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(54) **Rolling door with protection**

(57) The invention relates to a rolling door, comprising a vertically displaceable curtain element for closing an opening in a wall, with guiding cams provided at side edges of the curtain element and guides to be attached to the wall for guiding the guiding cams thereinbetween, wherein the curtain element comprises a main surface

situated between the guiding cams to which a protection element is coupled capable of hinging with respect to the main surface, which protection element comprises the guiding cam. The invention is characterized in that the protection element is coupled to the main surface with an adjustable spring pre-tension.

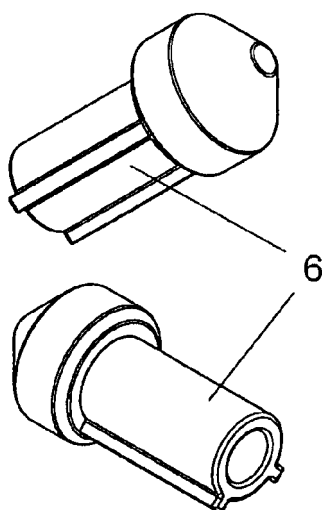


Fig. 9

Description

[0001] The present invention relates to a rolling door, comprising a vertically displaceable curtain element for closing an opening in a wall, with guiding cams provided at side edges of the curtain element and guides to be attached to the wall for guiding the guiding cams therebetween, wherein the curtain element comprises a main surface situated between the guiding cams to which a protection element is coupled capable of hinging with respect to the main surface, which protection element comprises the guiding cam.

[0002] Such a rolling door is known from US20030178159. Rolling doors according to the preamble are used for closing adjacent spaces. The main purpose is to prevent draught through the opening in the wall. In practice, the rolling doors are exposed to considerable forces because of differences in air pressure on either side of the rolling door. Since rolling doors are predominantly used in an industrial environment they are prone to damage as a result of collisions, such as by vehicles, in particular fork lift trucks.

[0003] In order to prevent damage to the rolling door, it is provided with a protection element that ensures that the main surface (that is to say, a panel element or panel elements which form part of the curtain element) can be moved and that the guiding cam comes out of the guide. The protection element is coupled on the one hand with the guiding cam and on the other hand with the main surface of the rolling door and ensures that in a state of rest the guiding cam is in the guides by means of a spring force and that the curtain element extends therebetween. When a force is exerted having a component perpendicular to the curtain element, the protection element causes the cams to hinge relative to the main surface and to come out of the guides. The force exerted on the curtain element is then restricted to the force with which the protection hinges.

[0004] It has now been found that such a rolling door can be improved. In particular, a known rolling door has the disadvantage that the force necessary to make the protection element hinge is too small, causing the cams to be already pulled out of the guides at slight differences in air pressure on either side of the rolling door. On the other hand, in some cases the spring force is so high that the protection only functions with a force acting upon the curtain element that is higher than a break or tear resistance of the curtain element. Depending on the variables of the specific location, the protection element has to be designed specifically.

[0005] The object of the invention is to provide an improved rolling door.

[0006] In particular the object of the invention is to provide a rolling door having an improved protection element.

[0007] Further, the object of the invention is to provide a rolling door that can be made suitable for any location variable in a simple way.

[0008] In order to achieve at least one of the aforementioned objectives, the invention provides a rolling door according to the preamble, comprising the measures of claim 1. Herewith the advantage is obtained that the protection can be adjusted to the circumstances that apply for the particular application. The spring pre-tension can be set at the predominant or the maximum difference in air pressure over the rolling door. Thus, it is prevented that the guiding cams of the rolling door are pulled out of the guides as a result of a large difference in air pressure on either side of the rolling door. On the other hand, the spring pre-tension can be set at a value preventing the material used to manufacture the rolling door from getting damaged when a force is exerted on the rolling door, in particular a force having a component perpendicular to the curtain element.

[0009] Within the invention with the term curtain element any material or part is meant that can provide for closing the opening in the wall. In practice panels, drapes, grills and the like are known.

[0010] It is notably preferred that the protection element is coupled to the main surface with adjustable spring pre-tension, thus obtaining a simple coupling and stable operation.

[0011] Further, it is preferred that the coupling of the protection element to the main surface is provided for by: - an element connected to the main surface and immobile with respect thereto; and - an element connected to the protection element and mobile with respect thereto. With this the advantage is obtained that the protection element is formed as a device of which the immobile element can be attached to the main surface of the curtain element, so that the entire protection element can be replaced in a simple way in case of maintenance, damage or the like.

[0012] Furthermore, it is preferred that the immobile element and the mobile element have areas of contact to be positioned against each other, wherein at least one of the elements comprises a spring element that presses against a surface of that at least one element situated away from the area of contact, wherein a connection cable is coupled with one end to an end of the spring element situated away from that at least one element, and the connection cable is fed through openings provided in both openings and mutually aligned, and with the other end is coupled to: - either the other of both elements, - or a spring element provided to the other of those both elements. This provides a simple linear device that can be attached flush against a surface of the curtain element.

[0013] In particular the device, that is to say the protection element, can be incorporated into a part of the curtain element, shielding the element from the surroundings and thus being substantially insensitive to pollution. To that end the invention provides a rolling door which is characterised in that the curtain element comprises a profile extending between side edges of the curtain element, wherein the profile comprises a fixed profile section situated away from the side edges of the curtain element and comprises mobile profile sections situated at the side

edges; wherein the fixed profile section comprises the immobile element and the mobile profile section comprises the mobile element, *vice versa*. A profile forming part of the curtain element and which extends substantially along the entire width of the curtain element between both guides, may then be divided at a distance of every side edge, wherein the immobile part of the protection element is incorporated in the fixed profile section and the mobile part is incorporated in the separate mobile profile that can hinge with respect to that fixed profile section. That will provide a rolling door having a protection element without elements protruding beyond the curtain element.

[0014] In order to be able to provide for a simple change of the spring pre-tension it is preferred that the connection of the spring element to the connection cable is arranged for adjusting the spring pre-tension, preferably by means of a screw adjustment. Any such provision can be implemented simply.

[0015] A sturdy rolling door having a low weight is obtained when it is characterised in that the curtain element is formed by panels, drapes, grills or the like which are coupled by means of profiles and extend between the side edges. The profiles can each comprise the protection element at both ends. The profiles may for instance comprise a longitudinal groove into which a hem edge of the panels or the like can be fed. The panels may for instance be only fed into in a groove at the main surface or along the entire length between the side edges. That will, however, only be possible if the panels or the like are also capable of hinging near the pivoting point of the profiles. When drapes or other inherently flexible materials are used, this will be perfectly possible. In the case of grills or others stiff parts these will each have to be provided with a hinging line or they will have to be attached to the profiles merely over the length of the main surface.

[0016] Furthermore, it is preferred that at least one of the profiles comprises a fixed profile section situated away from the side edges of the curtain element and comprises mobile profile sections situated at the side edges; wherein the fixed profile section comprises the immobile element and the mobile profile section comprises the mobile element, *vice versa*, as explained above.

[0017] Finally, it is preferred that the immobile element and the mobile element have areas of contact to be positioned against each other, and wherein one of the areas of contact has a concave surface and another of the areas of contact has a convex surface co-operating with the concave surface. Thus a simple alignment of the elements can be obtained.

[0018] The present invention will now be illustrated with reference to the drawing.

fig. 1 shows a schematic perspective view of a rolling door;

fig. 2 shows a perspective front view of part of the rolling door according to fig. 1;

fig. 3 shows a perspective rear view of part of the rolling door according to fig. 2;

figs. 4, 5 and 9 show a perspective view of parts of the protection for a rolling door;

fig. 6 shows a perspective view of a mobile element of the protection element with a part of an immobile element coupled thereto;

fig. 7 shows an explosion view of the mobile element according to fig. 6; and

fig. 8 shows a view according to fig. 6 without enclosure.

[0019] Fig. 1 shows a rolling door 1 which is arranged between two wall elements 2, 3 in which guides 4, 5 are provided. In the guides 4, 5 a curtain 7 is moveable by means of guiding cams 6. The curtain 7 of the rolling door 1 illustrated in fig. 1 is constructed using profiles 8, to which curtain elements 9 are coupled.

[0020] The curtain 7 has a main area 10 and side areas 11, 12 situated on either side of the main area 10. The side areas extend to the side edges 14 of the curtain 7. The transition of main area 10 to side areas 11, 12 is constituted by a pivoting point 13 of the profiles 8.

[0021] The curtain 7 can be moved in a direction parallel to the direction in which the guides 4, 5 extend. That will usually be a vertical direction.

[0022] When a force is exerted on the curtain 7 having a force component perpendicular to the plane of the curtain 7, the guiding cams 6 will be pushed against a wall of the guides 4, 5. When the force component is greater than a failure limit of one of the parts of the curtain element, for instance a panel 9, a profile 8 or a cam 6, this part could succumb. In order to prevent that, a protection element has now been provided, which allows a mobile profile section 81 to hinge at the pivoting point 13 with respect to an immobile profile section 80.

[0023] Fig. 2 shows a front view of a situation wherein the mobile profile section 81 is hinged with respect to the immobile profile section 80. The guiding cam 6 has come out of the guide 4, allowing the curtain 7 to be moved without damage. The panel 9 is made of a flexible material and is not damaged. Fig. 3 shows a detail in rear view of the situation in fig. 2. Both profile sections 80, 81 are coupled to respective end-plug members 15, 16 of the protection element and each comprise an area of contact 17, 18. The immobile profile section 80 comprises an area of contact 17, the mobile profile section comprises an area of contact 18. Further, both members 15, 16 comprise an opening 19 through which a cable 20 is fed whose function will be explained hereinafter. In the illustrated embodiment the openings have been provided in the respective areas of contact.

[0024] Fig. 4 shows a perspective top view and bottom view of a member 16 of the protection element. The member 16 is fed in a profile section 81. In this embodiment the collar 21 and the contact surface 18 protrude beyond the profile section 81. The member 16 comprises a partially spherical contact surface 18'. The opening 19 ex-

tends fully through member 16.

[0025] Fig. 5 shows a schematic bottom view and top view of member 15, which is fed into the immobile profile section 80. In this figure, the collar illustrated in fig. 3 is not shown. The contact surface has a concave shape and cooperates with the spherical contact surface 18' of member 16. The opening 19 in member 15 extends through the entire member 15 and is aligned with opening 19 in member 16 when these both members 15, 16 are placed in the profile sections 80, 81, as a result of which the cable provides for an automatic centering of the members 15, 16.

[0026] Fig. 6 shows a schematic perspective view of profile section 81. The member 16 is fed into profile section 81, wherein the collar 21 lies against a head end face of the profile section 81. Member 15 is placed with contact surface 17 (not visible in the figure) against contact surface 18, 18' of member 16. The cable 20 is fed through the opening 19 into the members 15, 16. In practice, member 15 will be placed in an immobile profile section 80. Member 15 should then be secured in the profile section 80. In fig. 6 the guiding cam 6 is clearly visible.

[0027] Fig. 7 shows an explosion view of the mobile profile section 81 illustrated in fig. 6. The profile section 81 forms an enclosure for member 16, a spring element 22, a cable 20, a threaded rod 24, a ring 25 and a nut 26. The wire is provided with a cam 23 which is bigger than the opening 19 in member 15. The cam 23 of the wire 20 is tightly pulled against member 15. Member 15 is placed with contact surface 17 against contact surface 18 of member 16, which is fed into profile section 81 and is secured therein. The spring element 22 is placed with a first end 27 against receiving surface 29 (see fig. 4) of member 16. The wire 20 is fed through an internal opening of a threaded rod 24 and attached thereto. The threaded rod 24 extends to or beyond the end 28 of the spring element 22 and has external screw thread. Around the threaded rod 24 and against the end 28 of the spring 22, a ring 25 is positioned. Subsequently, a nut 26 is screwed onto the external screw thread of the threaded rod 24. By screwing down the nut 26 it will be possible to set a spring pre-tension of the spring 22. Fig. 8 shows the safety device in more detail. In this respect it is pointed out that the guiding cam 6 is placed into the mobile profile section 81 separately from the other elements illustrated in fig. 8. This allows for adjusting the spring pre-tension when placing the rolling door or afterwards, for instance for adjustments in case of altered environmental variable, such as wind pressure.

[0028] For attaching curtain elements 9, the profiles 80, 81 have been provided at their outer sides with longitudinal grooves 96. The curtain elements 9 have thickened longitudinal edges (not shown) which are incorporated therein, which is a technique known per se. If curtain elements 9 are rigid, the longitudinal grooves 96 will act as a hinge. In the embodiment shown, the collar 21 has corresponding recesses for the thickened longitudinal edges of the curtain elements 9 and in order to orient

these properly, the interior of the profiles 80, 81 has been provided with grooves 97 and the end plugs 15, 16 have been provided with complementary cams 98.

[0029] If the mobile element is hinged relative to the immobile element, member 15, as shown in fig. 8, will hinge with respect to member 16. The cable will then be pulled behind member 15 with one end and be pulled with the other end against the ring at the end 28 of the spring 22. The spring 22 will then be depressed, which requires a force. When the spring has a high spring pre-tension, which can be obtained by moving the nut 26 in the direction of member 16, the force for letting the mobile element hinge with respect to the immobile element will be higher than when the spring pre-tension is lower. Thereby, an accurate and simple adjustment of the spring pre-tension is achieved.

[0030] The invention is not limited to the embodiments shown in the figures and which have been described hereinbefore. The invention is merely restricted by the following claims.

Claims

1. Rolling door, comprising a vertically displaceable curtain element for closing an opening in a wall, with guiding cams provided at side edges of the curtain element and guides to be attached to the wall for guiding the guiding cams thereinbetween, wherein the curtain element comprises a main surface situated between the guiding cams to which a protection element is coupled capable of hinging with respect to the main surface, which protection element comprises the guiding cam, **characterized in that** the protection element is coupled to the main surface with an adjustable spring pre-tension.
2. Rolling door according to claim 1, wherein the protection element is coupled to the main surface with an adjustable spring pre-tension.
3. Rolling door according to claim 1 or 2, wherein the coupling of the protection element to the main surface is provided for by: - an element connected to the main surface and immobile with respect thereto; and - an element connected to the protection element and mobile with respect thereto.
4. Rolling door according to any of the preceding claims, wherein the immobile element and the mobile element have areas of contact to be positioned against each other, wherein at least one of the elements comprises a spring element that presses against a surface of that at least one element situated away from the area of contact, wherein a connection cable is coupled with one end to an end of the spring element situated away from that at least one element, and the connection cable is fed through open-

ings provided in both openings and mutually aligned, and with the other end is coupled to: - either the other of both elements, - or a spring element provided to the other of those both elements.

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5. Rolling door according to any of the preceding claims, wherein the curtain element comprises a profile extending between side edges of the curtain element, wherein the profile comprises a fixed profile section situated away from the side edges of the curtain element and comprises mobile profile sections situated at the side edges; wherein the fixed profile section comprises the immobile element and the mobile profile section comprises the mobile element, *vice versa*.

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6. Rolling door according to claim 4 or 5, wherein the connection of the spring element to the connection cable is arranged for adjusting the spring pre-tension, preferably by means of a screw adjustment.

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7. Rolling door according to any preceding claim, wherein the curtain element is formed by panels, drapes, grills or the like which extend between the side edges.

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8. Rolling door according to any preceding claim, wherein the curtain element is formed by panels, drapes, grills or the like which are coupled by means of profiles and extend between the side edges.

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9. Rolling door according to claim 8, wherein at least one of the profiles comprises a fixed profile section situated away from the side edges of the curtain element and comprises mobile profile sections situated at the side edges; wherein the fixed profile section comprises the immobile element and the mobile profile section comprises the mobile element, *vice versa*.

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10. Rolling door according to one of claims 3-10, wherein the immobile element and the mobile element have areas of contact to be positioned against each other, and wherein one of the areas of contact has a concave surface and another of the areas of contact has a convex surface co-operating with the concave surface.

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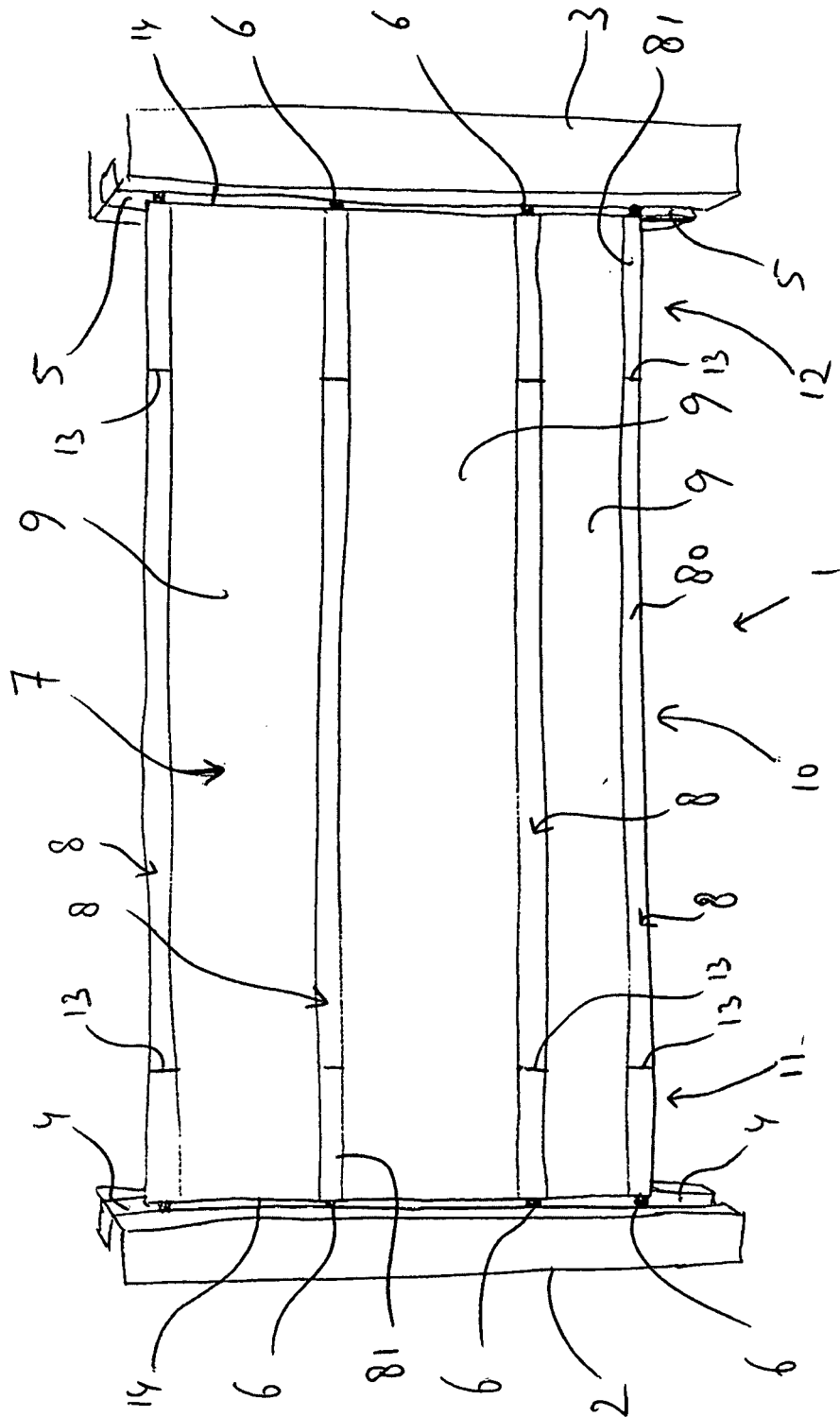


Fig. 1

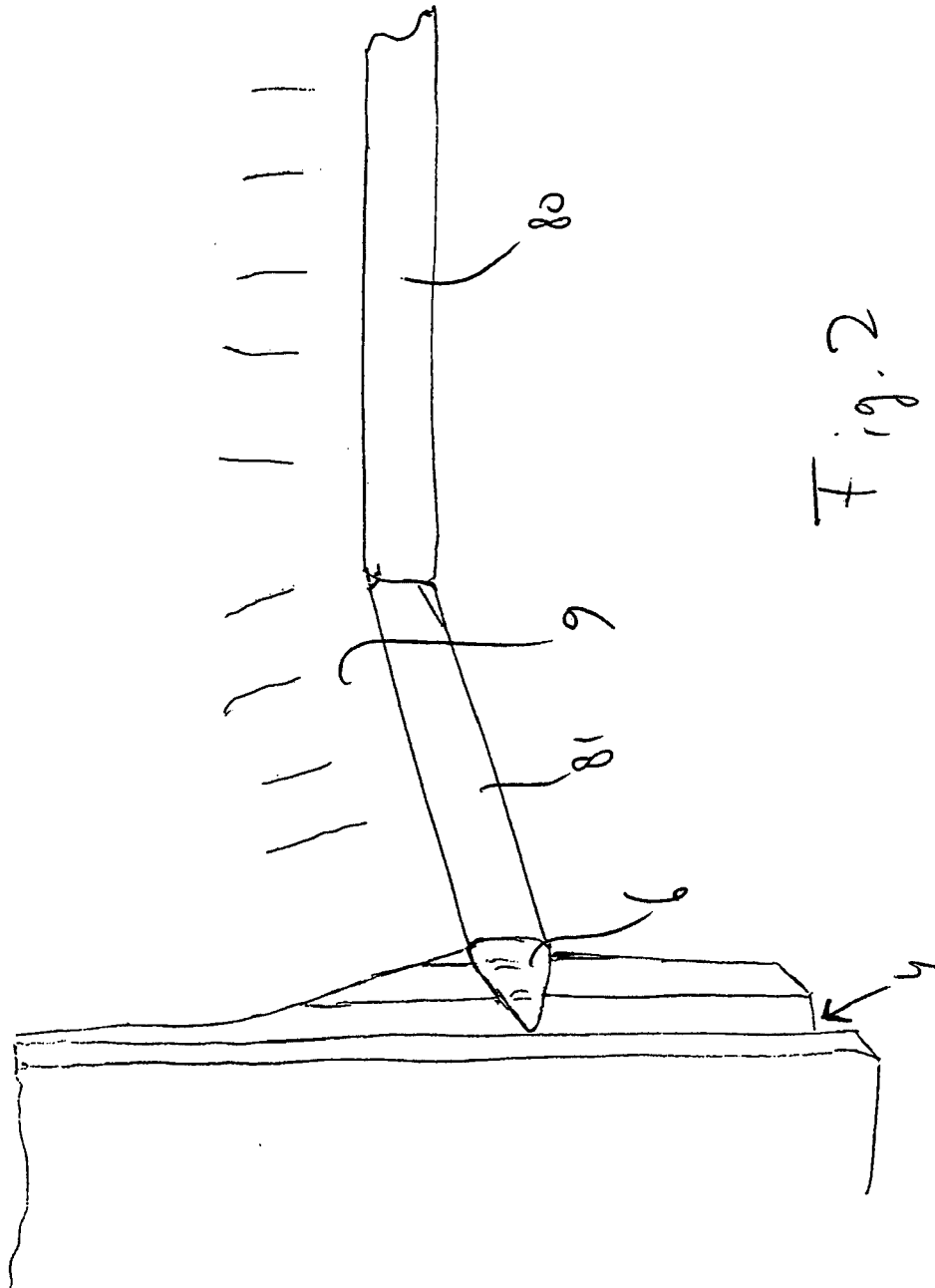


Fig. 2

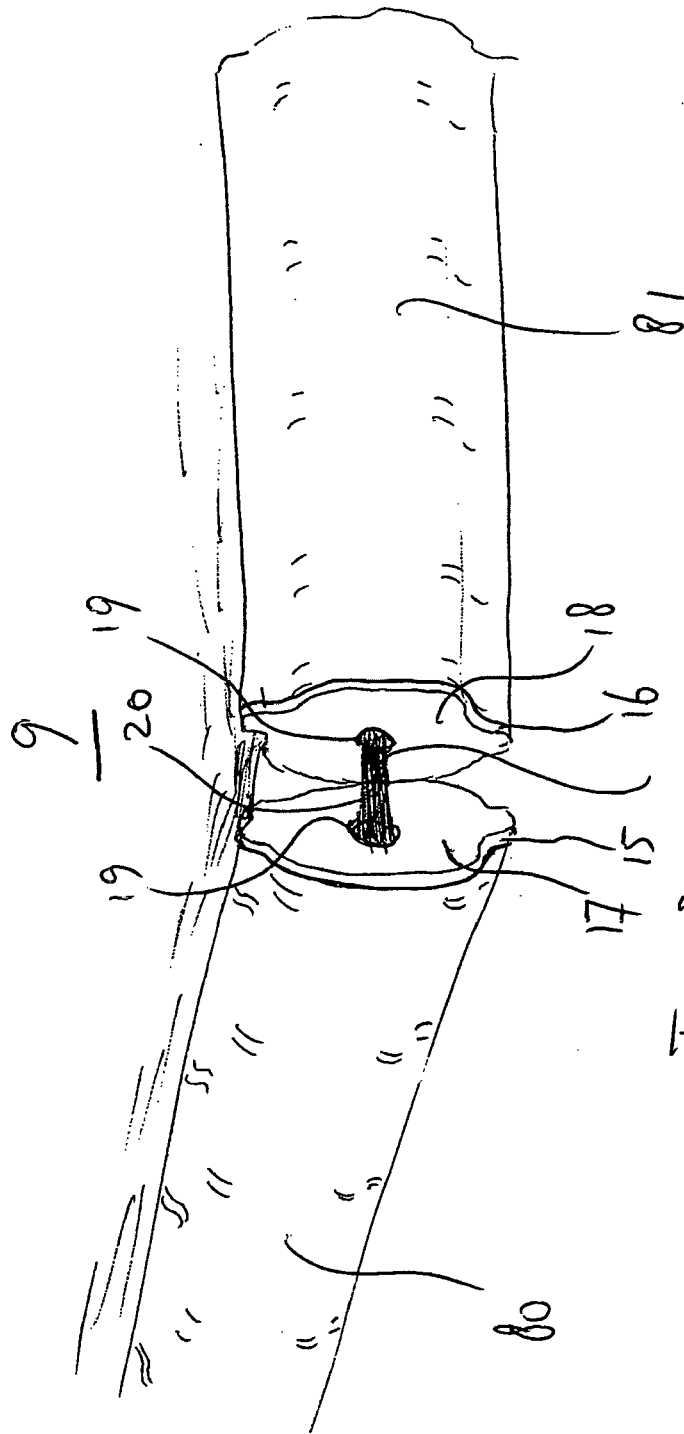
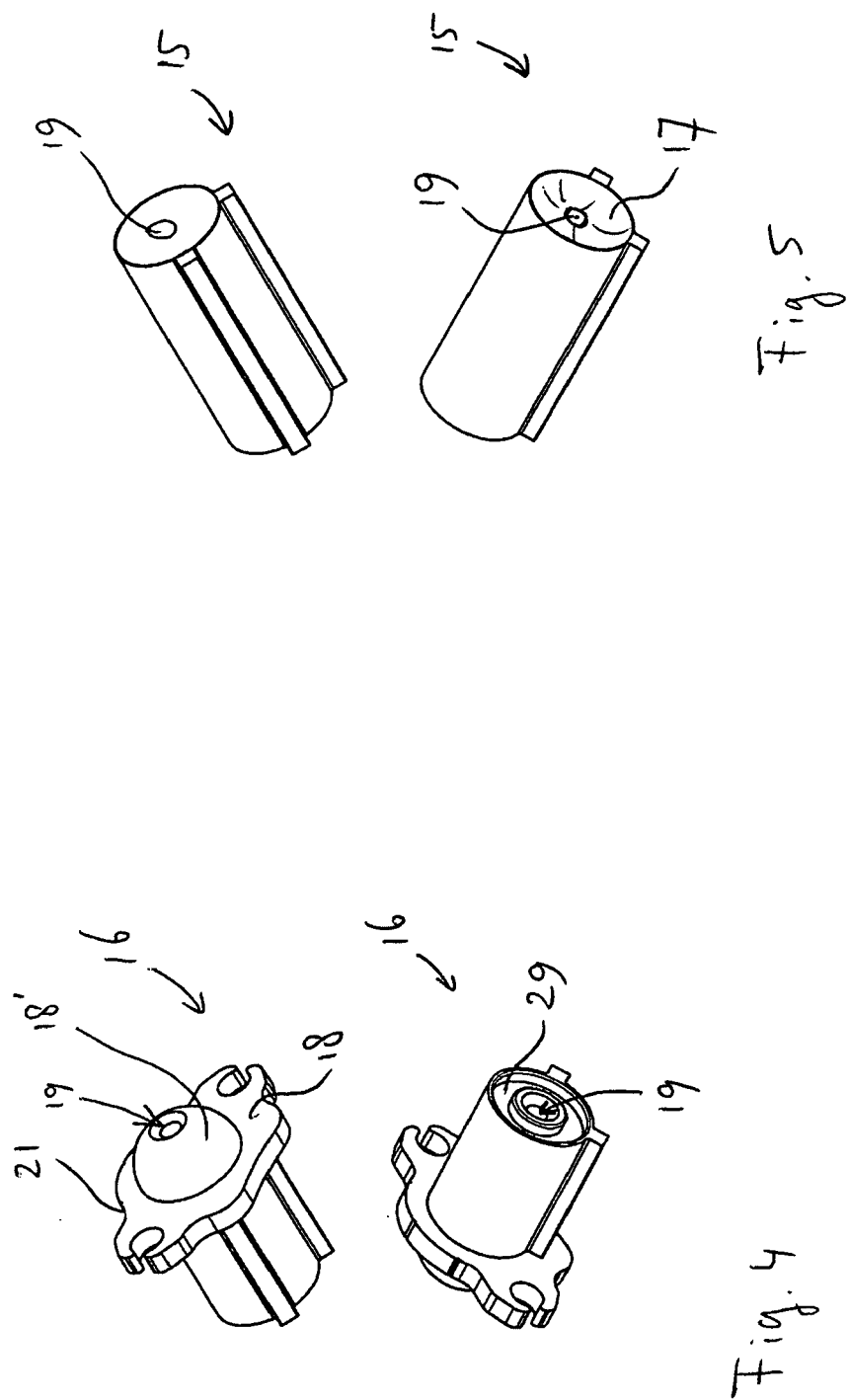


Fig. 3



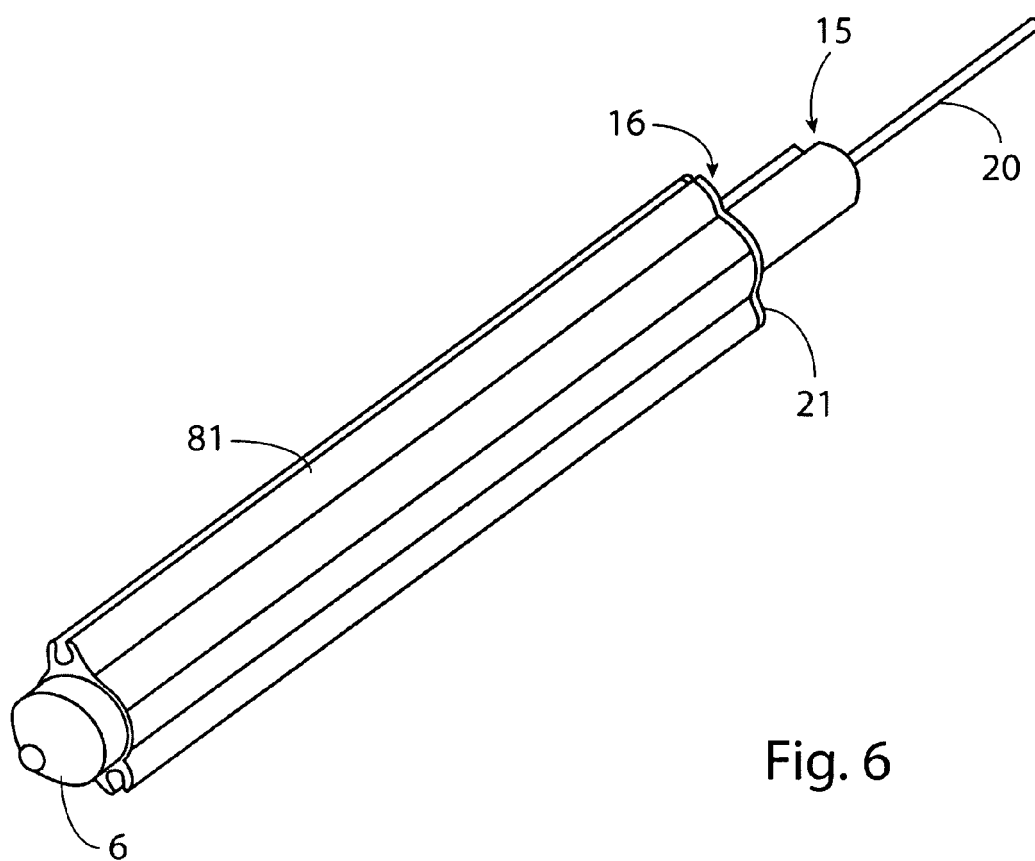


Fig. 6

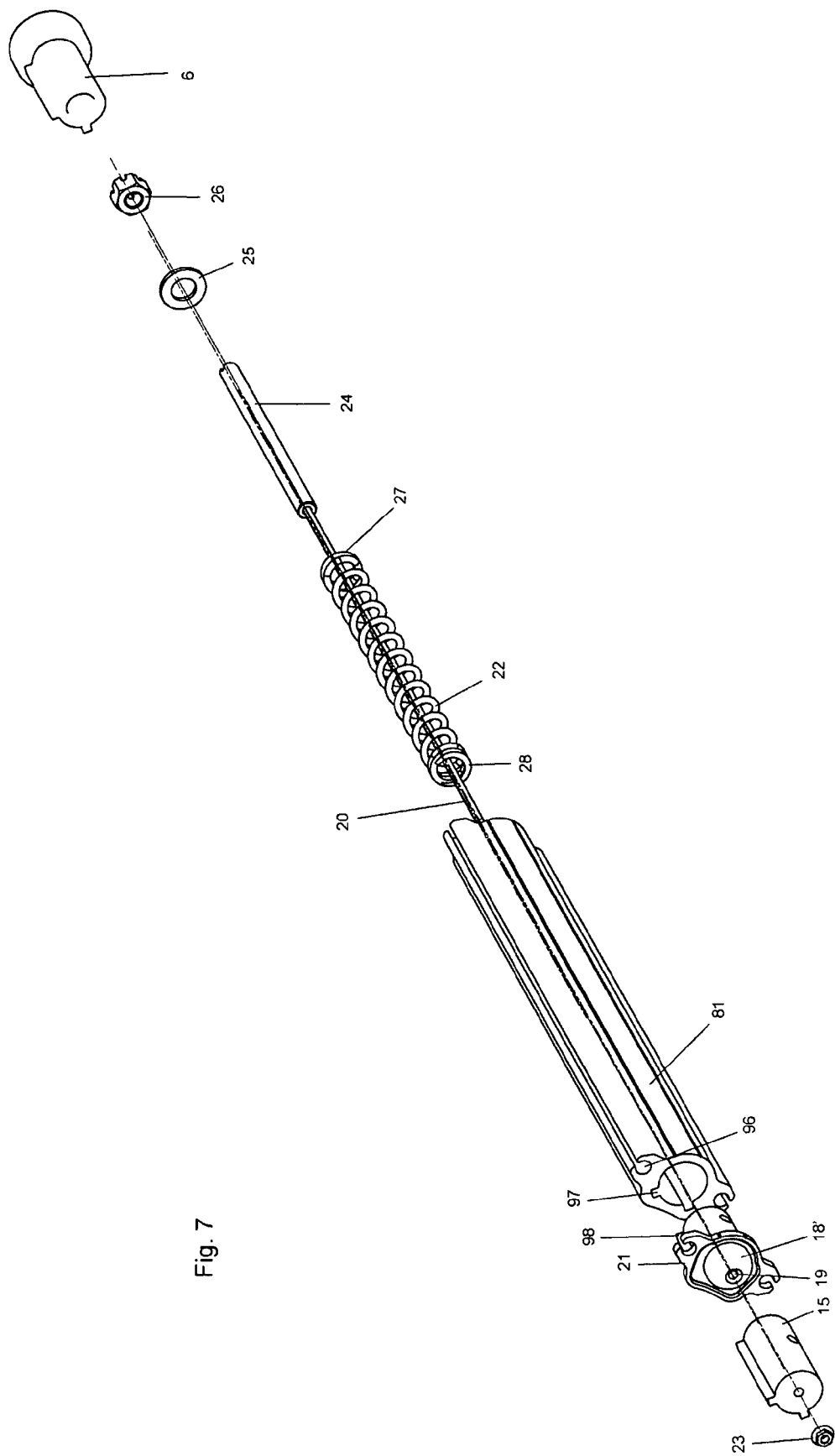


Fig. 7

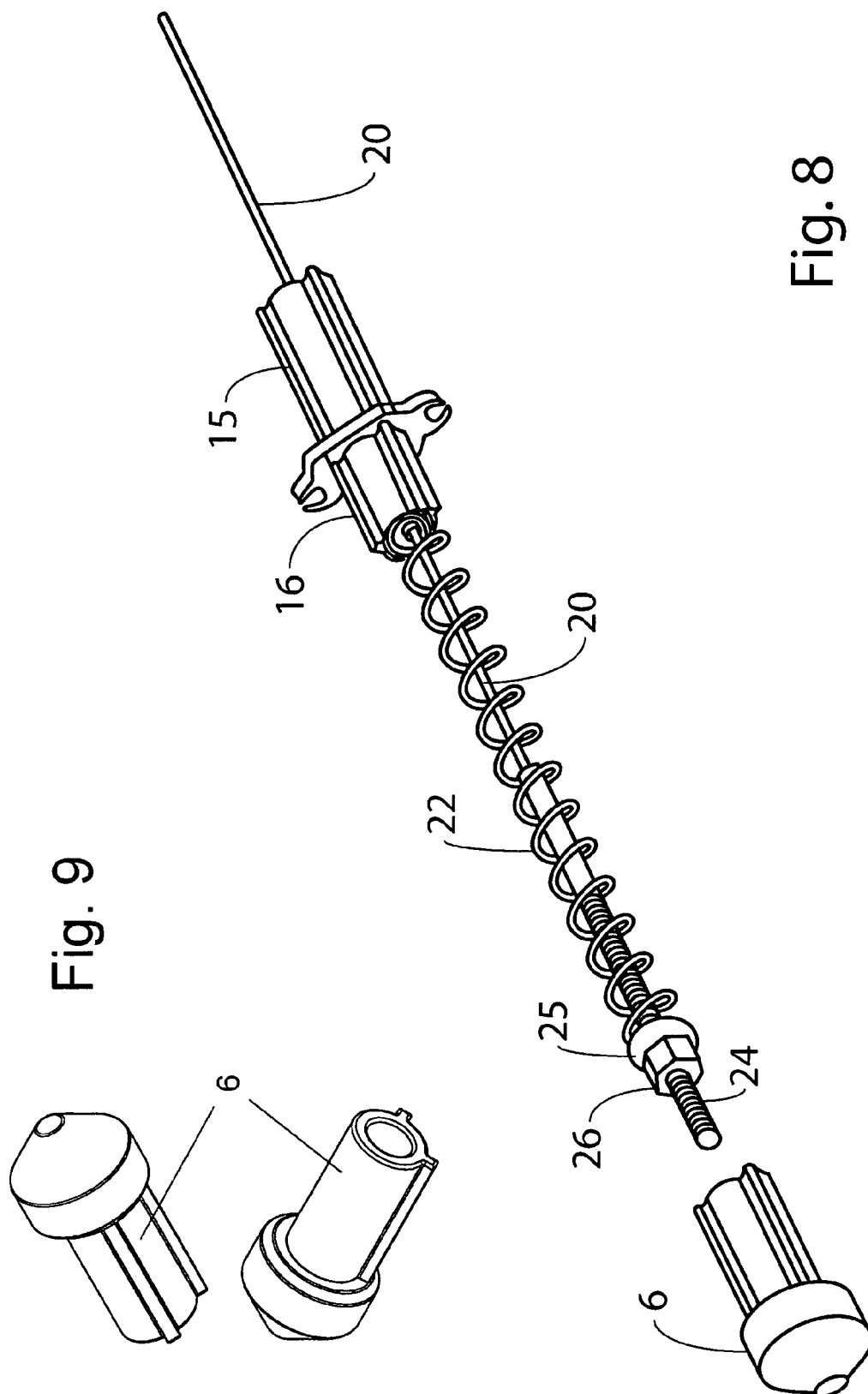


Fig. 8

Fig. 9

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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