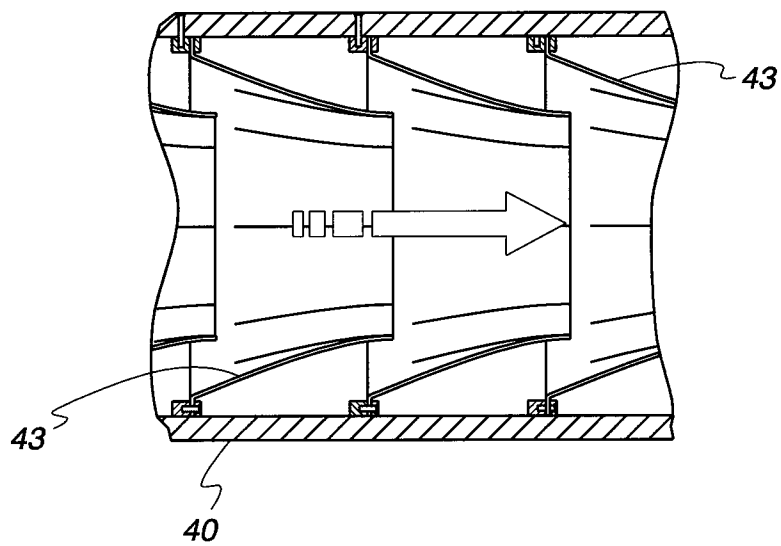


Fig. 17



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Fig. 18

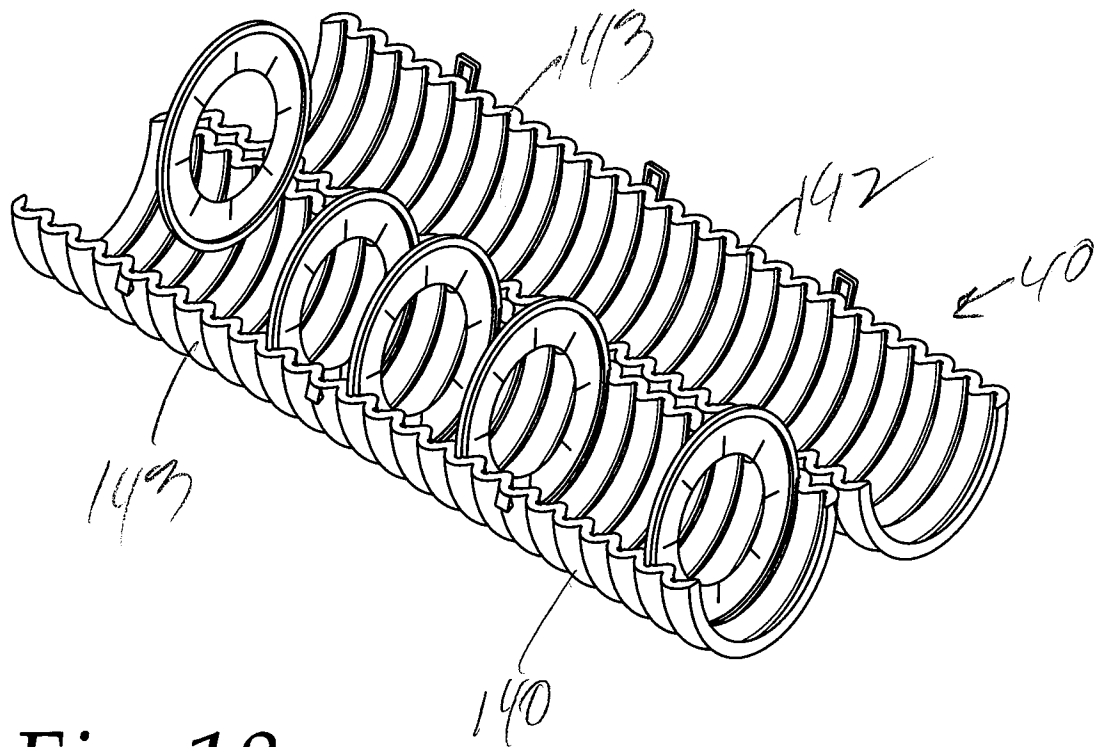
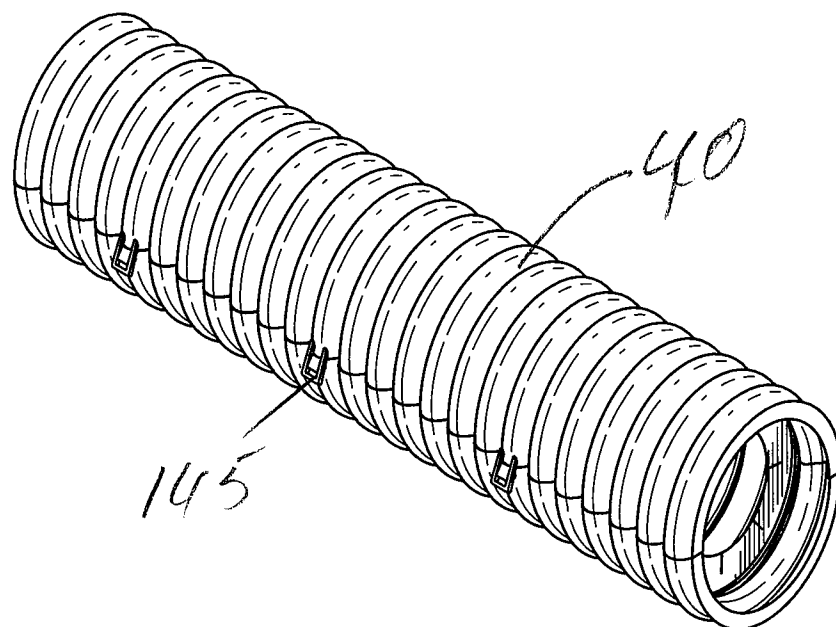
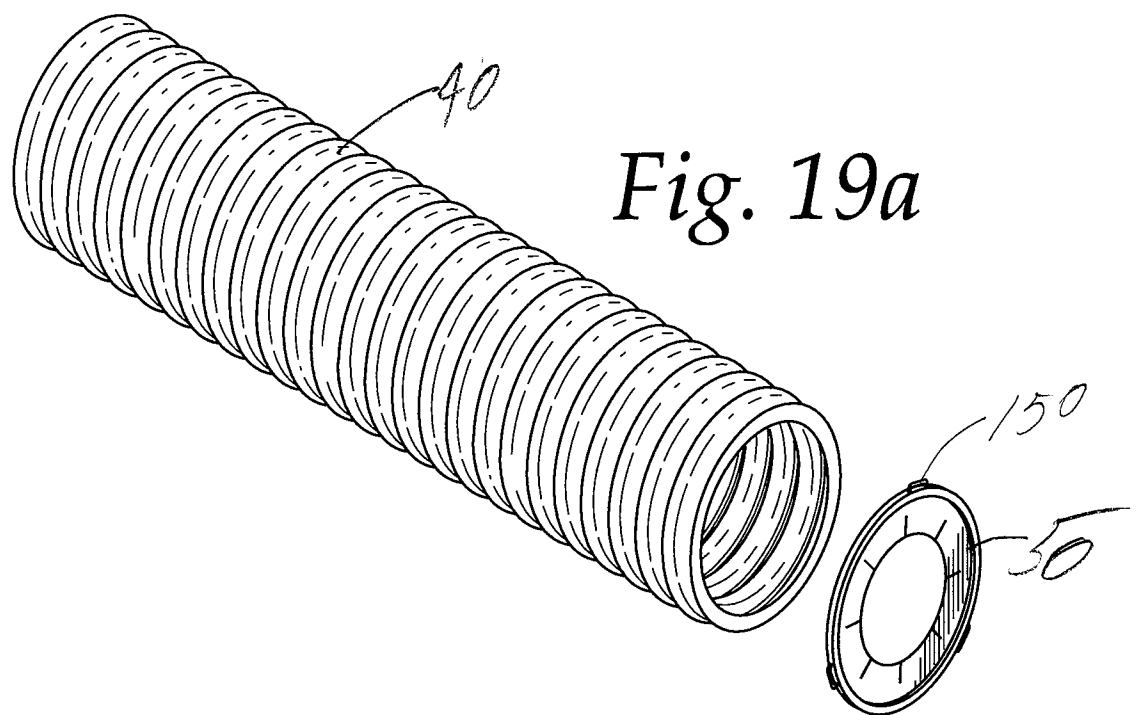
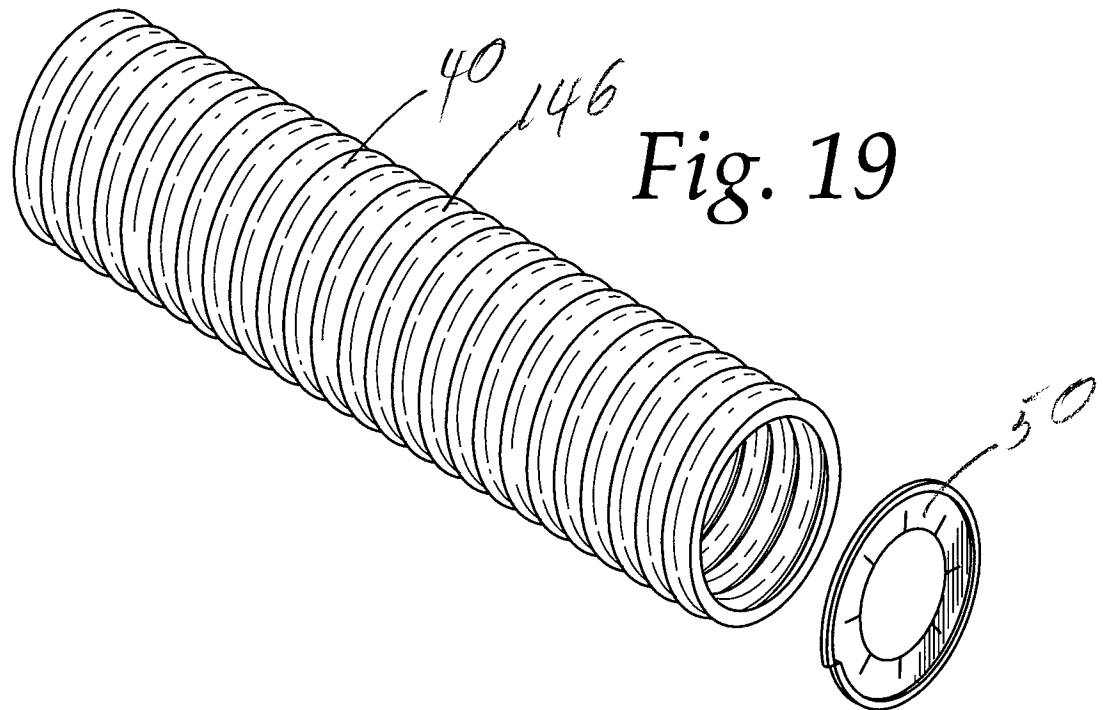


Fig. 18a



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Fig. 20

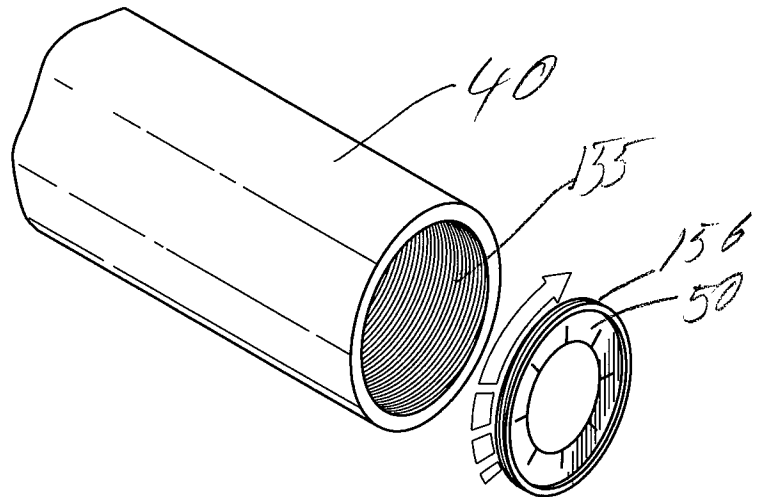


Fig. 21

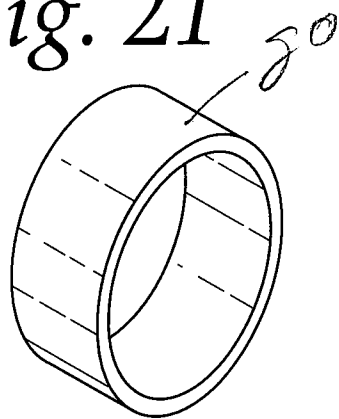


Fig. 22

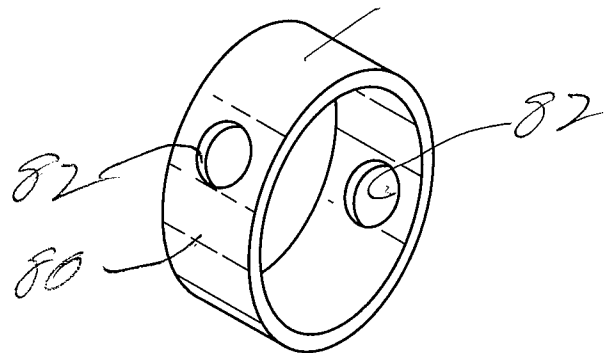
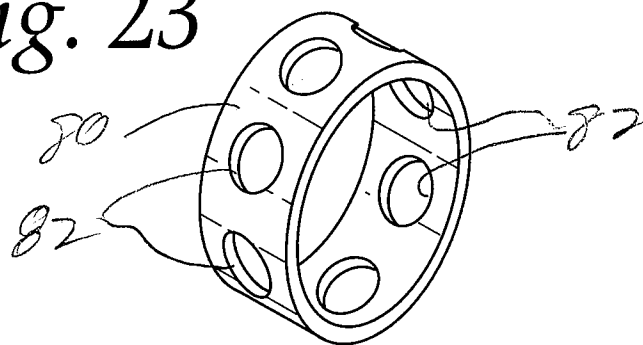


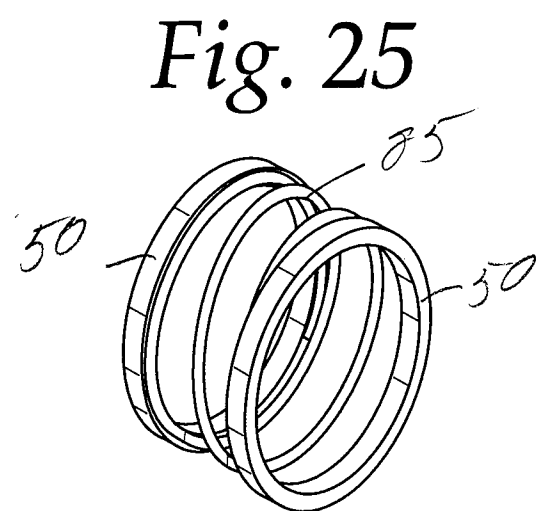
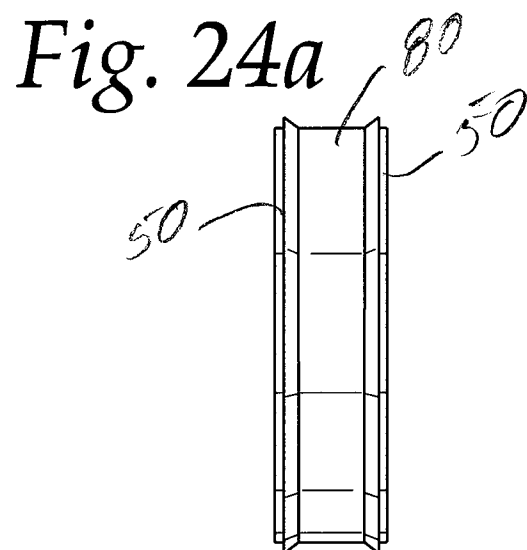
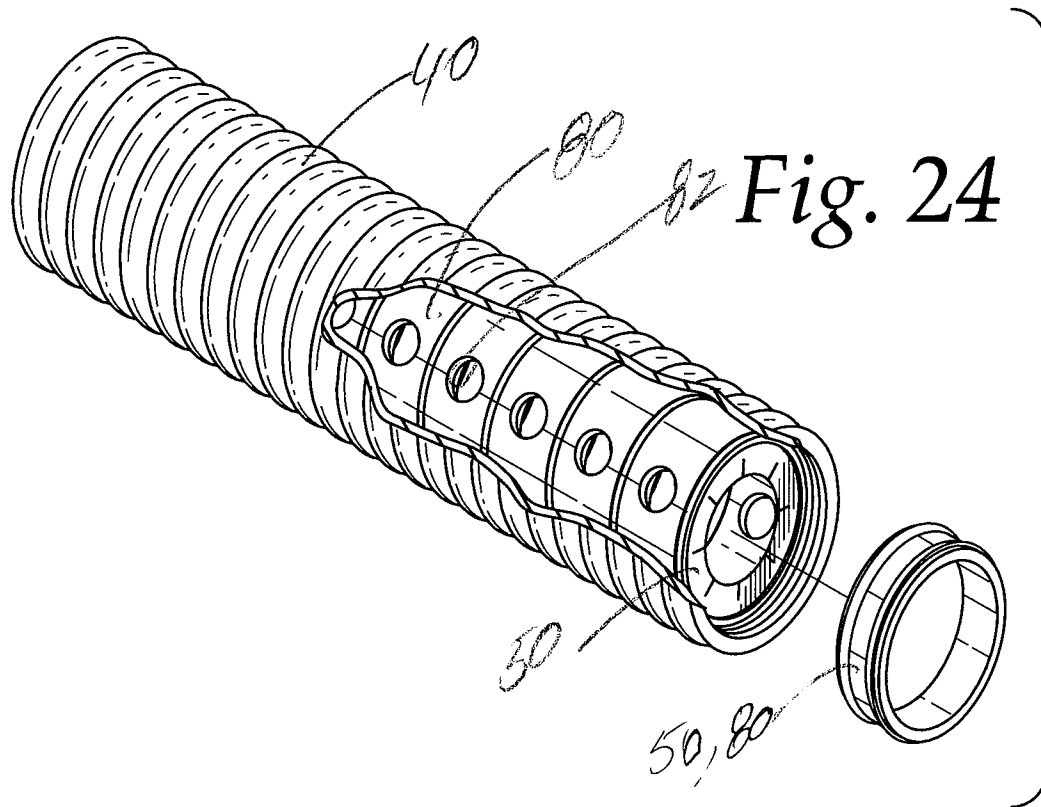
Fig. 23



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Fig. 26

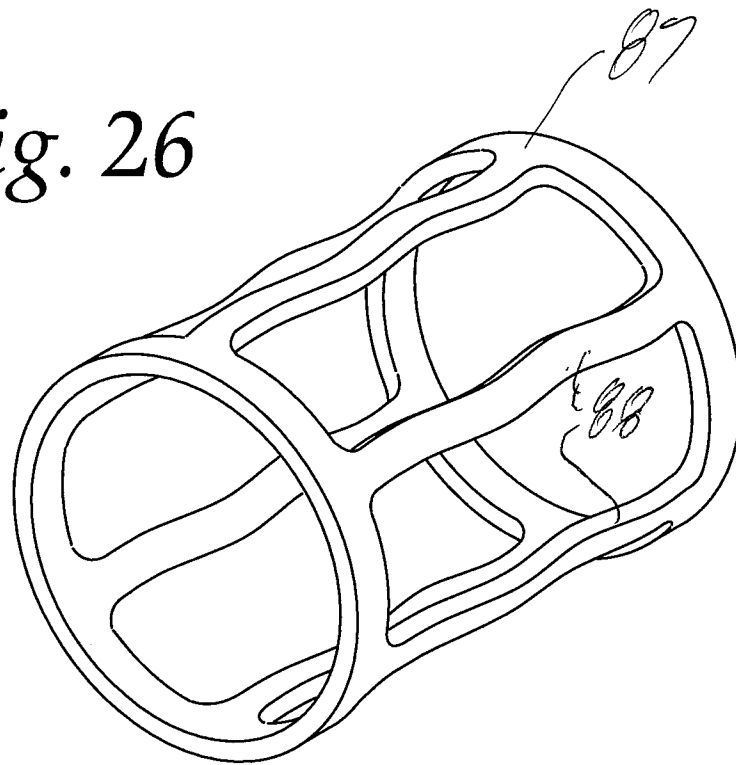
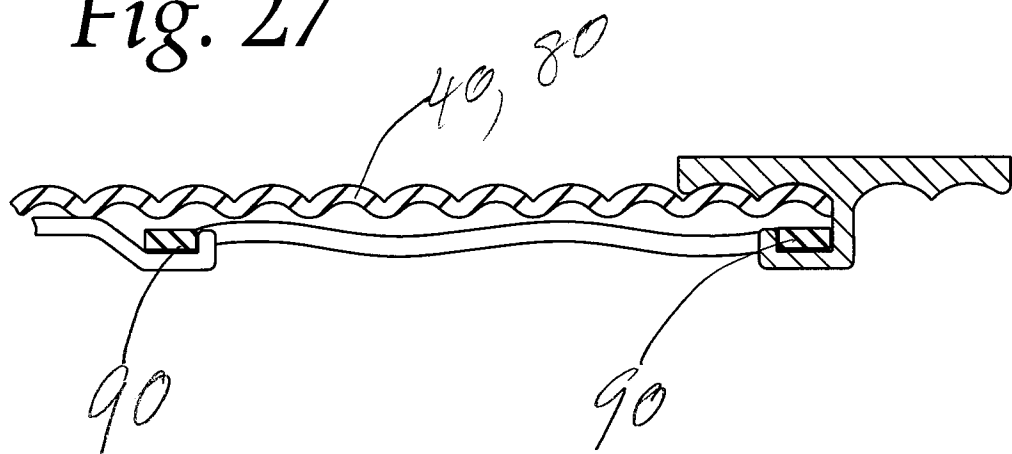


Fig. 27



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Fig. 28

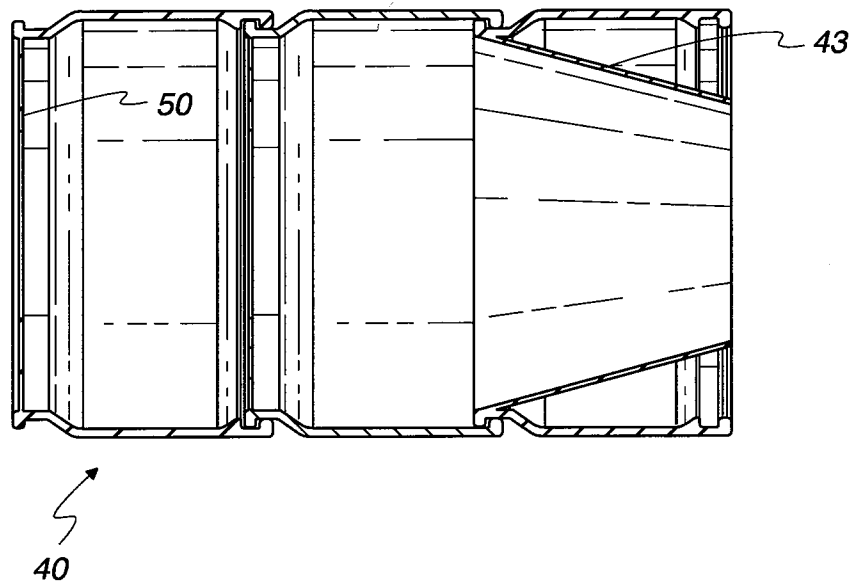
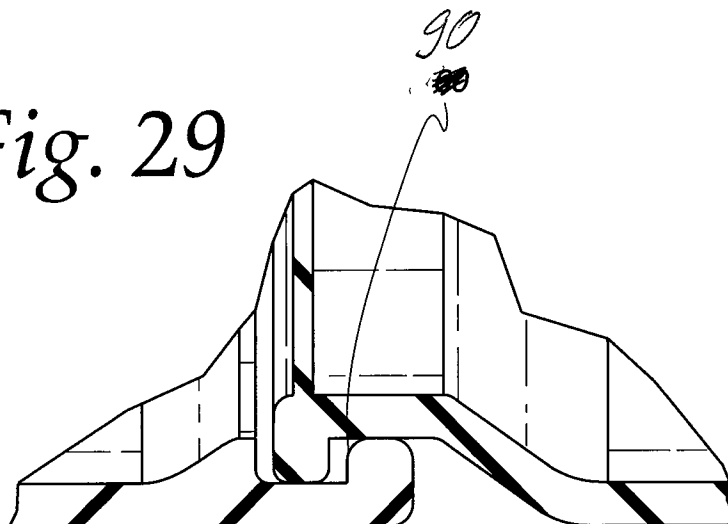


Fig. 29



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Fig. 30

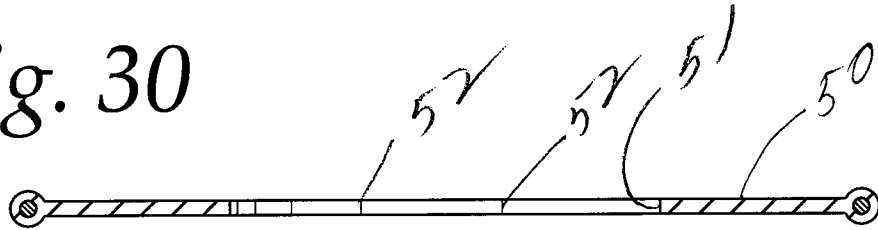


Fig. 31

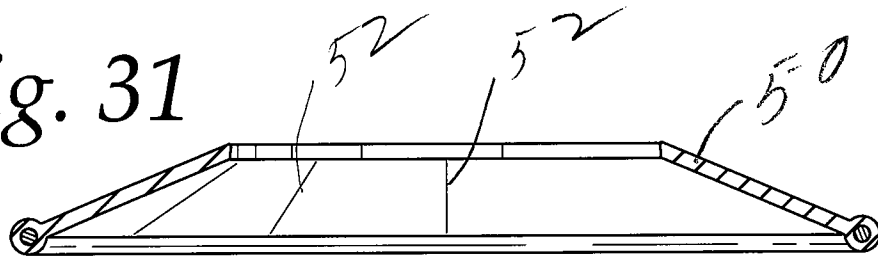


Fig. 32

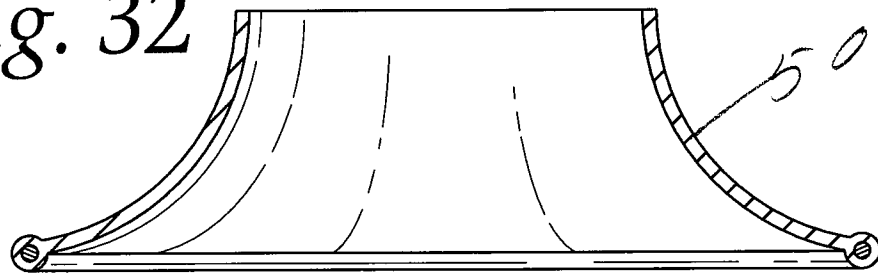
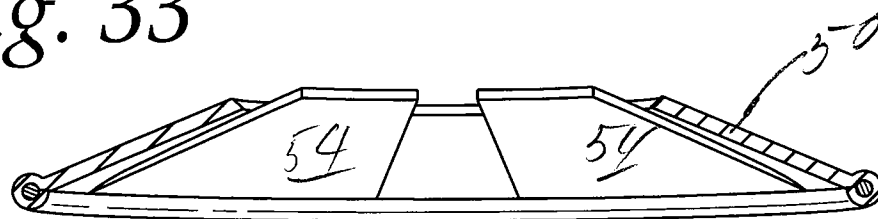


Fig. 33



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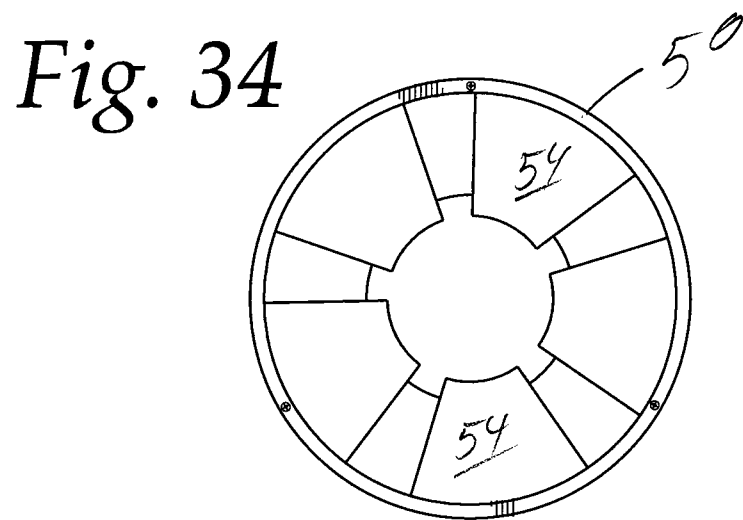
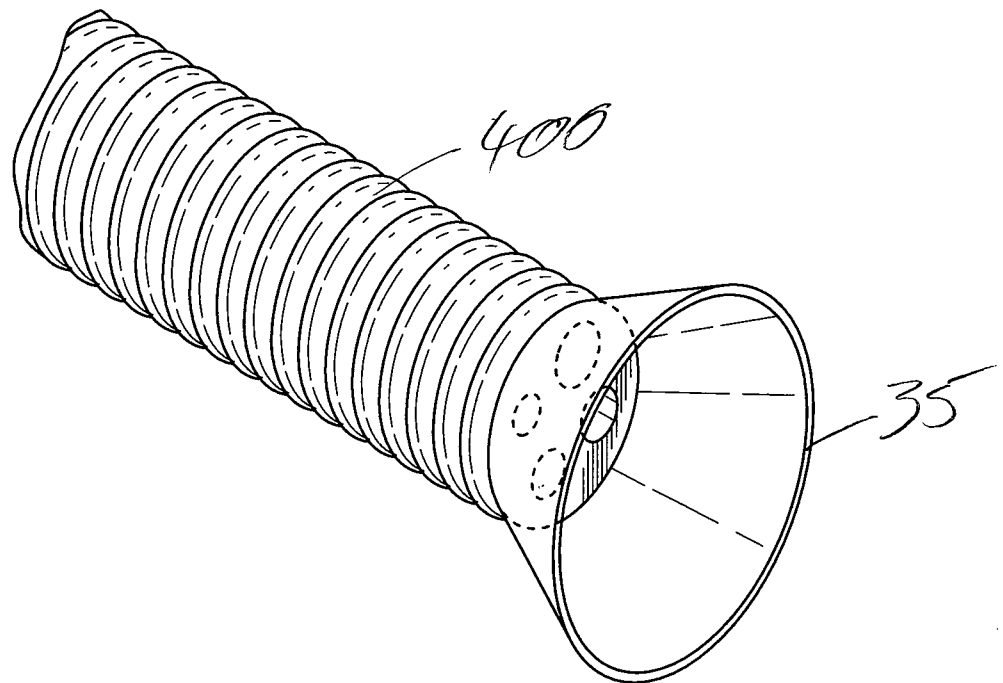


Fig. 35



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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2008/058151

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - A01D 46/24 (2008.04)

USPC - 56/336

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)

IPC(8) - A01D 46/24 (2008.04)

USPC - 56/336

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 practicable, search terms used)

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2,288,682 A (CHITTENDEN) 07 July 1942 (07.07.1942) entire document	1-2, 4-5, 14, 16, 28, 31
Y		3, 6-13, 15, 17-27, 29-30, 32
Y	WO 2000/62594 A1 (LUCAS) 26 October 2000 (26.10.2000) entire document	3, 6-9, 23, 27, 30, 32
Y	US 4,524,573 A (KINNEY) 25 June 1985 (25.06.1985) entire document	10
Y	US 2,545,072 A (DENMAN) 13 March 1951 (13.03.1951) entire document	11-13, 15
Y	US 3,584,442 A (WHITE) 15 June 1971 (15.06.1971) entire document	15
Y	US 5,007,772 A (MCKENNA et al) 16 April 1991 (16.04.1991) entire document	17-21, 29
Y	US 6,182,431 B1 (BALCHEN) 06 February 2001 (06.02.2001) entire document	22
Y	US 3,664,104 A (JAMSHIDI) 23 May 1972 (23.05.1972) entire document	24-26

☐ Further documents are listed in the continuation of Box C.

* Special categories of cited documents:

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Date of the actual completion of the international search

08 July 2008

Date of mailing of the international search report

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