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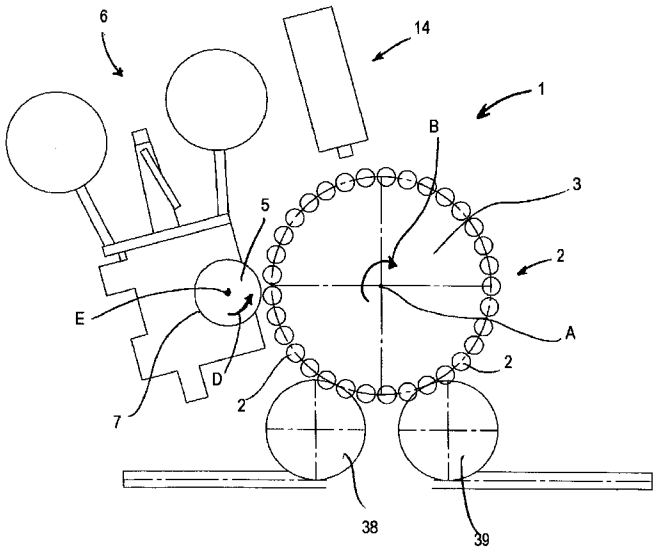
(54) Title: APPARATUS AND METHOD FOR OBTAINING LABELS



(57) Abstract: An apparatus for obtaining "shrink sleeve" labels (11), comprises a carousel (3) that is provided peripherally with spindle means (4) configured for being wound from portions (8) of plastic film, sealing means (14; 32) cooperating with said spindle means (4) for sealing opposite edges of said portions (8) for obtaining said "shrink sleeve" labels (11), said sealing means comprising laser means (14; 32) ; a method for labelling containers, comprises in sequence: - advancing a plastic film in an advancing direction; cutting said plastic film transversely to said advancing direction to obtain a portion of plastic film; winding said portion in such a way as to make opposite edges of said portion overlap one another; joining together said edges to obtain a "shrink sleeve" label, said joining comprising sealing by means of a laser beam.

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Apparatus and method for obtaining labels.

The invention relates to an apparatus and a method for obtaining labels for containers, in particular "shrink sleeve" labels in PET, PVC, polypropylene (PP), polystyrene (PS), or other materials suitable for being heat-shrunk.

By the term "shrink sleeve", tubular labels in plastic film are intended that are placed on a container and are subsequently heated to shrink on the external surface of the container and assume the shape thereof.

WO2004/020291 discloses an apparatus for labelling containers comprising a movement device that moves along an advancing direction a heat-shrinkable plastic film from which the "shrink sleeve" labels are obtained. The plastic film is unwound from a reel and is advanced to a transferring drum. A cutting device is provided that cuts the plastic film transversely to the advancing direction, in such a way as to obtain portions of plastic film having a preset length, measured longitudinally to the plastic film, so as to obtain "shrink sleeve" labels having a preset diameter.

There is provided a pneumatic device that can suck air inside the transferring drum through respective holes obtained on an external cylindrical wall of the latter.

The transferring drum is adjacent to a rotatable carousel that peripherally and rotatably supports a plurality of spindles spaced part from one another. Each spindle is shaped to support a bottle to be labelled and to receive from the transferring drum a portion of plastic film from which a "shrink sleeve" label is obtained. Each spindle comprises a further external cylindrical wall having a diameter substantially the same as the preset diameter of the "shrink sleeve" labels, provided with further holes through which air is sucked from outside to inside the spindle, to make a portion of plastic film adhere to the further cylindrical wall. By means of the further holes air can also be expelled outside the spindle to expand a "shrink

sleeve" label radially that is obtained after subjecting a portion of plastic film to a heat-sealing process. With each spindle there is associated a heat-sealing device comprising a bar element that can be heated by means of an electric resistance. The bar element is brought up to the portion of plastic film when the latter is wound around the spindle and seals together opposite edges of the portion of plastic film parallel to the second axis, so as to obtain a "shrink sleeve" label.

Each spindle comprises a supporting plate fixed transversely to the further cylindrical wall, shaped to supportingly receive a bottle. The spindle is axially drivable in such a way as to be able to insert the bottle inside the "shrink sleeve" label. This can occur only after the label has been dilated, through the air expelled from the further holes, in such a way as to give it a greater diameter than a transverse maximum dimension of the bottle.

During operation, the plastic film is advanced by the movement device to the transferring drum, near which it is cut by the cutting device in such a way as to obtain a portion of plastic film of preset length.

The portion of plastic film is advanced in such a way as to adhere to the transferring drum by means of the air sucked through the holes. Subsequently, the portion of plastic film is surrendered to a spindle, which in the meantime has been taken by the carousel to near the transferring drum. The portion of plastic film is made to adhere to the spindle by sucking air through the further holes. The portion of plastic film is wound on the further cylindrical wall in such a way as to have the opposite edges of the portion of plastic film partially overlapping one another longitudinally to the spindle. At this point the bar element is driven in such a way as to touch the edges of the portion of material, mutually sealing them and thus obtaining the "shrink sleeve" label.

At this point the "shrink sleeve" label is dilated by means of pressurised air expelled from the further holes so that it can reach a diameter greater than that of the spindle and can be removed from the latter. Whilst the "shrink sleeve" label is stationary with respect to the carousel, the supporting plate is driven so that the bottle supported thereupon can be lowered and introduced inside the "shrink sleeve" label. The bottle and the "shrink sleeve" label associated therewith are then conveyed to a heating station that forces the "shrink sleeve" label to contract through the heat effect, thus adhering to the side surface of the bottle.

The heat seals obtained with a hot bar are unsightly because at the heat seals the material of the label tends to get deformed in a clear manner, giving rise to creases and surface irregularities, which are not considered to be acceptable by the market.

Further, these heat seals require the blades between which opposite edges of the label are imprisoned to remain in contact with one another and with the material to be sealed for a relatively long period of time compared with the machine time available in an operating cycle, with the result that it is impossible to obtain high productivity.

The seals obtained by means of glues are first of all difficult to obtain without soiling with glue the parts of spindles on which the labels are wound.

Further, if thermofusible glues are used, the joint zones between the edges of each label tend to yield when the labels are heated to activate the heat-shrinkage thereof.

In order to overcome this drawback, special glues can be used that react to UV rays and do not decompose with heat; but this involves greater costs for acquiring glues and imposes the necessity of providing UV rays to dry the glues.

Further, the zones sealed with the traditional systems have a certain width, that is approximately of the order of a few millimetres, which does not enable the space available for

printing on the plastic film to be used in an optimal manner.

A defect of the known apparatuses for labelling is that they do not seal the "shrink sleeve" labels in a satisfactory manner.

A further defect of the known apparatuses is that it is difficult to remove axially a label from the spindle on which it has been obtained inasmuch as the label has a tubular shape having the same diameter as the spindle.

An object of the invention is to improve the systems for manufacturing "shrink sleeve" labels.

Another object of the invention is to obtain an apparatus that enables containers to be labelled with great precision and reliability.

A further object of the invention is to obtain an apparatus that is able to seal labels in a satisfactory manner.

A still further object of the invention is to obtain an apparatus that is able to process labels correctly without subjecting them to sudden stress that could damage them.

In a first aspect of the invention, an apparatus is provided for obtaining "shrink sleeve" labels, comprising a carousel that is provided peripherally with spindle means configured for being wound from portions of plastic film, sealing means cooperating with said spindle means for sealing opposite edges of said portions to obtain said "shrink sleeve" labels, characterised in that said sealing means comprises laser means.

In a second aspect of the invention, a method is provided for labelling containers, comprising in sequence:

- advancing a plastic film along an advancing direction;
- cutting said plastic film transversely to said advancing direction to obtain a portion of plastic film;
- winding said portion in such a way as to make opposite edges of said portion overlap one another;

- joining together said edges to obtain a "shrink sleeve" label,

characterised in that said joining comprises sealing by means of a laser beam.

Owing to the first and second aspect of the invention it is possible to seal with great precision and evenness opposite edges of a "shrink sleeve" label. Further, it is possible to obtain "shrink sleeve" labels with very rapid operating cycles owing to the limited time necessary for driving the laser means.

In a third aspect of the invention, an apparatus is provided comprising spindle means rotatable around a longitudinal axis, provided with a side surface shaped to be wound from a portion of plastic film to obtain a "shrink sleeve" label, characterised in that said side surface comprises zones arranged at distances from said longitudinal axis that are different from one another.

In a fourth aspect of the invention, a method is provided for producing "shrink sleeve" labels, comprising winding a portion of plastic film on a curved work surface having a cross section that has a greater extent than the extent of a circumference circumscribed to said cross section.

Owing to the third and the fourth aspect of the invention, it is possible to have an apparatus provided with spindle means that enables labels with high reliability to be obtained, reducing the risk that a "shrink sleeve" label can be damaged or even broken after being sealed. In particular, owing to the geometrical shape of the side surface, the spindle means can house a portion of plastic film having a preset length in a very small space with respect to the traditional case. This further enables the label to be detached with facility as soon as it is sealed from the side surface without having to resort to great air pressure to dilate the label, which in this way is not stressed excessively.

In a fifth aspect of the invention, a "shrink sleeve" label is provided, comprising a longitudinal sealing zone that joins a pair of opposite edges of a portion of plastic film, characterised in that said sealing zone has a significantly reduced width, for example of the order of a millimetre.

In this way, it is possible to increase the printable surface of the label.

The invention can be better understood and implemented with reference to the attached drawings that illustrate an embodiment thereof by way of non-limitative example, in which:

Figure 1 is a schematic view from above of an apparatus for labelling containers;

Figure 2 is a schematic view from above of an embodiment of an apparatus for labelling containers;

Figure 3 shows schematically a portion of the apparatus in Figure 2 during operation;

Figure 4 is a schematic view of another portion of the apparatus in Figure 1 or 2 during operation;

Figure 5 shows schematically a section of spindle means with which the apparatuses in Figure 1 or 2 are provided, in a first operating configuration;

Figure 6 is a fragmentary view that shows an enlarged detail of the spindle means in Figure 5;

Figure 7 is a view like the one in Figure 5 that shows the spindle means in a second operating configuration;

Figure 8 shows schematically a section of an embodiment of spindle means with which the apparatuses in Figure 1 or 2 are provided, in a third operating configuration;

Figure 9 is a fragmentary section that shows an enlarged detail of the spindle means in Figure 8;

Figure 9A is a fragmentary section like that in Figure 9, but relating to a version of retaining means for retaining the plastic film on the spindle means;

Figure 10 is a view like the one in Figure 8 that shows the spindle means in a fourth operating configuration;

Figure 11 is a schematic view of a further portion of the apparatus in Figure 1 or 2 that shows laser means during operation;

Figure 12 is another schematic and perspective view of the laser means in Figure 11 during operation;

Figure 13 is an enlarged detail of Figure 12 that shows the laser means during operation;

Figure 14 shows schematically a first operating mode of the laser means;

Figure 15 shows schematically a second operating mode of the laser means;

Figure 16 shows schematically a third operating mode of the laser means;

Figure 17 shows a still further portion of the apparatus in Figure 1 or 2 in a fourth operating configuration.

With reference to Figures 1 and 3, there is shown an apparatus 1 for labelling bottles 2, comprising a carousel 3, rotatable around a first axis of A, in a first rotation direction B. The carousel 3 supports peripherally a plurality of spindles 4 on which "shrink sleeve" labels 11 are formed. The spindles 4 are distributed uniformly on the carousel 3, and are rotatable, in the first rotation direction B, around respective second axes C arranged parallel to the first axis A.

With each spindle 4 there is associated at the bottom a supporting element 37, shown in Figures 4, 11, and 17, that is used to support a bottle 2.

A movement device 6 is provided that moves along an advancing path a plastic film that is removed from a reel on which it was initially wound. With the movement device 6 there is associated a cutting device, arranged for cutting the plastic film transversely to the advancing path, so as to obtain portions 8 of plastic film, which are precursors of the "shrink sleeve" labels 11, each of which is surrendered to a spindle 4.

The movement device 6 comprises a transferring drum 5, that is rotatable in a second rotation direction D opposite the first direction B and around a third axis E arranged parallel to the second axis C. The transferring drum 5 comprises a cylindrical side wall 7, on which there is obtained a plurality of holes connected to a pneumatic device. The pneumatic device is able to suck air inside the transferring drum 5 or expel air from the transferring drum 5 to the outside through the aforesaid holes, in function of an angular position of the latter with respect to the third axis E. By sucking air through the holes it is possible to make a portion 8 stick to the cylindrical side wall 7 after the latter has been separated from the plastic film. Through expulsion of air from the transferring drum 5 through the aforesaid holes it is on the other hand possible to detach the portion 8 from the cylindrical side wall, in such a way that it is transferred to a spindle 4 near the transferring drum 5.

Each spindle 4, as better shown in Figures 5 to 7, comprises a side surface 9 provided with a notch 10 that extends parallel to the second axis C and is shaped for receiving therein a fraction of the portion 8 of plastic film. In particular, inside the notch 10 there are received the opposite edges of a portion 8 that have to be sealed together and therefore have to partially overlap one another in an overlapping zone 13 having a desired width. This enables it to be prevented that sealed zones protrude in an undesired manner outside the spindle 4.

As shown in Figure 9A, in the overlapping zone 13 the opposite edges of the portion of plastic film to be sealed can be kept pressed against one another by means of a pressing element 50 supported on the carousel and movable between a neutral position in which it is at a certain distance from the side surface 9 of the spindle 4 and a grasping position in which it presses the overlapping edges of the portion 8 against the side surface 9.

In Figures 8 to 10, there is shown an embodiment of a spindle 4, in which the side surface 9 is provided with four uniformly distributed notches 10. However, it is possible to provide any number of notches 10.

On the side surface 9 there are obtained further holes 12 through which it is possible to suck air from outside inside the spindle 4 or to expel air outside the spindle 4.

By the sucking of air through the further holes 12 it is possible to make a portion 8 adhere to the side surface 9, which portion 8 is removed by the transferring drum 5, as shown in Figure 4, or to expel air so as to detach from the side surface 9 a label 11 that has just been obtained from a portion 8 and is ready to be applied to a bottle 2.

Owing to the notches 10, when a label 11 adheres to the side surface 9, it has a greater extent of the ideal circumscribed circumference of the spindle 4, i.e. of the circumference that the spindle 4 would have if the notches 10 were not present.

This makes it possible to detach the label 11 from the side surface 9 and remove it axially from the spindle 4 with facility.

With reference to Figures 1, 3, and 11 to 16, a laser device 14 is provided for sealing together the opposite edges of the portions 8 of plastic film supported on the spindles 4.

The laser device 14 is situated outside the carousel 3 and downstream of the transferring drum 5.

The laser device 14 is able to emit a laser beam 15 that is directed to the overlapping edges of a portion 8, in such a way as to travel longitudinally along the latter.

As a spindle 4, after receiving a portion 8, is dragged by the carousel 3 that rotates around the first axis A, the laser device 14 is able to follow the moving spindle 4 so that the laser beam 15 can travel correctly along the edges to be sealed.

Owing to the movement of the laser beam by means of a scanner optic, the system seals the label by following the

sealing joint position whilst it moves on the turntable 3. Sealing is thus performed on the diagonal of a rectangle having the height of the label as the height and having a base calculated in function of the rotation speed of the turntable, acquired by the PLC of the line before the start of sealing.

The laser beam 15 has a first speed component 16 parallel to the second axis C, and to a second speed component 17 transverse to the second axis C, in accordance with the advancing direction of the carousel 3 and substantially equal to the tangential speed at which the edges are moved.

As better shown in Figure 14, whilst the spindle 4 is advanced from a first position F, nearer the transferring drum 5, to a second position G in which the spindle 4 has been moved by a certain amount, the laser device 14 now moves from an initial configuration to a final configuration, in such a way that the laser beam 15 moves from an initial zone 21, in which it interacts with first end portions 40 of the edges, to a final zone 22, in which it interacts with second end portions 41 of the edges, travelling along a first portion 19 in the direction indicated by a first arrow H, so as to generate a sealed zone 20. The laser device 14, after generating the sealed zone 20, interrupts the emission of the laser beam 15 and moves again so as to be able to perform a new seal on a further portion 8 that in the meantime has been conveyed to the first position F. The laser device 14, in order to again reach the initial zone 21, defines a second portion 23 parallel to the first portion 19, in a direction indicated by a second arrow L opposite the first arrow H. Depending on the speed at which sealing is performed, it is possible to provide for the laser device 14 taking less time to return to the initial configuration from the final configuration if it moves from the final configuration to the initial configuration. This is necessary so that the laser device 14 can reach the initial zone 21 of a subsequent portion 8

before or at the moment at which the latter has reached the first position F.

In an embodiment of the apparatus 1, with reference to Figure 15, it is possible to provide for the laser device 14 opening in such a way that the laser beam 15 moves from a further initial zone 24, near a lower end of the portion 8, to a further final zone 25, near an upper end of the portion 8, travelling along a third portion 26 in the direction indicated by a third arrow M, so as to generate a sealed zone 20. The laser device 14, in order to again reach the further initial zone 24, identifies a fourth portion 27 parallel to the third portion 26, in a direction indicated by a fourth arrow N opposite the third arrow M. The speeds that affect the laser device 14 in this embodiment are similar to those disclosed with reference to Figure 14.

In another embodiment of the apparatus 1, with reference to Figure 16, it is possible to provide for the laser device 14 directing the laser beam 15 in such a way that the latter travels along a first path and a second path in an alternating manner. In particular, the laser beam 15 is directed from a first zone O, near an upper end of the portion 8, to a second zone P, near a lower end of the portion 8, travelling along a fifth portion 28, in the direction indicated by a fifth arrow Q. Another sealed zone 20 is thus generated. Subsequently, the laser device 14 interrupts the laser emission and arranges itself so as to reach a third zone R near a lower end of the portion 8, defining a sixth portion 29 that is parallel to a plane defined by the carousel 3 and which can be shorter than the fifth portion 28, thus enabling the laser device 14 to be prepared more rapidly for a subsequent sealing cycle. In this way, the laser device 14 is ready for sealing a subsequent portion 8 that in the meantime has reached the first position F. At this point, the laser device 14 emits a laser beam 15 in such a way that the latter travels along a seventh portion 30, in the direction indicated by a sixth

arrow S, moving from the third zone R to a fourth zone T near the upper end of the portion 8, thus generating the sealed zone 20.

Lastly, the laser device 14 again interrupts the laser emission and is arranged in such a way as to reach the first zone O, defining an eighth portion 31 parallel to the sixth portion 29. In this way, the laser device 14 is ready to seal a further portion 8 that in the meantime has reached the first position F, according to the methods that have just been disclosed.

With reference to Figure 2, there is shown an embodiment of an apparatus 1 that rather than having only a laser device 14 arranged outside the carousel 3, comprises a plurality of further laser devices 32, supported on the carousel 3. Each further laser device 32 is associated with a respective spindle and cooperates with the latter to seal a portion 8 of plastic film to obtain a label 11. Owing to this configuration, each further laser device 32 being rotated by the carousel 3, it is not necessary to take account of the rotation movement associated with the carousel 3, and in this way the method is facilitated by which the laser beam is directed to the portions 8. Further, the further laser devices 32 can perform a seal at intervals of time that can be chosen more freely, inasmuch as each one of them cooperates with a sole respective spindle, unlike the embodiment disclosed with reference to Figure 1, in which each laser device 32 has to reposition itself cyclically in an initial configuration to be able to seal successive portions 8 one at a time.

With each spindle 4 there is associated a pickup device 33 that is movable parallel to the second axis C, and arranged for transferring the label 11 from the spindle 4 to the respective bottle 2 placed under the latter and supported on the supporting element 37, as better shown in Figure 17. The pickup device 33 comprises a body 34 to which ends 35 are fixed, each provided with a contact portion 36 shaped to

interact with the surface of a label 11. Through the ends 35 air is sucked in such a way that the label 11 that has just been formed can adhere to the contact portions 36 and can be moved.

An inlet wheel 38 is provided that is used to convey bottles 2 to be labelled to the carousel 3. The inlet wheel 38 is adjacent to the carousel 3 and arranged in such a way that peripheral zones of the carousel interact first therewith and subsequently with the transferring drum 5.

The apparatus 1 further comprises an outlet wheel 39 that is used to remove bottles 2 from the carousel 3 that have been labelled. The outlet wheel 39 is adjacent to the carousel 3 and arranged downstream of the transferring drum 5 with respect to the first rotation direction B.

During operation, a bottle 2 is transferred from the inlet carousel 38 to a spindle 4 and is advanced to near the transferring drum 5.

A first end zone of the portion 8 is moved away from the cylindrical side wall 7 of the transferring drum 5 by means of air that is expelled through the holes and is made to adhere by means of air that is sucked through the further holes 12 to the side surface 9, which is rotated in the meantime. Similarly, further zones of the portion 8 are progressively made to adhere to the side surface 9.

The spindle 4 is driven in such a way that the opposite edges of the portion of material 8 are at the end overlapping one another by a suitable amount that is necessary to enable them to be subsequently sealed to obtain a label 11. Furthermore, the spindle 4 is positioned in such a way that the edges of the portion 8 are received inside a notch 10, so that they can be sealed correctly according to the above methods.

After receiving the portion 8, the spindle 4 is positioned in such a way that the edges to be sealed face the laser device 14, or the respective further laser device 32, in such a way as to be able to interact with a laser beam 15.

Once the label 11 has been sealed, it is moved away from the side surface 9 by means of air that is expelled through the further holes 12 and is moved by the pickup device 33 in such a way as to be arranged around the bottle 2, located below the spindle 4. At this point the bottle 2 and the label 11 associated with it are surrendered to the outlet wheel 39 to be directed to a heating station. In the heating station the label 11 is subjected to heat treatment by means of which it retracts and adheres to the external surface of the bottle 2.

CLAIMS

1. Apparatus for obtaining "shrink sleeve" labels (11), comprising a carousel (3) that is provided peripherally with spindle means (4) configured for being wound from portions (8) of plastic film, sealing means (14; 32) cooperating with said spindle means (4) for sealing opposite edges of said portions (8) for obtaining said "shrink sleeve" labels (11), characterised in that said sealing means comprises laser means (14; 32).
2. Apparatus according to claim 1, wherein said laser means (14; 32) is configured for directing a laser beam (15) from a zone wherein said laser beam (15) acts on first end portions (40) of said edges, to a further zone, wherein said laser beam (15) acts on second end portions (41) of said edges opposite said first end portions, so as to generate a sealed strip (20).
3. Apparatus according to claim 1 or 2, wherein said laser means (14; 32) comprises a laser device (14) arranged outside said carousel (3).
4. Apparatus according to claim 3, wherein said laser device (14) is configured for cooperating sequentially with a plurality of spindles (4) of said spindle means.
5. Apparatus according to claim 4, as claim 3 is appended to claim 2, wherein said laser device (14) is configured for moving said laser beam (15) at a speed having a first speed component (16) longitudinal to said spindle means (4) and a second speed component (17) that is equal to a peripheral speed at which said edges are moved.
6. Apparatus according to claim 1 or 2, wherein said laser means (14; 32) comprises a plurality of laser devices (32) supported on said carousel (3) and cooperating with a plurality of spindles (4) with which said spindle means is provided.
7. Apparatus according to claim 6, wherein each laser device (32) of said plurality of laser devices (32)

cooperates with a respective spindle (4) of said plurality of spindles (4).

8. Apparatus according to any one of claims 1 to 7, wherein said spindle means (4) is provided with a side surface (9), comprising zones arranged at a distance from a longitudinal axis (C) of said spindle means (4) that are different from one another.

9. Apparatus according to claim 8, wherein said side surface (9) comprises notch means (10) extending parallel to said longitudinal axis (C) and configured for receiving parts of said portion (8).

10. Apparatus according to claim 9, wherein said notch means comprises a notch (10).

11. Apparatus according to claim 9, wherein said notch means comprises a plurality of notches (10) distributed on said side surface (9).

12. Apparatus according to any one of claims 8 to 11, wherein on said side surface (9) there is obtained a plurality of holes (12) through which air can be sucked into said spindle means (4) to make said portions (8) adhere to said side surface (9), and air can be expelled outside said spindle means (4) to remove radially said "shrink sleeve" labels (11) from said side surface (9).

13. Method for labelling containers (2), comprising advancing a plastic film along an advancing direction, cutting said plastic film transversely to said advancing direction to obtain a portion (8) of plastic film, winding said portion (8) in such a way as to make opposite edges of said portion (8) overlap one another, joining together said edges to obtain a "shrink sleeve" label (11), characterised in that said joining comprises sealing by means of a laser beam (15).

14. Method according to claim 13, wherein said sealing comprises directing said laser beam (15) from a first zone (O), wherein said laser beam (15) acts on first

end portions (40) of said edges, to a second zone (P), wherein said laser beam (15) acts on second end portions (41) of said edges opposite said first end portions, so as to generate a sealed strip (20).

15. Method according to claim 14, wherein said winding comprises winding said portion (8) on a spindle (4) supported on a carousel (3).

16. Method according to claim 15, wherein said winding comprises overlapping opposite edges of said portion (8) at notch means (10) of said spindle (4).

17. Method according to claim 15, or 16, wherein after said winding there is provided driving said carousel (3) in such a way as to advance said spindle (4) to laser means (15) by which said laser beam (15) is generated.

18. Method according to claim 17, wherein said driving comprises moving said laser beam (15) from said first zone (O) to said second zone (P), at a speed having a first speed component (16) that is longitudinal to said spindle (4) and a second speed component (17) equal to a peripheral speed at which said edges are moved during said advancing.

19. Method according to claim 18, wherein after said moving said laser beam (15) is repositioned from said second zone (P) to said first zone (O) in such a way as to act on a subsequent portion supported on a further spindle adjacent to said spindle (4).

20. Method according to claim 18, wherein after said moving said laser beam (15) is positioned from said second zone (P) to a third zone (R) in such a way as to act on further second end portions of a subsequent portion supported on a further spindle adjacent to said spindle (4).

21. Method according to claim 20, wherein after said positioning there is provided further moving said laser beam (15) from said third zone (R) to a fourth zone (T) in such a way as to act on further first end portions

of said successive portion to generate a further sealed strip.

22. Method according to claim 21, wherein after said further moving, positioning said laser beam (15) from said fourth zone (T) to said first zone (O) is further provided, in such a way as to act on still further first end portions of a further subsequent portion supported on a still further spindle adjacent to said further spindle.

23. Apparatus, comprising spindle means (4) rotatable around a longitudinal axis (C), provided with a side surface (9) shaped to be wrapped by a portion (8) of plastic film to obtain a "shrink sleeve" label (11), characterised in that said side surface (9) comprises zones arranged at distances from said longitudinal axis (C) that are different from one another.

24. Apparatus according to claim 22, wherein said side surface (9) comprises notch means (10) extending parallel to said longitudinal axis (C) and shaped to receive parts of said portion (8).

25. Apparatus according to claim 23, wherein said notch means comprises a notch (10).

26. Apparatus according to claim 23, wherein said notch means comprises a plurality of notches (10) distributed on said side surface (9).

27. Apparatus according to any one of claims 22 to 25, wherein on said side surface (9) there is obtained a plurality of holes (12) through which air can be sucked into said spindle means (4) to make said portion (8) stick to said side surface (9), and air can be expelled out of said spindle means (4) to move said "shrink sleeve" label (11) radially away from said side surface (9).

28. Method for producing "shrink sleeve" labels, comprising winding a portion of plastic film on a curved work surface having a cross section that has an extent that

is greater than the extent of a circumference circumscribed to said cross section.

29. "Shrink sleeve" label, comprising a longitudinal sealing zone that joins a pair of opposite edges (40, 41) of a portion of plastic film, characterised in that said sealing zone (20) has a significantly reduced width.

30. Label according to claim 29, wherein said sealing zone (20) has a width of the order of a millimetre.

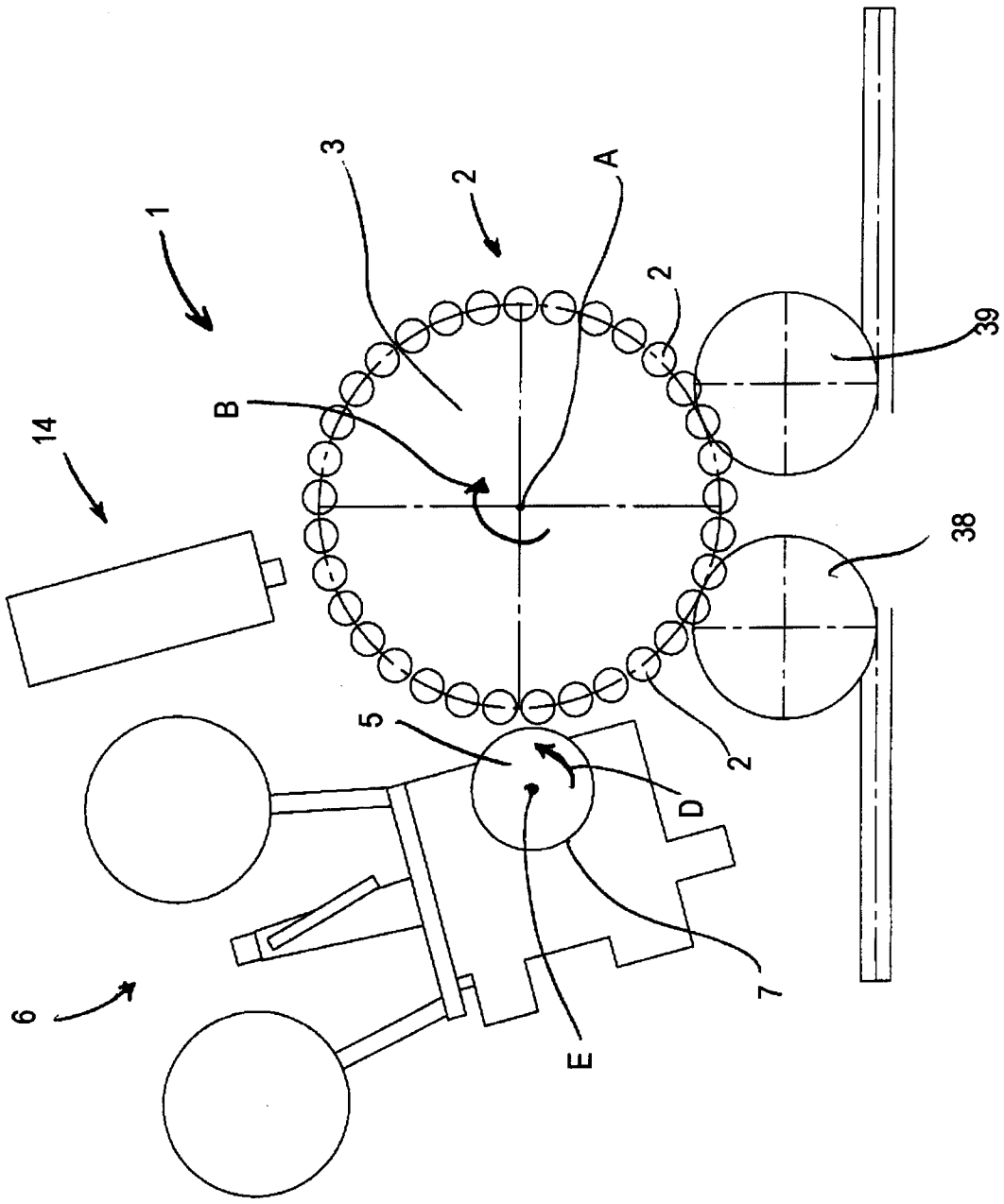

Fig. 1

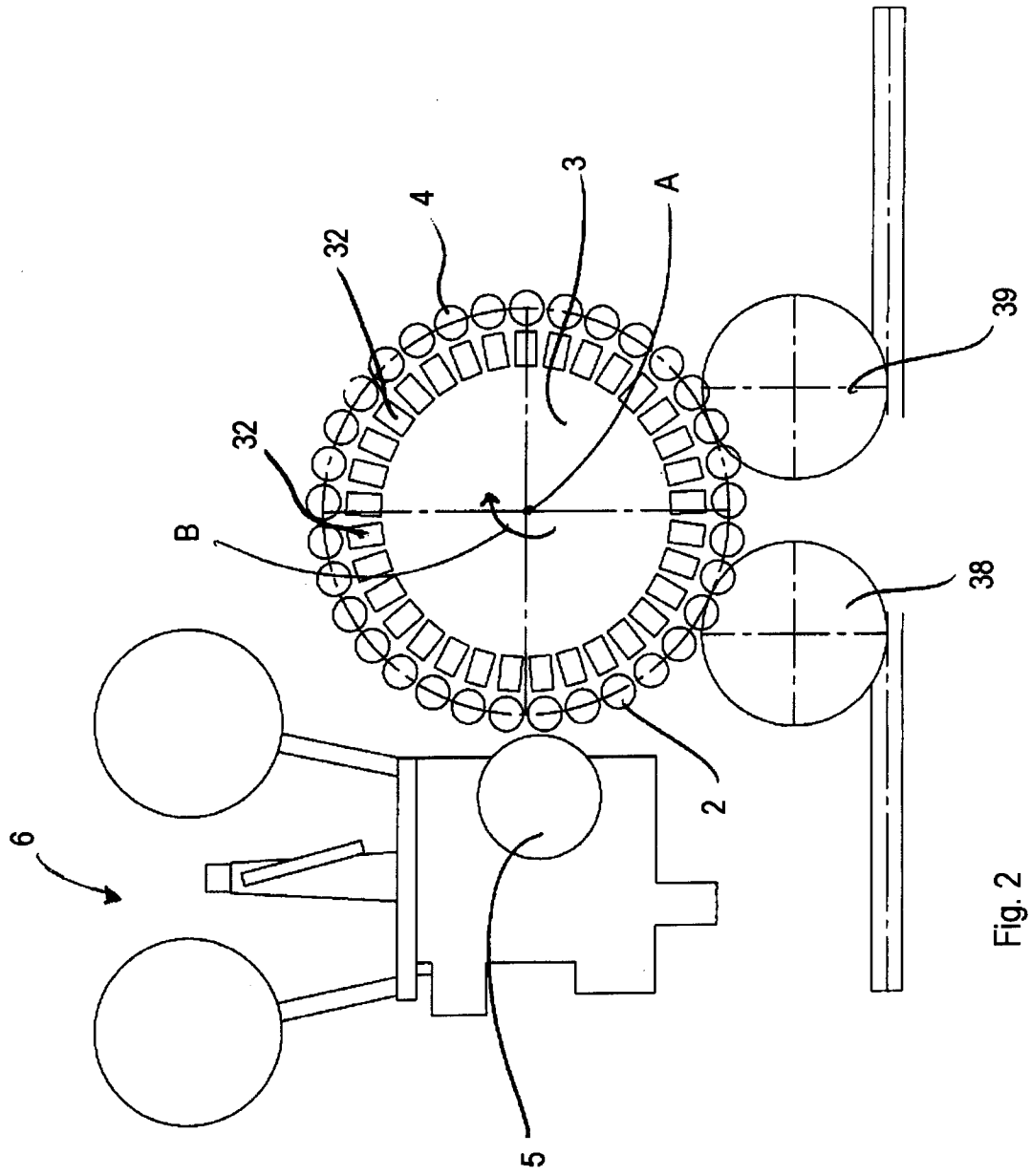

Fig. 2

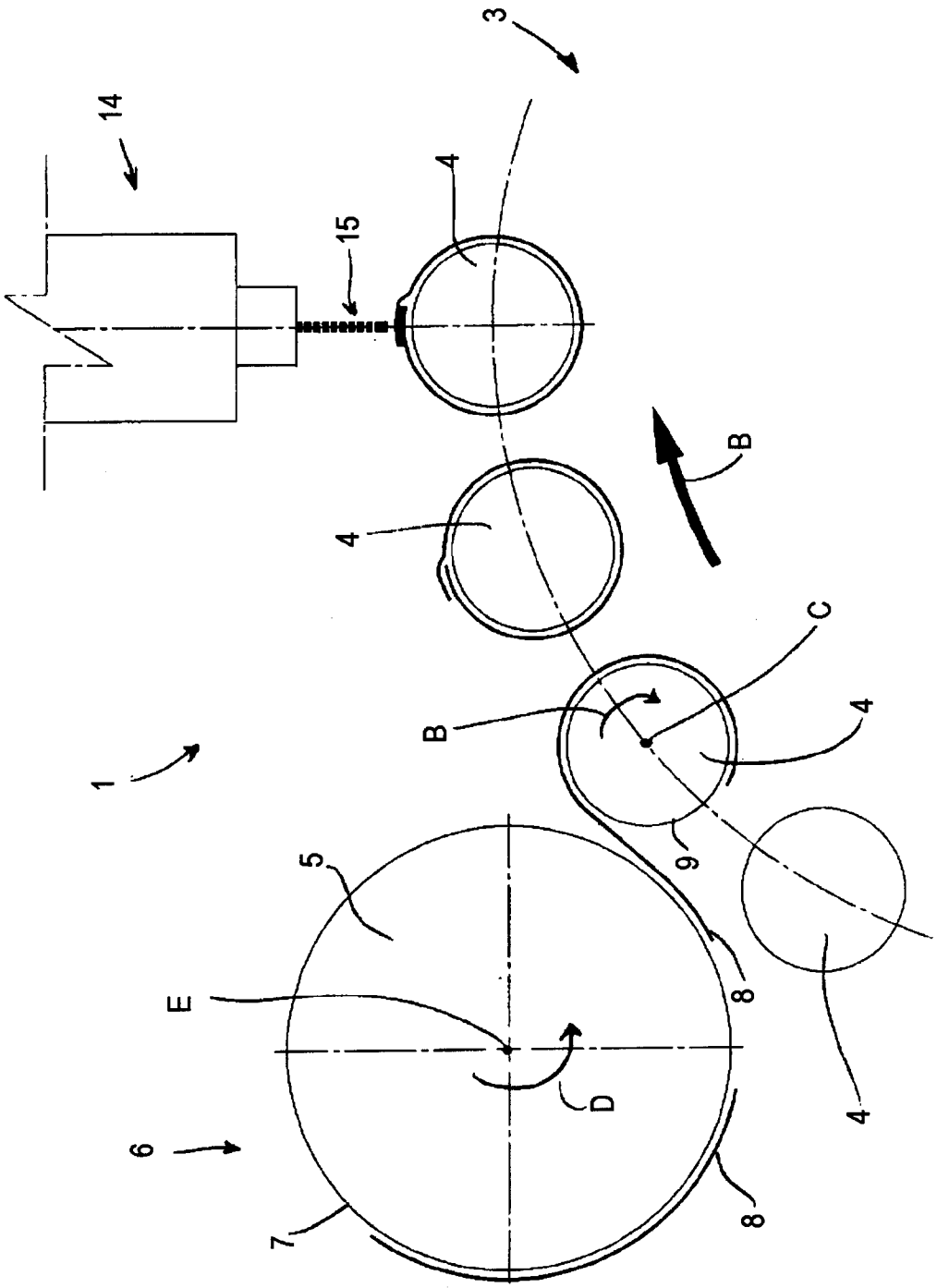

Fig. 3

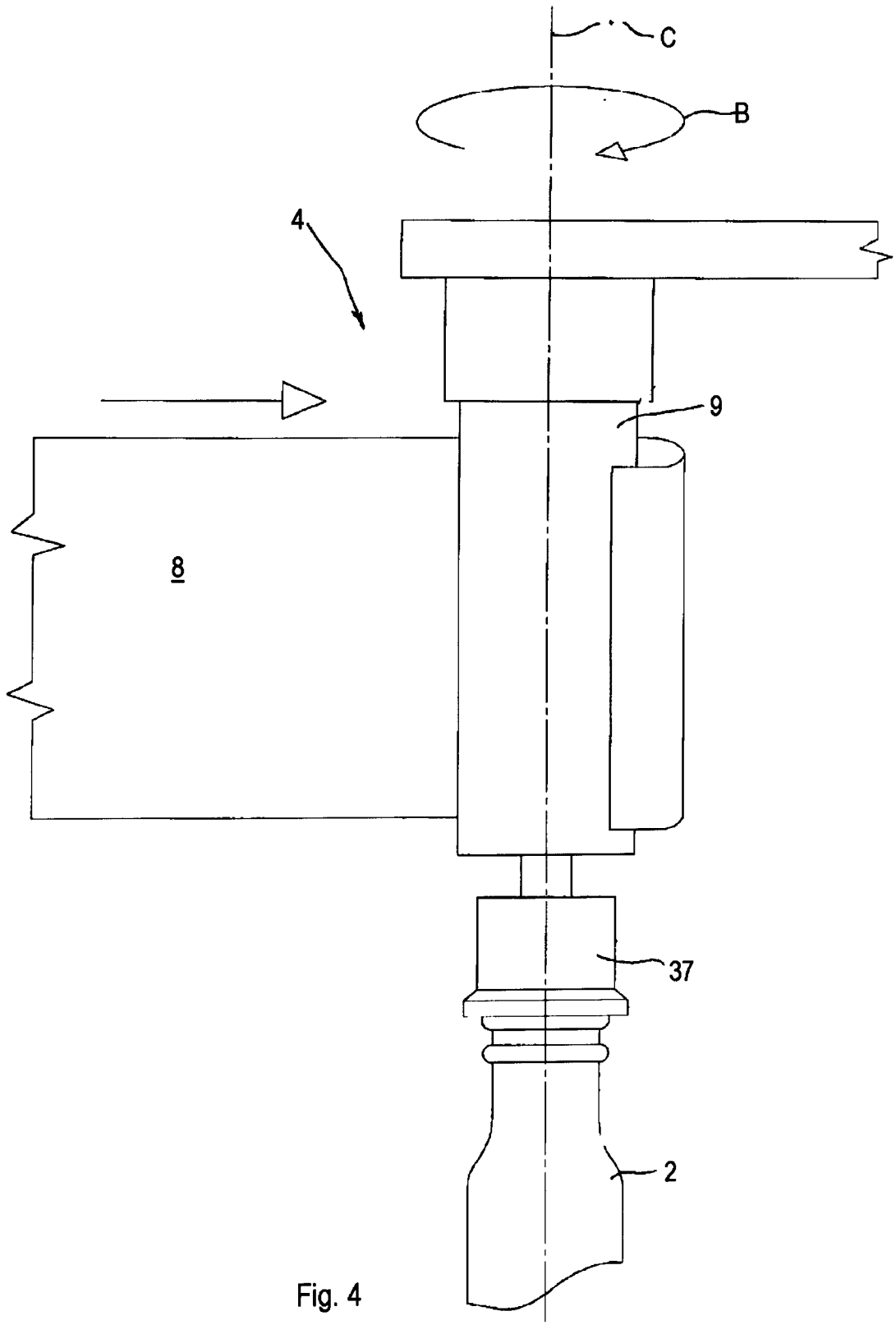

Fig. 4

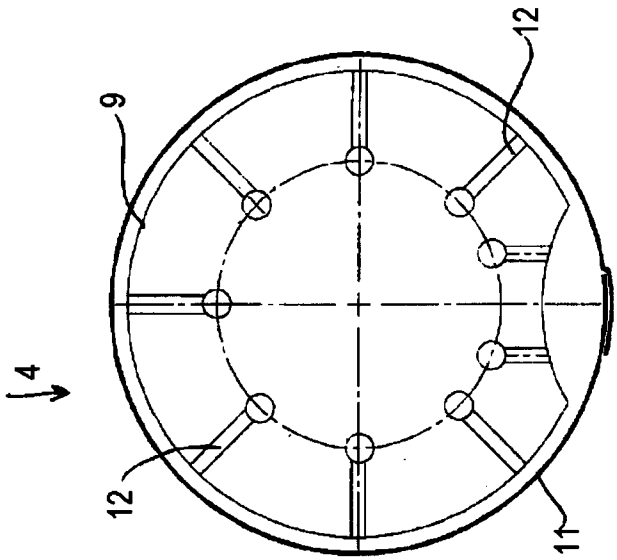

Fig. 7

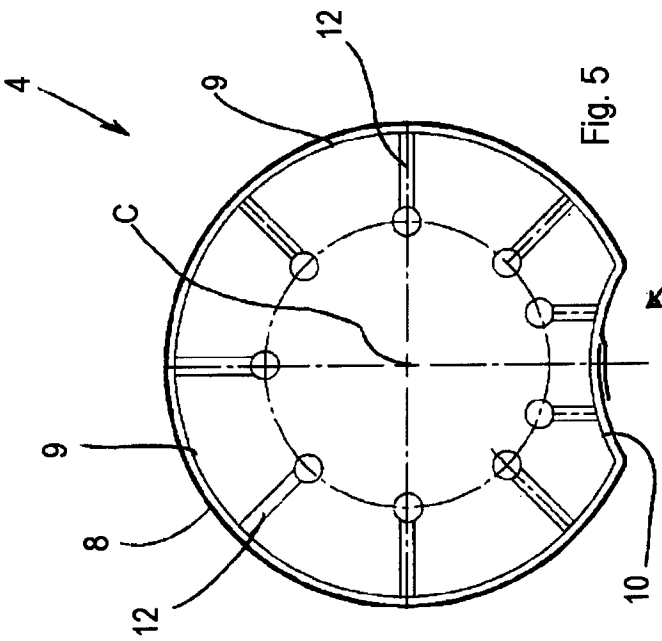

Fig. 5

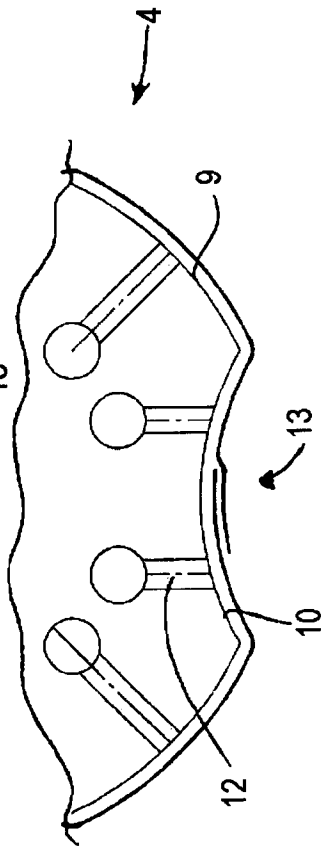

Fig. 6

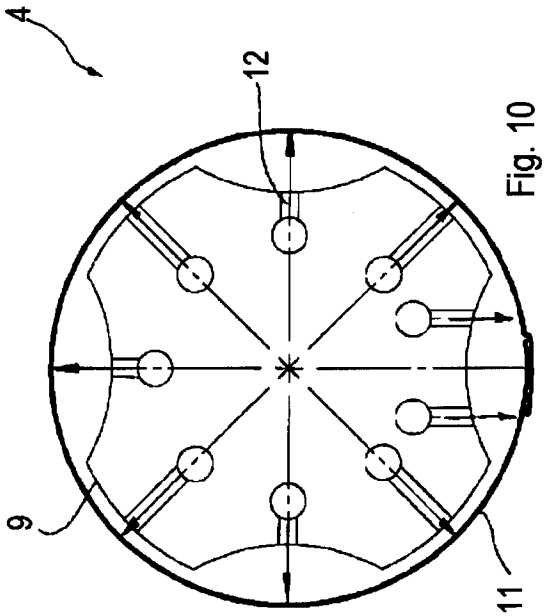

Fig. 10

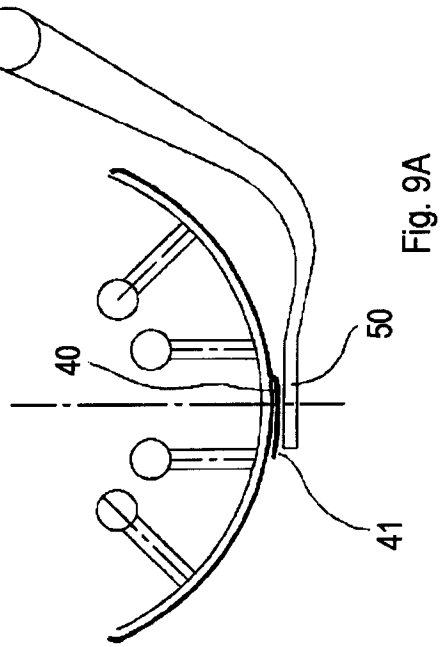

Fig. 9A

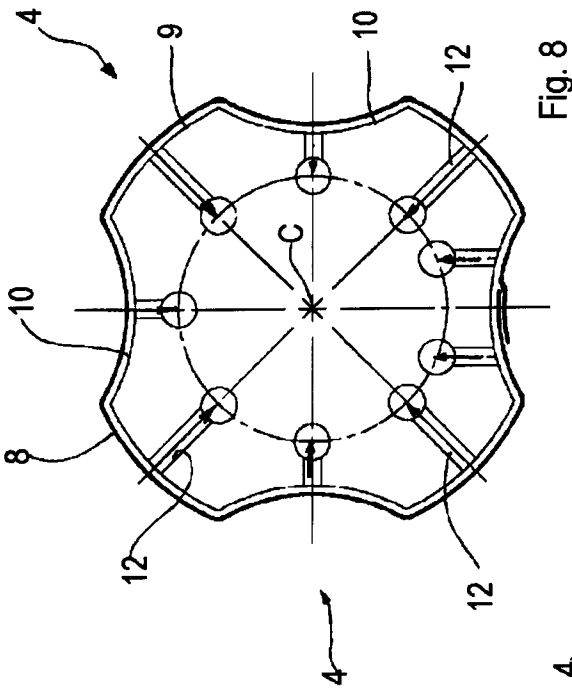

Fig. 8

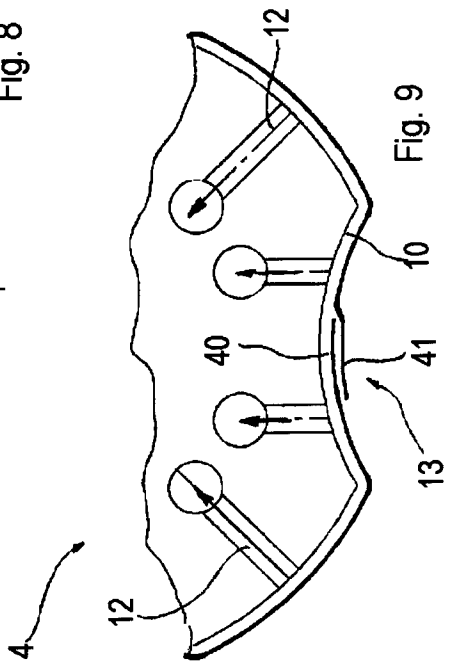

Fig. 9

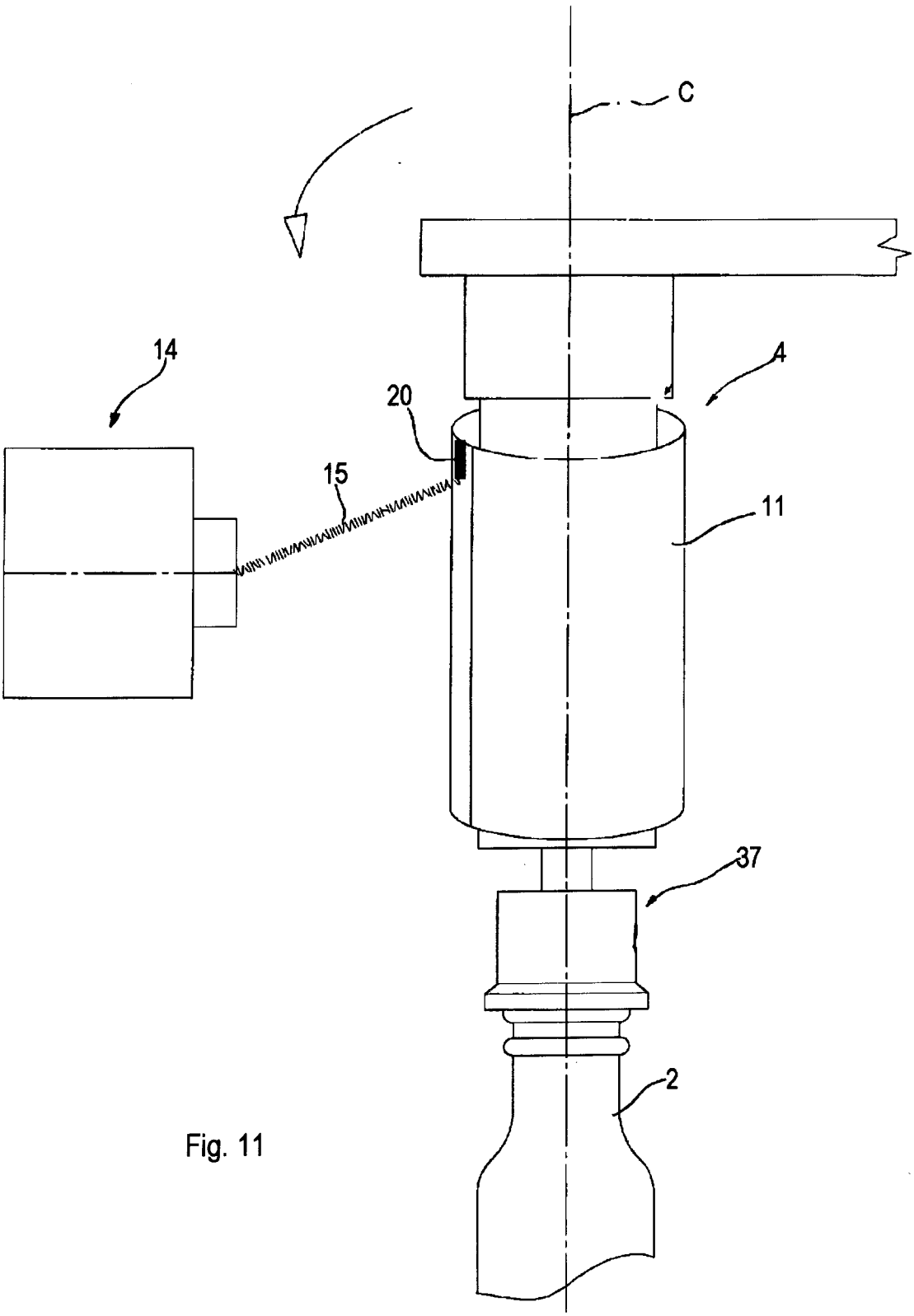

Fig. 11

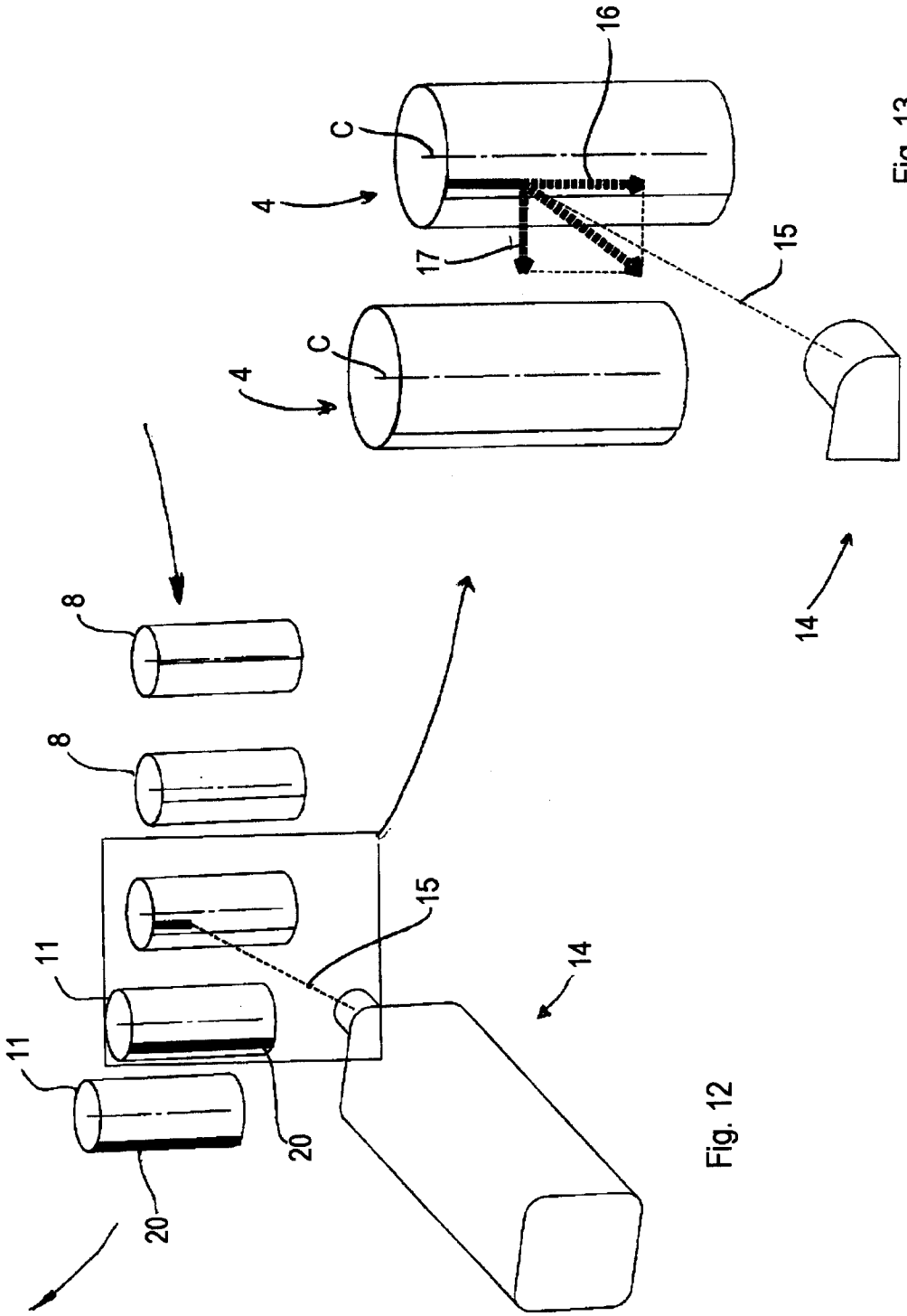

Fig. 13

Fig. 12

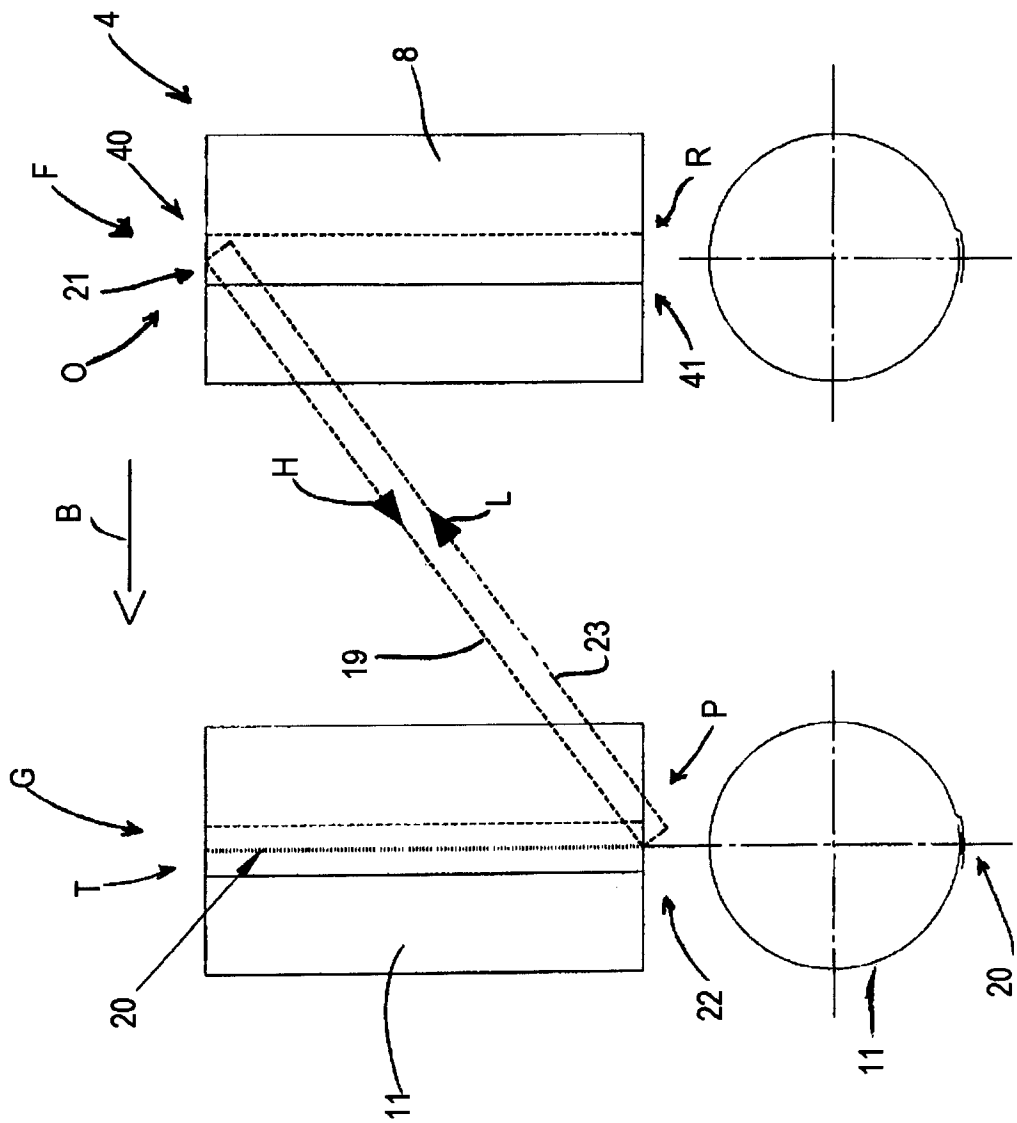

Fig. 14

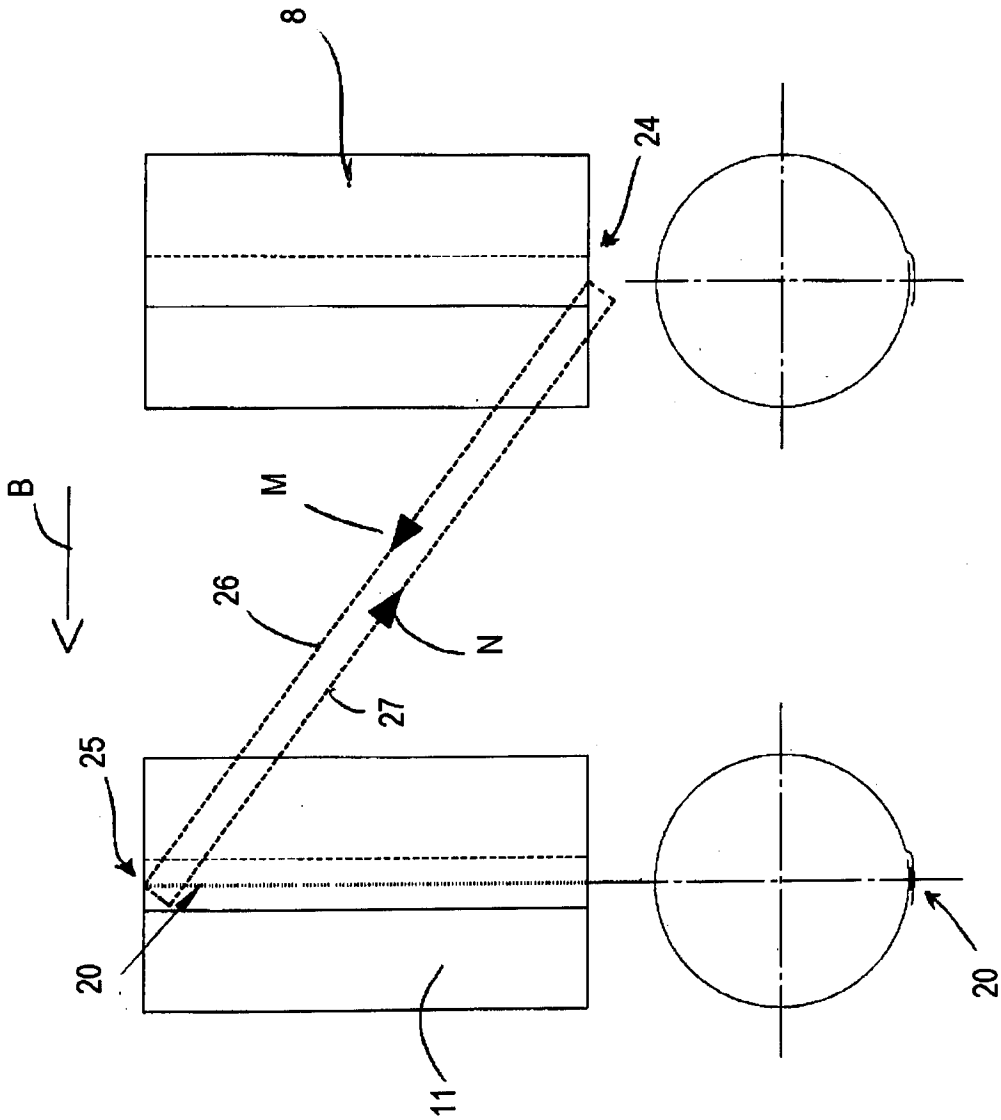

Fig. 15

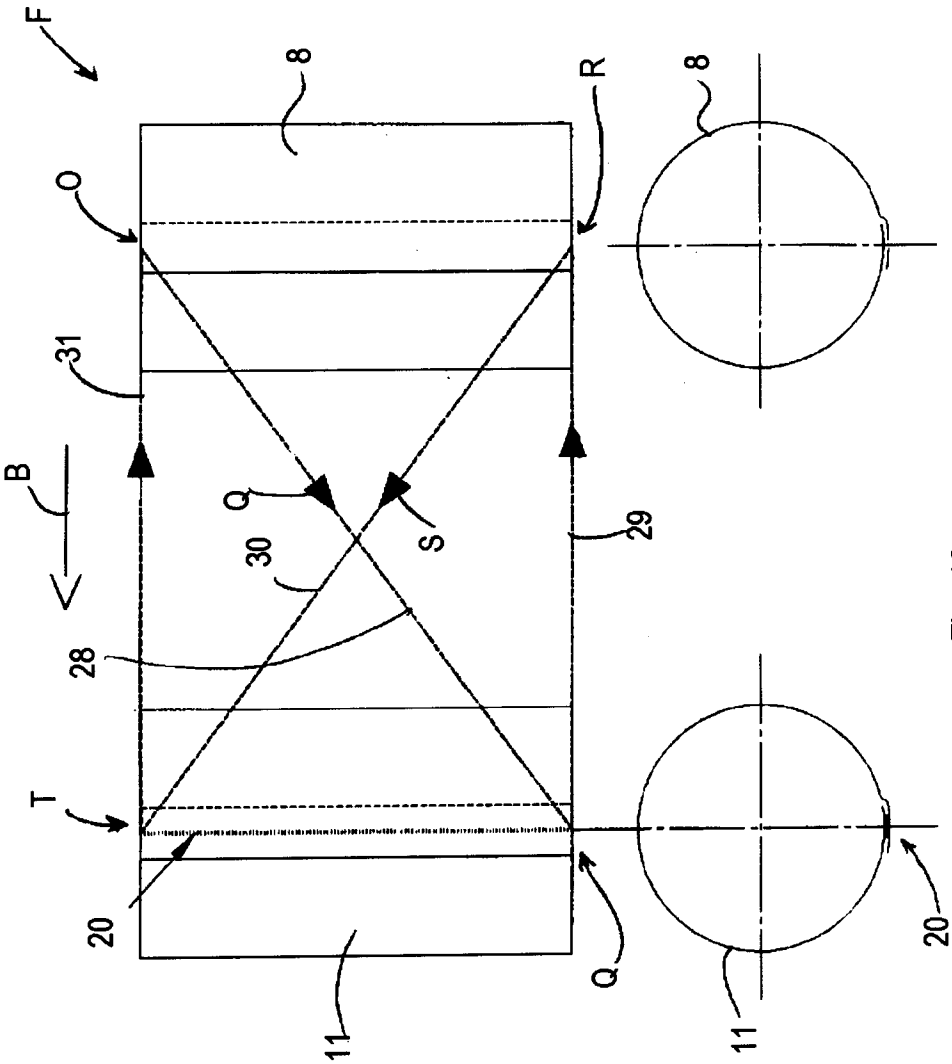

Fig. 16

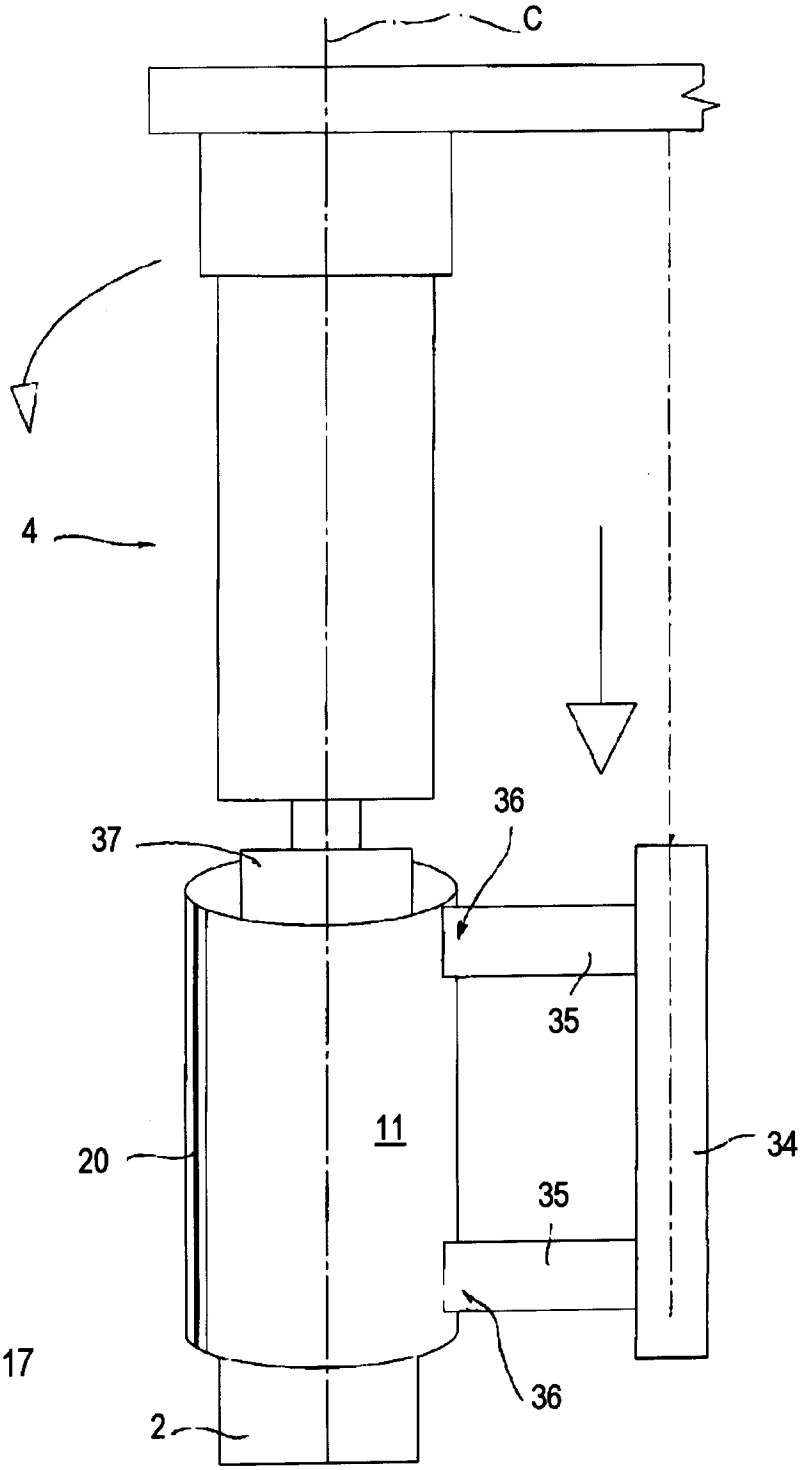

Fig. 17