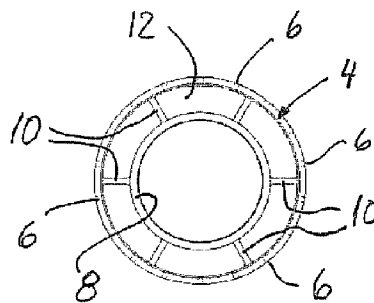
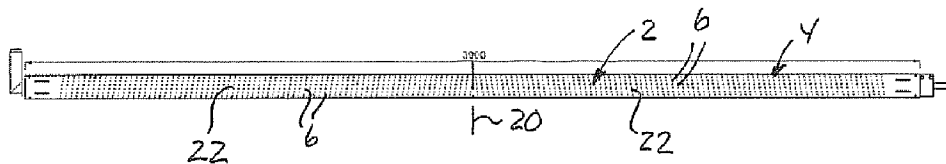




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(54) Titre : CYLINDRE COMPORTANT DES CONDUITS D'AIR DIVISES
 (54) Title: CYLINDER WITH AIR PARTITIONED DUCTS



(57) **Abrégé/Abstract:**

A tubular cylinder particularly for handling plastic film webs in connection with production of thin plastic film, e.g. thin packing film, the cylinder including an outer tube with a large number of radial apertures that communicate with an inner tube arranged coaxially relative to the outer tube, and which by means of radial longitudinal partitionings is divided into a number of longitudinal curving ducts, the inner tube being connected with a tubular duct for the supply of air, the cylinder include bearing means at opposite ends allowing the cylinder to rotate, where the radial nozzle apertures in the outer tube are arranged along two helical lines, and that the helix at one side of the centre plane is winding in a direction opposite the helix at the other side of the centre plane, and that the radial nozzle apertures are angled outwards relative to the radial centre plane.

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ABSTRACT

A tubular cylinder particularly for handling plastic film webs in connection with production of thin plastic film, e.g. thin packing film, the cylinder including an outer tube with a large number of radial apertures that communicate with an inner tube arranged coaxially relative to the outer tube, and which by means of radial longitudinal partitionings is divided into a number of longitudinal curving ducts, the inner tube being connected with a tubular duct for the supply of air, the cylinder include bearing means at opposite ends allowing the cylinder to rotate, where the radial nozzle apertures in the outer tube are arranged along two helical lines, and that the helix at one side of the centre plane is winding in a direction opposite the helix at the other side of the centre plane, and that the radial nozzle apertures are angled outwards relative to the radial centre plane.

Cylinder with Air Partitioned Ducts

Field of the Invention

The present invention concerns a tubular cylinder particularly for use in handling webs of plastic film in connection with production of thin plastic film.

5 Background of the Invention

Production of thin plastic films - e.g. thin packing films - occurs based on a thin plastic bag made by blowing, e.g. with a thickness of 8 μm .

After blowing, the thin plastic bag is worked via a system of rollers into a flattened double plastic bag, e.g. with a width of about 3700 mm. With the object of tensioning wide plastic
10 films in production, special reversing rollers are used as it is very important that the film is kept properly tensioned such that it will not become creased or deformed.

US-A 6,125,754 Discloses a channelled roller, used in association with flexible webs, which is provided with a pressurized gas flow, and which may be used to remove web wrinkles, clean webs, and roller, brake rollers, and hest, cool, moisturize, and dry webs. In operation,
15 gas flow travels through the roller channels and applies non-contact forces to the web, thereby removing wrinkles and providing other types of beneficial web treatment.

Summary of the Invention

It is the object of some embodiments of the invention to indicate a tubular cylinder or roller of the kind mentioned in the introduction, and which is particularly suited fro keeping the plastic
20 film tensioned, i.e. without creasing or deforming the plastic film.

In one embodiment of the invention, there is provided a tubular cylinder particularly for handling plastic film webs in connection with production of thin plastic film, e.g. thin packing film, the cylinder including an outer tube with a large number of radial nozzle apertures that communicate with an inner tube arranged coaxially relative to the outer tube, and which by
25 means of radial longitudinal partitionings is divided into a number of longitudinal curving air

ducts, the inner tube being connected with a tubular duct for the supply of air, the cylinder including bearing means at opposite ends allowing the cylinder to rotate, wherein that the radial nozzle apertures in the outer tube is arranged along two helical lines, and wherein the helix at one side of the centre plane is wound in a direction opposite the helix at the other side of the centre plane, and wherein the radial nozzle apertures are angled outwards relative to the radial centre plane.

In another embodiment of the invention, there is provided a tubular cylinder for handling plastic film webs comprising: an outer tube including nozzles which point in a direction to direct air radially outward from the outer tube, an inner tube disposed coaxially relative to the outer tube, partitions connecting the inner and outer tube to provide air ducts, the inner tube being connected to a duct for supplying air to the air ducts, cylinder bearings disposed at opposite ends of the cylinder for rotatably supporting the cylinder rotate; and wherein the nozzles are disposed on the outer tube along helices, a first helix being wound in a first direction on a first side of a center plane of the cylinder and a second helix being wound in a second direction opposite the first direction on a second side of the center plane, the nozzles pointing in the direction away from the radial center plane, the duct for supplying air to the air ducts extending into the inner tube to cause air to be injected into the inner tube and to be partially conducted backward along an outer side of the tubular duct to a first end of the inner tube and to partially conducted backward along the outer side of the tubular duct to a second end of the inner tube and to be introduced into the air ducts and radially directed onward through the nozzles, connections disposed between an inner side of the inner tube and the air ducts, and longitudinally displaceable air regulators for optimizing airflow out through the nozzles and means for longitudinally fixing the longitudinally displaceable air regulators.

In another embodiment of the invention, there is provided a tubular cylinder for handling plastic film webs comprising: an outer tube including nozzles which point in a direction to direct air radially outward from the outer tube, an inner tube disposed coaxially relative to the outer tube, partitions connecting the inner and outer tube to provide air ducts, the inner tube

being connected to a duct for supplying air to the air ducts, cylinder bearings disposed at opposite ends of the cylinder for rotatably supporting the cylinder rotate; screws interacting with an inner wall of the air ducts; and wherein the nozzles are disposed on the outer tube along helixes, a first helix being wound in a first direction on a first side of a center plane of the cylinder and a second helix being wound in a second direction opposite the first direction on a second side of the center plane, the nozzles pointing in the direction away from the radial center plane, the duct for supplying air to the air ducts extending into the inner tube to cause air to be injected into the inner tube and to be partially conducted backward along an outer side of the tubular duct to a first end of the inner tube and to partially conducted backward along the outer side of the tubular duct to a second end of the inner tube and to be introduced into the air ducts and radially directed onward through the nozzles, connections disposed between an inner side of the inner tube and the air ducts, and longitudinally displaceable air regulators for optimizing airflow out through the nozzles and means for arresting which interacts with an inner wall of the air ducts to longitudinally fix the longitudinally displaceable air regulators.

Description of the Invention

The tubular cylinder according to the invention is wherein that the radial nozzle apertures in the outer tube is arranged along two helical lines, and that the helix at one side of the centre plane is wound in a direction opposite the helix at the other side of the centre plane, and that the radial nozzle apertures are angled outwards relative to the radial centre plane.

By means of simple technical measures is hereby achieved a cylinder of the present kind which has a strongly improved ability to keep a web of plastic film stretched in tension and free from creases and even without the plastic film being subjected to deformation forces.

This arrangement with outwardly inclining radial nozzle apertures has the effect that during operation, i.e. when air is discharged through the nozzle apertures, by passage of a thin, e.g. flattened bag-shaped plastic film web (with a total thickness of the magnitude $2 \times 8 \mu\text{m}$) around the tubular cylinder, a supporting air film is formed which due to the outwardly inclining nozzle apertures will have a smoothening or tensioning effect, which - without

producing any kind of deformation forces - contributes to counteracting formation of creases in the plastic film web.

The tubular cylinder according to the invention is suitably designed such that that the outwardly directed angle of the radial nozzle apertures is between 1° and 50°, preferably about 5 15° relative to the radial centre plane.

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Preferably, the tubular cylinder according to the invention is additionally designed such that the spacing between the helical centre lines measured along the outer side of the outer tube is of the magnitude 5 - 50 mm, preferably 22.5 mm.

With the object of optimising the action on a given plastic film web, the tubular cylinder
5 according to the invention is designed such that the nozzle apertures have a diameter of between 0.5 and 5 mm, preferably 2.5 mm.

The tubular cylinder according to the invention may advantageously further be designed such that for supply of air, the tubular duct in a way known per se extends a length inwards into the inner tube such that the injected air is partly conducted back along the outer side of the tubular
10 duct to the left end of the inner tube and partly to the right end of the inner tube for introduction into the longitudinal curving air ducts and onwards radially out through the outwardly inclining nozzle apertures of the outer tube.

With the object of optimising the airflow outward through the radial nozzle apertures, the tubular cylinder according to the invention may further be designed such that at opposite ends,
15 by radial connections between the inner side of the inner tube and the longitudinal curving air ducts it has longitudinally displaceable regulating means for optimising the resulting airflow out through the inclining nozzle apertures.

The tubular cylinder according to the invention may furthermore particularly advantageously be designed such that the longitudinally displaceable regulating means include arresting
20 means which opposite the longitudinal curving air ducts are accessible through externally open, elongated openings.

The tubular cylinder according to the invention may in a particular simple way be designed such that the arresting means are constituted by pointed screws interacting with an inner wall of the longitudinal curving air ducts.

25 With the object of optimising, i.e. prolonging, the service life of the tubular cylinder according to the invention, it may advantageously be designed such that at least one of the bearing means includes adjustable stopper means adapted to regulate the working position of

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bearing means includes adjustable stopper means adapted to regulate the working position of the cylinder such that by wear it may e.g. be turned 180°.

Description of the Drawings

The invention is explained more closely in the following with reference to the drawing, on
5 which:

Fig. 1 shows a plan view of an embodiment of a tubular cylinder according to the invention, as seen from a rear side;

Fig. 2 shows a plan view of the cylinder shown in Fig. 1, as seen from the top;

Fig. 3 shows a plan view, partly in section, of the cylinder shown in Fig. 2;

10 Fig. 4 shows a plan sectional view through a tubular cylinder according to the invention;

Fig. 5 shows a plan sectional view of an end part of a tubular cylinder according to the invention;

Fig. 6 shows a plan sectional view of a left end part of a tubular cylinder, cf. Fig. 3;

15 Fig. 7 shows a plan sectional view of a right end part of a tubular cylinder, cf. Fig. 3; and

Fig. 8 shows a perspective view of a preferred tubular cylinder according to the invention.

Detailed Description of Embodiments of the Invention

20 The tubular cylinder 2 shown in Figs. 1-4 consists of an outer tube 4 provided with a large number of nozzle apertures 6 to which air is supplied by means of longitudinal curving air ducts 12 which by means of radial partitionings 10 are formed between the outer tube 4 and an inner tube 8.

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The nozzle apertures 6, which e.g. have a diameter of 2.5 mm, are provided at each their side of a centre plane 20 arranged along helical centre lines 22 with mutual spacing of e.g. 22.5 mm. In other words, the radial nozzle apertures 6 in the outer tube 4 are arranged along two helical lines, and that the helix at one side of the centre plane 20 is winding in a direction opposite the helix at the other side of the centre plane 20. In addition, the radial nozzle apertures 6 (Fig. 5, 24) are angled e.g. 15° outwards relative to the centre plane.

This arrangement with outwardly inclining radial nozzle apertures 6 has the effect that during operation, i.e. when air is discharged through the nozzle apertures 6, by passage of a thin, e.g. flattened bag-shaped plastic film web (with a total thickness of the magnitude $2 \times 8 \mu\text{m}$) around the tubular cylinder 2, a supporting air film is formed which due to the outwardly inclining nozzle apertures 6 will have a smoothing or tensioning effect, which - without producing any kind of deformation forces - contributes to counteract crease formation in the plastic film web.

It is to be mentioned that the tubular cylinder 2 which at opposite ends is rotatably suspended on ball bearings 16 and 18 by initiation of a given reversing task of a plastic film web will rotate in the direction of movement due to the friction between the plastic film web and the tubular cylinder 2. But when the air film has been established between the tubular cylinder 2 and the plastic film web, the tubular cylinder 2 will find its neutral state and then stand still.

Figs. 6 and 7 show that the tubular cylinder 2 at opposite ends are designed with radial connections 26 between the inner tube 8 and the longitudinal curving air ducts 12. Opposite the radial connections 26, regulating means 28 are displaceably arranged with arresting means 30 that are accessible for displacement along radial connections 26 through outwardly open slots 32 and which can be locked into desired position by means of pointed screws 34.

By means of this regulating arrangement it is possible to regulate the resulting airflow out through the radial nozzle apertures 6 such that the air film between the plastic film web and the tubular cylinder 2 is optimised correspondingly.

At the right end (Fig. 7) are shown stopper means 36 intended for use by alternative fixation to the tubular cylinder 2, e.g. by a rotation of 180°, with the object of extending the service life of the tubular cylinder 2 - or, in other words, to enable turning of the tubular cylinder 2 if one of its sides has become worn.

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Reference numbers of the drawings

	2	tubular cylinder
	4	outer tube
	6	radial nozzle apertures
5	8	inner tube
	10	longitudinal radial partitionings
	12	longitudinal curving air ducts
	14	tubular supply duct
	16	bearing means (left end)
10	18	bearing means (right end)
	20	radial centre plane
	22	helical centre line
	24	outwardly directed angle (preferably 15°)
	26	radial connections
15	28	regulating means
	30	arresting means
	32	pointed screws
	34	stopper means

CLAIMS:

1. A tubular cylinder for handling plastic film webs comprising:

an outer tube including nozzles which point in a direction to direct air radially outward from the outer tube, an inner tube disposed coaxially relative to the outer tube,
5 partitions connecting the inner and outer tube to provide air ducts, the inner tube being connected to a duct for supplying air to the air ducts, cylinder bearings disposed at opposite ends of the cylinder for rotatably supporting the cylinder rotate; and wherein

the nozzles are disposed on the outer tube along helixes, a first helix being wound in a first direction on a first side of a center plane of the cylinder and a second helix
10 being wound in a second direction opposite the first direction on a second side of the center plane, the nozzles pointing in the direction away from the radial center plane, the duct for supplying air to the air ducts extending into the inner tube to cause air to be injected into the inner tube and to be partially conducted backward along an outer side of the tubular duct to a first end of the inner tube and to partially conducted backward along the outer side of the
15 tubular duct to a second end of the inner tube and to be introduced into the air ducts and radially directed onward through the nozzles, connections disposed between an inner side of the inner tube and the air ducts, and longitudinally displaceable air regulators for optimizing airflow out through the nozzles and means for longitudinally fixing the longitudinally displaceable air regulators.
- 20 2. The tubular cylinder according to claim 1, wherein an outwardly directed angle of the nozzles relative to a line perpendicular to an outer surface of the outer tube relative to the center plane ranges between 1° and 50°.
3. The tubular cylinder according to claim 1 wherein spacing between adjacent rows of nozzles ranges from 5-50 mm.
- 25 4. The tubular cylinder according to claim 1, wherein the nozzles have an aperture diameter ranging between 0.5-5 mm.

5. The tubular cylinder according to claim 1, wherein at least one of the bearings includes an adjustable stopper for adjusting a working position of an outer face cylinder facing the plastic film web to permit rotation for prolonging a life of the cylinder.

6. The tubular cylinder according to claim 1, further comprising means for
5 arresting, wherein the means for arresting interacts with an inner wall of the air ducts to longitudinally fix the longitudinally displaceable air regulators.

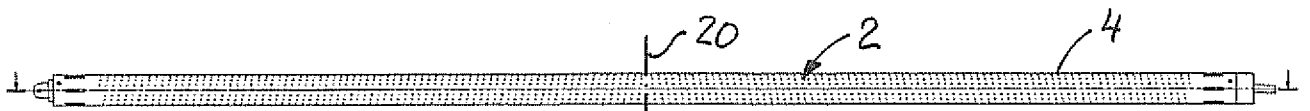


Fig. 1

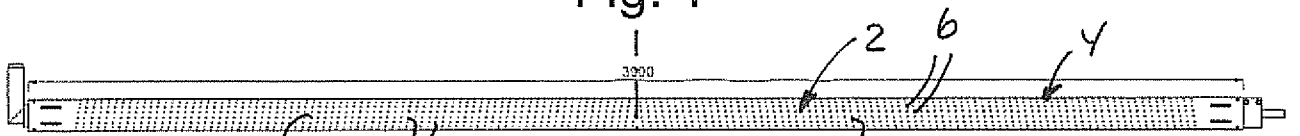


Fig. 2

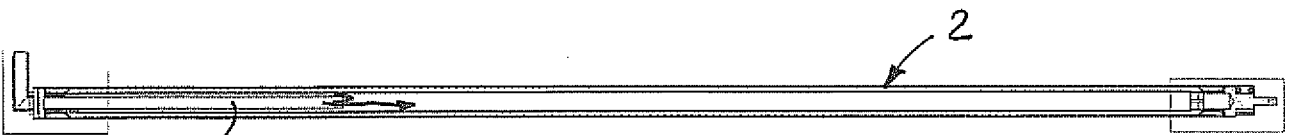


Fig. 3

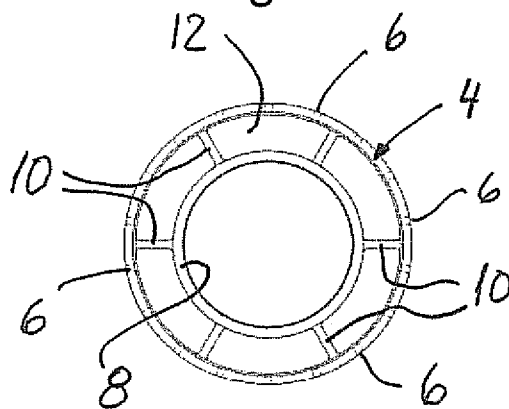


Fig. 4

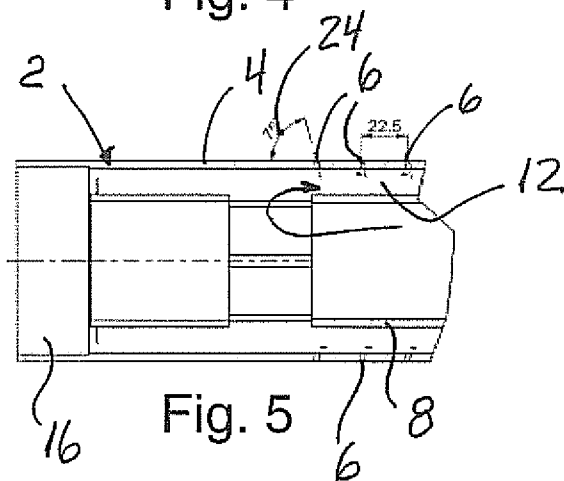


Fig. 5

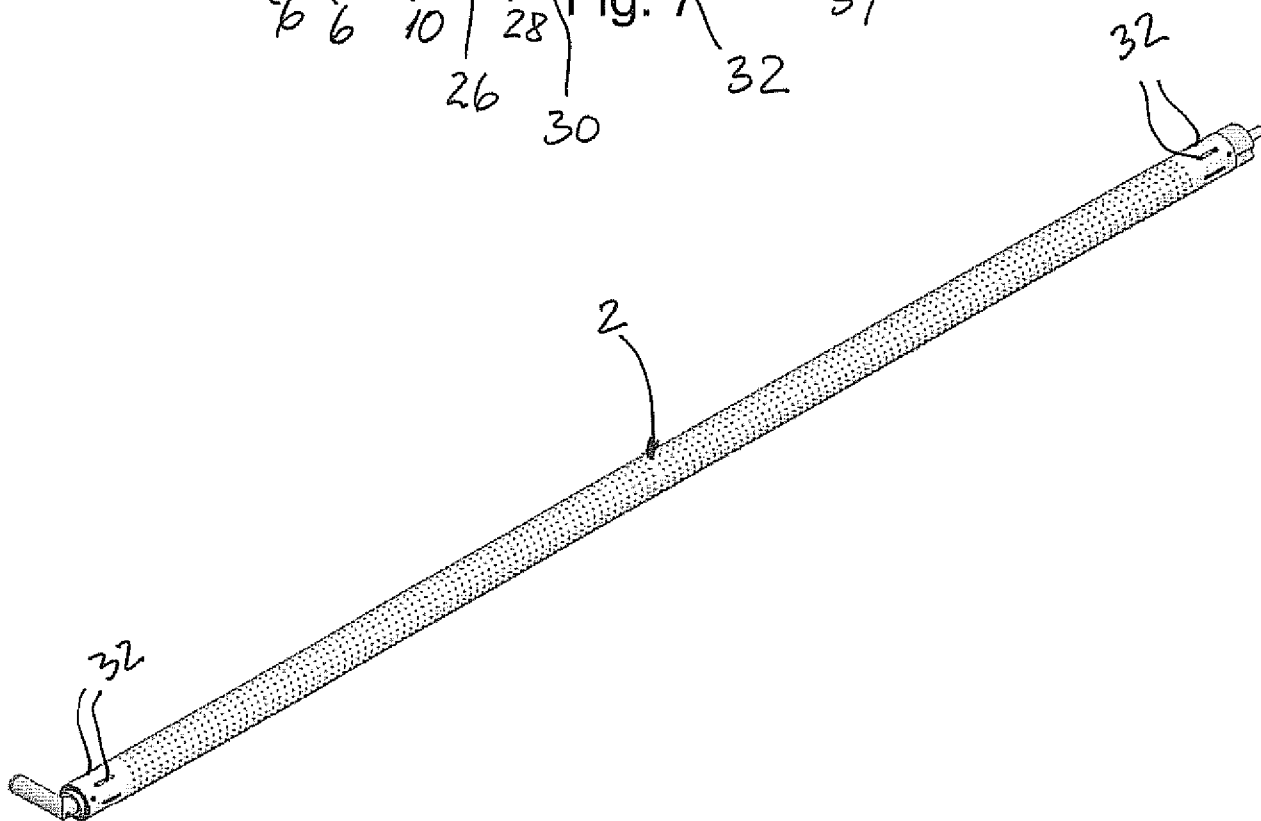
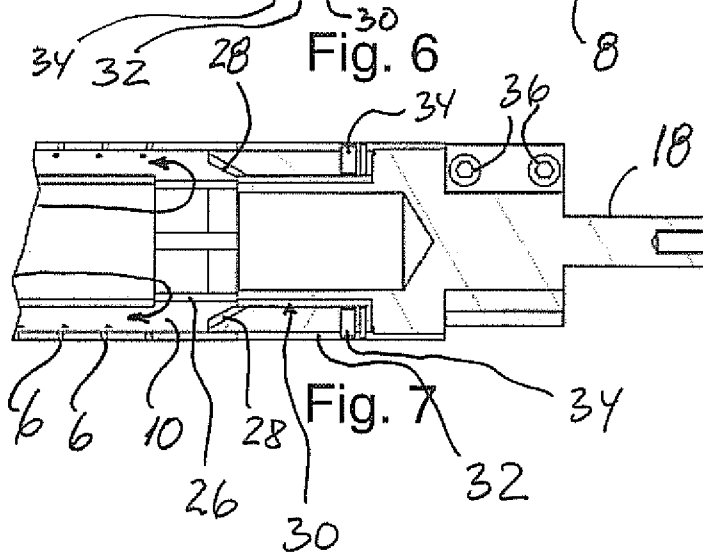
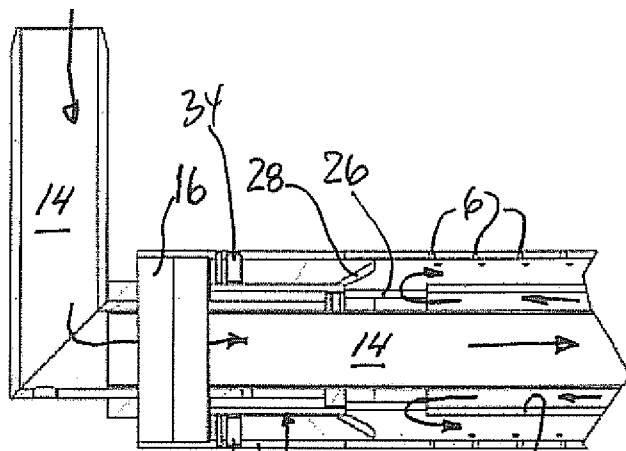


Fig. 8

