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(71) Applicant: **B.PROJET S.r.l.**
12040 Vezza D'Alba (CN) (IT)

(72) Inventor: **Benotto, Danilo**
12040 Vezza D'Alba (Cuneo) (IT)

(74) Representative: **Cian, Paolo**
Saconney & Cian
Corso Vittorio Emanuele II, 14
10123 Torino (IT)

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(54) **FAST-SLIDING ROLL UP DOOR COMPRISING A FULLY FLEXIBLE CURTAIN**

(57) A fast-sliding roll up door comprises a flexible curtain (12) adapted to close an opening defined by an upper crosspiece (14) and a base plane (16), and by a pair of longitudinal uprights (18). The upper edge (12a) of the curtain (12) is connected to a winding shaft (20) driven in rotation by control means that control the vertical movement of the curtain (12), which include a transmission roller (24) parallel to the winding shaft (20), whose outer surface is engaged by a portion of the curtain (12).

The rotation of the roller (24) is controlled by driving means that include a first pair of gear wheels (28) coupled to the ends of the roller (24), and a second pair of rotatable gear wheels (38) adjacent to the base plane (16). Such gear wheels (28, 38) are engaged by flexible drive members (32, 36) each of which supports a side dragging member (40) for dragging the curtain (12). Counterweight means (42, 44) connected to said winding shaft (20) controls the rotation thereof.

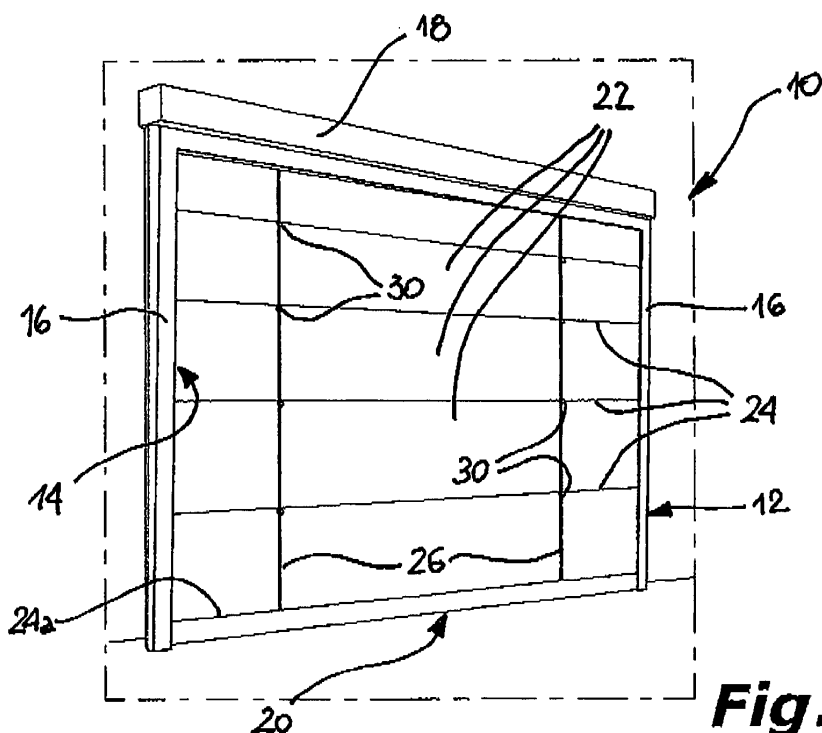


Fig. 1

Description

[0001] The present invention refers in general to doors for industrial use of the fast vertical sliding type, namely in which the opening and closing steps take place with a relatively high speed.

[0002] More particularly, the invention relates to a roll-up door of the type defined in the preamble of appended claim 1.

[0003] Roll up doors for industrial use comprising a flexible curtain are usually provided with at least one rigid transverse member such as a bar, which is arranged close to the lower edge of the curtain, as described in DE-40 05 963.

[0004] In these known doors, further rigid transverse members can also be provided, for example associated with the curtain in transverse pockets spaced of a usually constant distance in the longitudinal direction of the curtain.

[0005] The present invention, instead, has the object to propose a roll up door for industrial use having a fully flexible curtain, that is completely lacking in any rigid transverse members, which is highly reliable in use and which can be made with reduced manufacturing costs, and which also allows the curtain to be released from the dragging system in the event of an accidental impact of the curtain, particularly of the lower edge thereof, against an obstacle, during its winding or unwinding movement, or in the event of a transverse thrust applied to the curtain, for example by the force of the wind, and which also allows the undeformed configuration of the curtain to be easily and quickly restored when the action of said accidental impact, or of said transverse thrust, ceases.

[0006] In order to achieve this object, the subject of the invention is a roll-up door of the type defined in the appended claims.

[0007] In particular, the roll up door of the invention comprises control means including:

- a transmission roller parallel to a curtain winding shaft and interposed between the latter and the upper crosspiece of an opening of the door, the radially outer surface of which is partially engaged by a portion of the curtain, which transmission roller is connected to driving means for controlling the rotation thereof in both the directions of rotation,
- a first pair of gear wheels each of which is coupled to a respective end of said roller, and a second pair of gear wheels each of which is rotatably mounted close to a base plane of the door and in a position adjacent to a respective upright of the door, the gear wheels of said first pair of gear wheels and of said second pair of gear wheels which are arranged at a same side of the curtain being engaged by respective continuous flexible drive members to which a relevant side dragging member for dragging the curtain is fixed close to its lower transverse edge, and
- counterweight means connected to said winding

shaft to control its rotation as a result of the winding or unwinding of the curtain on it owing to the rotation of said roller,

- whereby the rotation of said roller causes the curtain to slide longitudinally with respect to said opening as a consequence of the friction between the radially outer surface of the roller and the curtain and, simultaneously, as a consequence of the movement of said dragging members connected to the sides of the curtain, which is caused by the rotation of said first and second pair of gear wheels and of said continuous flexible drive members, the winding or unwinding of the curtain on the winding shaft is controlled simultaneously by said counterweight means.

[0008] According to a preferred feature of the invention, a third and a fourth pair of gear wheels coaxial and fast into rotation with each other are interposed between said first and second gear wheels, which are rotatably mounted in a position adjacent to a respective upright and close to the crosspiece of said opening, a gear wheel of the first pair of gear wheels and a gear wheel of the third pair of gear wheels being engaged by a first continuous flexible drive member, a gear wheel of the second pair of gear wheels and a gear wheel of the fourth pair of gear wheels being engaged by a second continuous flexible drive member.

[0009] According to another preferred feature, said continuous flexible drive members consist of gearing chains.

[0010] According to yet another preferred feature, the curtain dragging members are susceptible of being removably fixed to the curtain, each of them being made in the form of a bracket transverse to the curtain, which cooperates with at least one second retaining member fixed to the curtain.

[0011] Further characteristics and advantages of the invention will become more clear from the following detailed description, given by way of a non-limiting example and referred to the annexed drawings in which:

Figure 1 is a schematic front view of a roll up door according to the invention in its open configuration with the door curtain fully lowered, in which an opening defined between an upper crosspiece and a base plane of the door, as well as between a pair of opposite vertical uprights of the door, is closed,

Figure 2 is a side elevation view of the door of figure 1,

Figure 3 is a view similar to Figure 1, showing the door according to the invention in its open configuration with the relevant curtain fully raised,

Figure 4 is a side elevational view of the door according to the invention in the configuration shown in Figure 3,

Figure 5 is an enlarged detail view of a side dragging member of the curtain in its normal operating condition and according to a first preferred embodiment,

Figure 6 is a view similar to figure 5 showing the relevant side dragging member uncoupled from the curtain, as a result of an accidental external stress applied to the curtain, and

Figures 7 and 8 are views similar to Figure 6 that refer to side dragging members of the curtain according to two alternative embodiments.

[0012] With reference to the figures, a roll up door according to the invention is indicated 10 as a whole. The door 10, of the so-called "fast-sliding" type, comprises a fully flexible curtain 12, for example made of a continuous sheet of plastic material or of plastic-coated textile, which allows an opening delimited in the vertical direction by an upper crosspiece 14 and by a base plane 16, as well as laterally by a pair of opposite vertical uprights 18 that extend along the longitudinal direction of the door 10, to be closed or open.

[0013] The curtain 12 has an upper transverse edge 12a which is fixed to a rotatable winding shaft 20 arranged in a position generally close to the upper crosspiece 14 of the aforesaid opening, on which the curtain 12 is intended to be wound in the open condition of the door 10. Conveniently, respective annular plates 22 for containing the side edges of the curtain 12 are connected to the opposite ends of the shaft 20.

[0014] Control means described below are associated with the door 10 in order to control the longitudinal movement of the curtain 12, that is its raising or lowering movement, as well as the rotation of the winding shaft 20.

[0015] A transmission roller 24 parallel to the shaft 20 is interposed between the shaft 20 and the crosspiece 14, which is connected to driving means which allow its rotation to be controlled in both the directions of rotation. These driving means typically consist of a gearmotor unit 26 including an electric motor and having a motion output shaft coaxial with the roller 24.

[0016] A portion of the curtain 12 engages an angular portion of the radially outer surface of the roller 24, so that when the roller 24 rotates, as a result of the driving of the gearmotor unit 26, the friction generated between the surface of the roller 24 and the inner surface of the curtain 12 causes a sliding of the curtain 12.

[0017] Moreover, a pair of identical gear wheels 28 are coupled at the opposite ends of the roller 24. Furthermore, a second pair of gear wheels 38, which are respectively rotatably mounted in the vicinity of the base plane 16 in a position adjacent to a respective upright 18 of the door 10, is provided, as well as a third pair of gear wheels 30 and a fourth pair of gear wheels 34, the pairs of gear wheels 30 and 34 being interposed between the pairs of gear wheels 28 and 38.

[0018] In particular, a gear wheel of the third pair of wheels 30 and a gear wheel of the fourth pair of wheels 34 are coupled at a respective side of the curtain 12 on a same idle shaft that extends close to the crosspiece 14 along a direction parallel to the axes of the shaft 20 and of the roller 24, so that the gear wheels of each pair of

wheels 30 and 34 are fast into rotation.

[0019] The control means arranged on a single side of the curtain 12 will be described below, being understood that the control means of the opposite side of the curtain 12 are equal and symmetrical.

[0020] The teeth of a gear wheel 28 and of a gear wheel 30 engage a first ring shaped continuous flexible drive member 32, conveniently made by a chain or, as an alternative, by a toothed belt. Similarly, the teeth of a gear wheel 34 and of a gear wheel 38 engage a second ring shaped continuous flexible drive member 36, which is also conveniently made by means of a chain or, as an alternative, by a toothed belt.

[0021] The second flexible drive member 36 has a vertical extension substantially similar to the extension of the uprights 18 delimiting sideways the opening of the door 10.

[0022] A side dragging member 40 of the curtain 12 is fixed to each flexible drive member 36, which is intended to be removably connected to a side edge portion of the curtain 12 in a position close to its lower transverse edge 12b.

[0023] Moreover, counterweight means are connected to the winding shaft 20 to control the rotation of the shaft 20 as a consequence of the winding or unwinding of the curtain 12 on it, owing to the rotation of the roller 24. These counterweight means, which are preferably associated with only one of the sides of the curtain 12, typically on the side opposite to that in which the gearmotor unit 26 is located, conveniently consist of an elongated flexible member 42, such as a belt, having an end connected to the shaft 20 and the other end fixed to a counterweight body 44 the weight of which is greater than the weight of the curtain 12.

[0024] With reference to the aforementioned side dragging members 40 of the curtain 12, they are arranged to be removably fixed to the curtain 12, and to be connected to it again in an easy and rapid manner in the event that, following to an accidental cause, they should separate from the curtain 12. In particular, if the lower edge of the curtain 12 contacts an obstacle during the lowering step, it undergoes a deformation causing the opposite sides of the curtain to approach. Similarly, if the curtain 12 is hit by a strong wind, particularly in the direction transverse to its plane, it can flex in its central portion and deform in such a manner that its opposite side edges approach to each other. Under these circumstances, in order to avoid damage to the curtain 12 and its control means, it is preferable that it can disengage from the side dragging members 40, to be then connected again to them when the cause of the deformation ceases. In particular, the dragging members 40 are made in the form of brackets transverse with respect to the curtain 12, which cooperate with respective retaining members fixed to the curtain 12.

[0025] According to a first embodiment, and with reference to Figures 5 and 6, each dragging member consists of a bracket 40 provided with a slit 40a extending

transverse to the curtain 12, so that the relevant dragging member 40 is fork-shaped. At least one pin member 40b, such as a bolt, is slidably engaged in the slit 40a, which projects from the surface of the curtain 12 with the relative head spaced from the surface of the curtain 12. Preferably, three pin members 40b are fixed on each side of the curtain 12, arranged in a row. In this case, an approach of the opposite side edges of the curtain 12, indicated by arrow A in Figure 5, causes a traction of the curtain as a result of which the pin members 40b slip out of the slit 40b, as shown by arrows B of Figure 6, until the configuration of separation shown in this last Figure is achieved. To restore the normal operating condition of the curtain 12, once the cause which caused its accidental deformation has ceased, it is sufficient to insert again the pin members 40b in the slit 40a of the brackets 40.

[0026] According to another embodiment of the dragging members 40, each of them consists of a flat bracket to which a first fastening member 40c of a hooks and hooks fastening unit, such as Velcro®, is fixed, while a second complementary fastening member 40d is fixed on the surface of the curtain 12 in a corresponding position.

[0027] According to yet another embodiment of the dragging members 40, each of them consists of a bracket carrying a first fastening member 40e of the magnetic attraction type, like a magnetized plate, while a second complementary magnetic fastening member 40f, such as a ferromagnetic plate, is fixed on the surface of the curtain 12 in a corresponding position.

[0028] Also in the alternative embodiments of the dragging members 40 described above, restoration of the normal operation condition of the curtain 12 takes place simply by connecting again the bracket 40 together with the first fastening member 40c or 40e, with the respective second fastening member 40d or 40f of the curtain 12.

[0029] In the operation of the roll up door of the invention, to open or close the relevant opening, driving of the gearmotor 26 in a direction of rotation causes the roller 24 to rotate correspondingly, and the consequent dragging of the curtain 12 as a result of the friction generated between the radially outer surface of the roller 24 and the curtain 12.

[0030] At the same time, the rotation movement of the roller 24 is transmitted synchronously on each side of the curtain 12 to the respective lateral dragging members 40 through the pair of gear wheels 28 and 30 and the flexible drive member 32, as well as through the pair of gear wheels 34 and 38 and the flexible drive member 36. Therefore, the dragging members 40 drag the lower edge of the curtain 12 according to the relative lifting or lowering movement, so as to cause sliding of the curtain 12.

[0031] At the same time, the counterweight means cause rotation of the shaft 20, and therefore the winding or unwinding of the curtain 12 with respect to it, as a result of the unwinding or winding of the elongated flexible member 42, respectively, owing to the effect of the tension applied on it by the counterweight body 44.

Claims

1. Fast-sliding roll up door, comprising a fully flexible curtain (12) adapted to close an opening that extends in height between an upper crosspiece (14) and a base plane (16) of the roll up door (10), and in width between a pair of opposite longitudinal uprights (18), which curtain (12) has an upper transverse edge (12a) connected to a rotatable winding shaft (20) arranged close to said upper crosspiece (14), for winding the curtain (12) in the open condition of the roll up door (10), and control means adapted to drive into rotation said winding shaft (20) and to control the longitudinal movement of the curtain (12),

characterized in that said control means include:

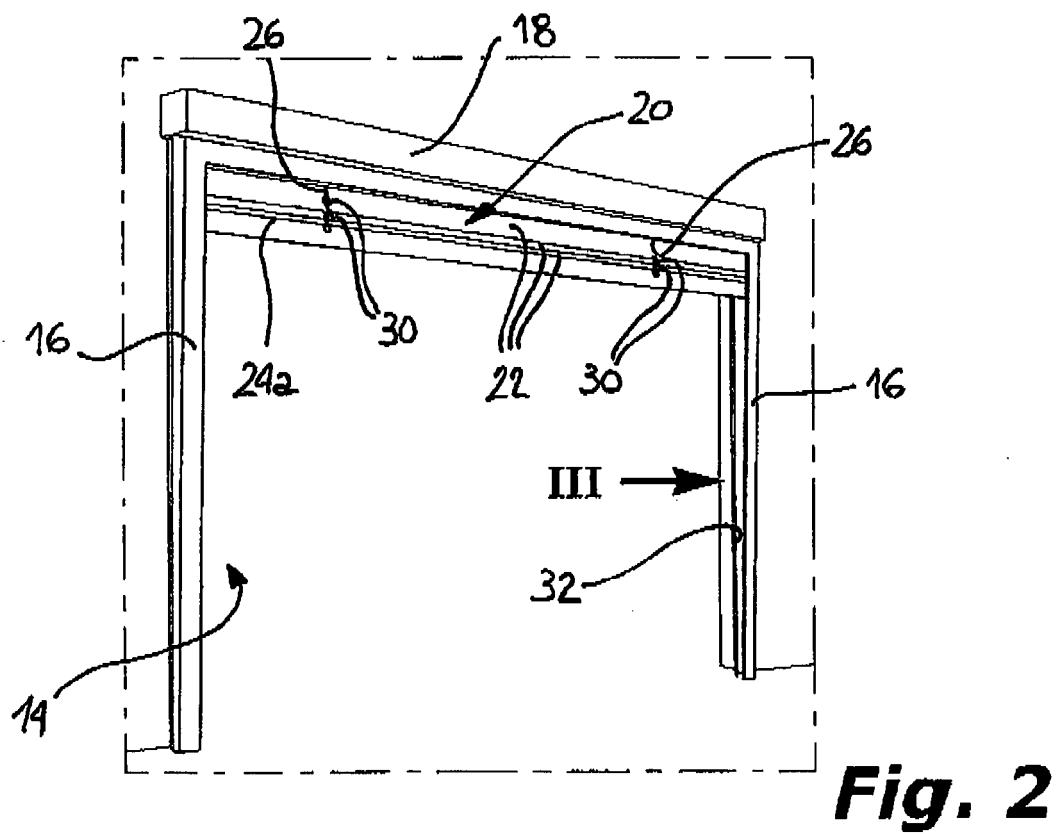
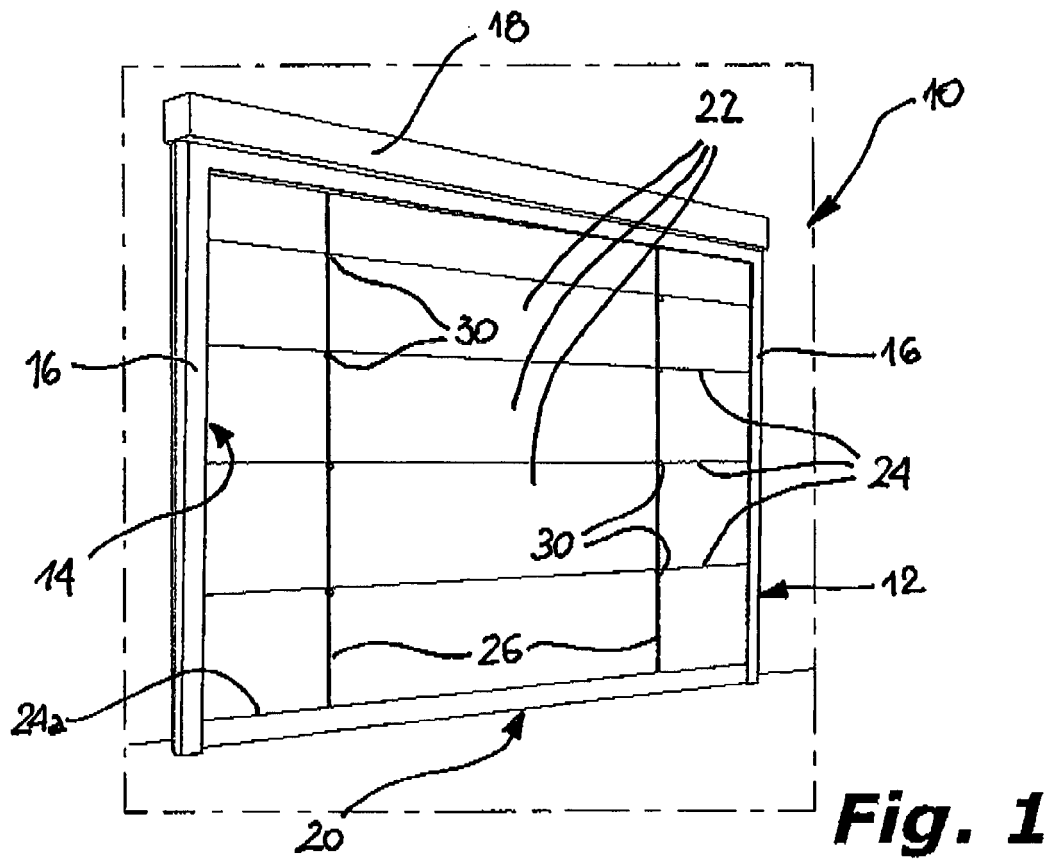
- a transmission roller (24) parallel to said winding shaft (20) and interposed between the latter and the upper crosspiece (14), the radially outer surface of which is partially engaged by a portion of the curtain (12), said transmission roller (24) being connected to driving means for controlling the rotation thereof in both the directions of rotation,
- a first pair of gear wheels (28) each of which is coupled to a respective end of said roller (24), and a second pair of gear wheels (38) each of which is rotatably mounted close to said base plane (16) and in a position adjacent to a respective upright (18), the gear wheels of said first pair of gear wheels and of said second pair of gear wheels (28, 38) which are arranged at a same side of the curtain (12) being engaged by respective continuous flexible drive members (32, 36) to which a relevant side dragging member (40) for dragging the curtain (12) is fixed close to its lower transverse edge (12b), and
- counterweight means (42, 44) connected to said winding shaft (20) to control its rotation as a result of the winding or unwinding the curtain (12) on it, owing to the rotation of said roller (24),
- whereby the rotation of said roller (24) causes the curtain (12) to slide longitudinally with respect to said opening as a consequence of the friction between the radially outer surface of the roller (24) and the curtain (12) and, simultaneously, as a consequence of the movement of said dragging members (40) connected to the sides of the curtain (12), which is caused by the rotation of said first and second pair of gear wheels (28, 38) and of said continuous flexible drive members (32, 36), the winding or unwinding of the curtain (12) on the winding shaft (20) is controlled simultaneously by said counterweight means (42, 44).

2. Roll up door according to claim 1, **characterized in that** a third and a fourth pair of gear wheels (30, 34)

coaxial to each other and fast into rotation, are interposed between said first and second pair of gear wheels (28, 38), which are rotatably mounted in a position adjacent to a respective upright (18) and in the vicinity of the crosspiece (14) of said opening, a gear wheel of the first pair of gear wheels (28) and a gear wheel of the third pair of gear wheels (30) being engaged by a first continuous flexible drive member (32), a gear wheel of the second pair of gear wheels (38) and a gear wheel of the fourth pair of gear wheels (38, 34) being engaged by a second continuous flexible drive member (36).

3. Roll up door according to claim 1 or 2, **characterized in that** said continuous flexible drive members consist of gearing chains (32, 36).
4. Roll up door according to any one of claims 1 to 3, **characterized in that** the driving means for driving into rotation said roller (24) comprise a gearmotor unit (26) including an electric motor, the output shaft of the gearmotor unit (26) being coaxial with said roller (24) and with said first pair of gear wheels (28).
5. Roll up door according to any one of claims 1 to 4, **characterized in that** said counterweight means include an elongated flexible member (42), such as a belt, the first end of which is connected to said winding shaft (20) and the second end of which is fixed to a counterweight body (44) having a weight greater than the curtain (12).
6. Roll up door according to any one of claims 1 to 5, **characterized in that** said dragging members (40) of the curtain (12) are susceptible of being removably fixed to the curtain (12), and **in that** each of them is made in the form of a bracket transverse to the curtain (12), which cooperates with at least one second retaining member (40b, 40d, 40f) fixed to the curtain (12).
7. Roll up door according to claim 6, **characterized in that** each dragging member of the curtain consists of a fork shaped bracket (40) provided with a slit (40a) that extends transverse to the curtain (12), which slit (40a) is slidably engaged by at least one pin member (40b), such as a bolt, projecting from the surface of the curtain (12).
8. Roll up door according to claim 6, **characterized in that** each dragging member of the curtain consists of a bracket (40) that supports a first fastening member (40c) of a fastening unit provided with loops and hooks, such as Velcro®, a second corresponding fastening member (40d) being fixed to the surface of the curtain (12).
9. Roll up door according to claim 6, **characterized in**

that each dragging member of the curtain consists of a bracket (40) that supports a first fastening member (40e) of the magnetic attraction type, such as a magnetized plate, a second corresponding fastening member (40f), such as a ferromagnetic plate, being fixed to the surface of the curtain (12).



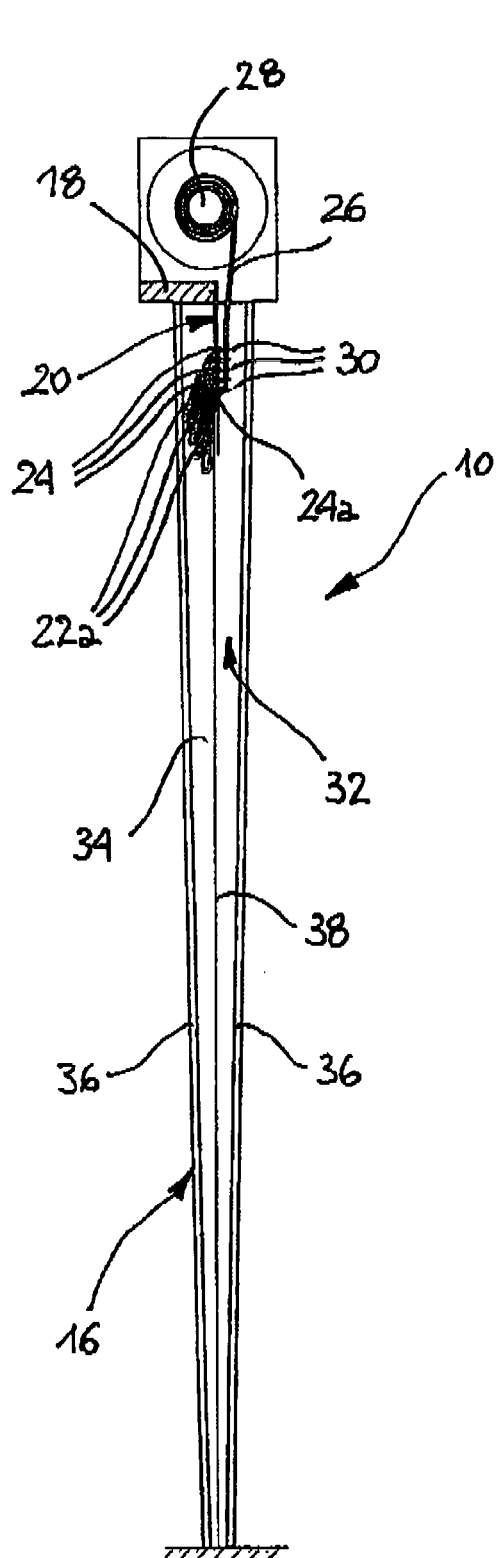


Fig. 3

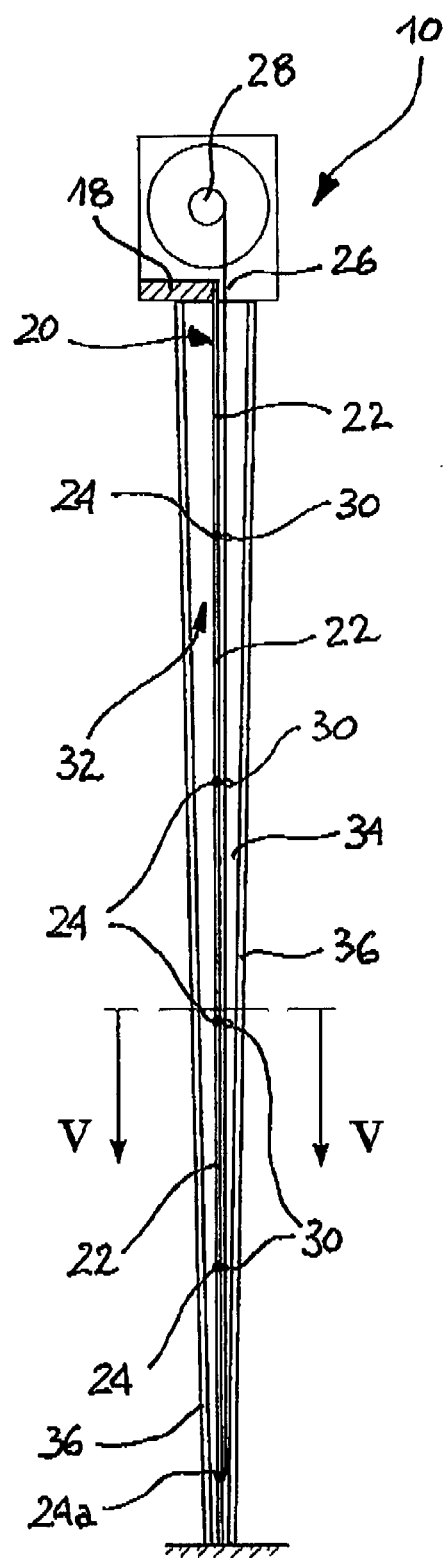


Fig. 4

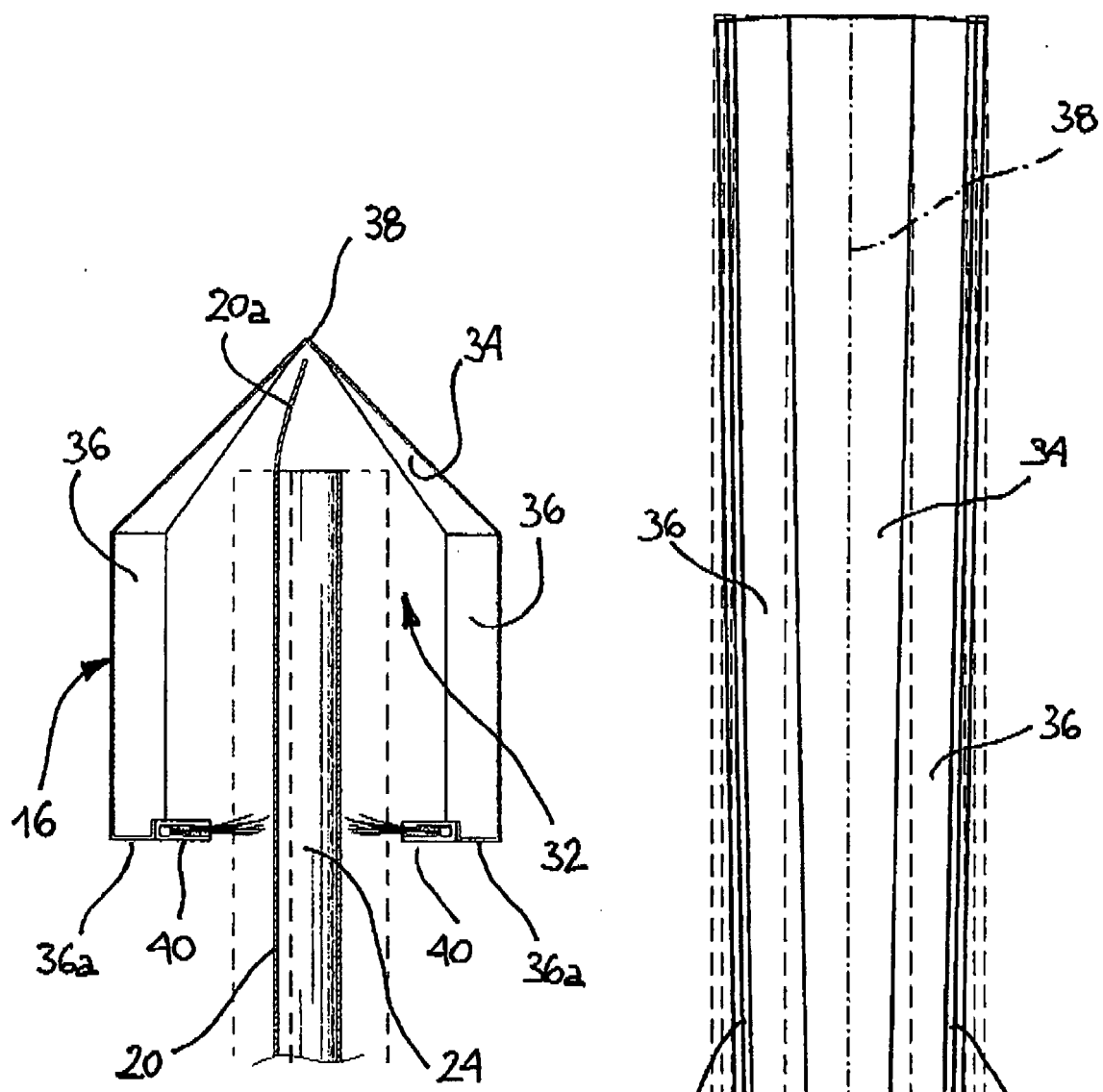


Fig. 5

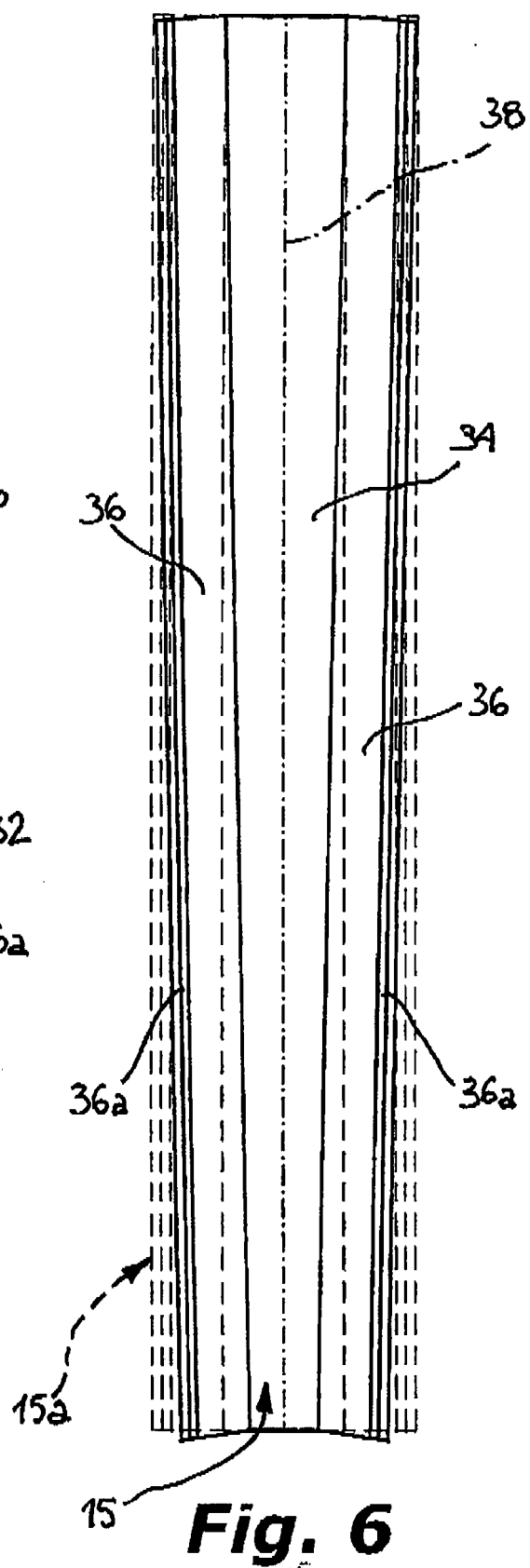


Fig. 6



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 Application Number
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Place of search Munich		Date of completion of the search 29 November 2019	Examiner Merz, Wolfgang
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REFERENCES CITED IN THE DESCRIPTION

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