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(54) **Tubular stranding machine**

Rohrförmige Verseilmaschine

Toronneuse tubulaire

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(56) References cited:
GB-A- 1 001 636
GB-A- 2 064 611
US-A- 4 760 692

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Description

[0001] The present invention relates to a tubular stranding machine representing an improvement on the classical tubular stranding machine: as in known traditional tubular stranding machines, the outer tube constitutes the supporting structure and rotary stranding body because it guides and rotates the cable-forming wires originating from spools housed in its interior.

[0002] Within this aim, an object of the present invention is to provide a stranding machine able to use spools of much greater diameter than those used in traditional machines, so considerably increasing the machine filling coefficient. This results in a proportional reduction in the reloading downtime and a parallel increase in machine production.

[0003] Within this aim, an object of the invention is to provide a tubular stranding machine able to minimize stressing of the wires to be stranded, hence obtaining a better quality final product.

[0004] The patent GB 1 001 636 discloses a device for the manufacture of wire ropes and flexible shafts which comprises a hollow cylindrical rotor whose opposite ends are closed by disc-like members connected to hollow shafts which are substantially coaxial with the rotor and extend both outside the rotor to be received in bearing members and inside the rotor, the facing ends of the shafts within the rotor being spaced apart by a distance at least sufficient to allow a wire supply bobbin to be mounted on a shaft, the rotor being cut away in a region corresponding with the space between the facing ends of the shafts to provide an opening for bobbin insertion, drive means for drawing a core through the rotor and hollow shafts and rotating the rotor in a predetermined relationship with the passage of the core therethrough and guide means for guiding wire from a bobbin when so mounted to a winding station on the rotor whereby to wind the wire around the core.

[0005] A further object of the present invention is to provide a stranding machine which for the same number of spools is shorter and more compact than machines of known type, with a considerable reduction in the overall layout dimensions.

[0006] Another object of the present invention is to provide a stranding machine which is economically advantageous and hence of lower construction cost. This and further aims which will be more apparent hereinafter are attained by a tubular stranding machine according to claim 1.

[0007] Further characteristics and advantages of the invention will be more apparent from the description of a preferred but non-exclusive embodiment of the invention, illustrated by way of non-limiting example with reference to the accompanying drawings, in which:

Figure 1 is an overall perspective schematic view of the supporting structure of a tubular machine according to the invention.
Figure 2 is a side elevation of the tubular machine of the invention within the cylinder 2 shown sectioned on a plane passing through the axis 1.
Figure 3 is a section through the machine of the invention on a transverse plane cutting a spool to show the location of a winding apparatus.
Figures 4 and 6 are a section through the machine of the invention on a transverse plane lying between two spools to show the action of the unwinding means.
Figure 5 shows a device 56 for reloading the spools.
Figure 7 is a side elevation of a particular embodiment of the tubular machine of the invention.
Figure 8 is a side elevation of the tubular machine showing the use of the machine of Figure 7 in armouring, screening or depositing another layer on an already formed cable.
Figure 9 is a side elevation of a further particular embodiment of the tubular machine of the invention.
Figure 10 is a side elevation of a detail of the machine of Figure 9.
Figure 11 is a schematic cross-section through the machine of Figure 9.

[0008] With reference to said figures, the stranding machine of the invention consists of a hollow cylindrical body 2 intended to support the "N" spools (where N is an even number at least equal to n, the maximum number of wires to be stranded on it in a single pass) disposed in its interior with axes coinciding with its axis 1.

[0009] The cylinder 2 is closed at its two ends by two solid cylinder sections or discs 50 and 51 from which projectingly carry the two short shafts 3 and 4 resting on the ground supports 5 and 6 and free to rotate within them via interposed bearings 7 and 8.

[0010] With reference now to Figure 2, the cylinder 2 could, if N is very large, be supported also or exclusively by one or more intermediate supports 9, of diameter greater than the cylinder 2, within which the cylinder, thickened thereat by an additional circular ring 38 fixed to it, rotates freely by way of interposed bearings of the type indicated by 10.

[0011] The cylinder 2 is rotated in known manner by a motor secured to the ground, which transmits movement to the rotary structure by mechanisms always external to the hollow shaft 3 in order not to disturb any passage of wires or cables within the shaft 3; for example by means of a mechanism consisting of the reducer 16 which acts on the ring gear 17 (keyed onto the cylinder) by means of a suitable motion transmission system such as the toothed belt 18.

[0012] The "N" spools of the cylinder 2 are disposed in its interior in orderly arrangement with their axes coinciding with that of the cylinder and with the overall machine axis 1.

[0013] Each spool is supported by a solid cylinder section or disc 25 or 65, fixed to the body of the cylinder 2 (with which it forms one piece), by means of a projecting shaft through the intermediation of a ball bearing 29 or 30 and having it axis parallel to or coinciding with the overall machine axis 1.

[0014] If disc 25 support two shafts 27 (to support a right hand spool 23, i.e. disposed at the right of the flange with reference to the drawing, or 68, to support a left hand spool 24, i.e. disposed at the left of the flange with reference to the drawing, and the interposed pairs of bearings 29 and 30) as projectingly supports from each lateral face two identical equipments, one right hand 23+27+29 and one left hand 24+28+30, it is subjected to a balanced load about the central plane of symmetry of the flange, except for the end flanges 61 and 62 which are loaded only on their inner side.

[0015] Hereinafter differently constituted spool pairs will be considered, i.e. those facing the same intermediate space between two consecutive flanges, even if supported by two different flanges, for example, in the drawing of Figure 2 starting from the left, the first and second, the third and fourth, and so on: and in general pairs will be considered composed, in the drawing of Figure 2, of a spool supported by a projection to the right of the flange (such as the first, the third, the fifth ...) and indicated as type 23 or "right hand", and of a spool supported by a projection to the left of the flange (such as, again in said drawing, the second, the fourth, etc.), indicated as type 24 or "left hand".

[0016] The reference numeral 65 indicates the disc subsequent to 25 (to its immediate right in Figure 2) and 64 the left spool supported by it, 68 the shaft which supports it, and 70 the pairs of intermediate bearings. The entire machine can be considered as containing N/2 such pairs.

[0017] As all spool pairs have identical functions, fixings, drives, motion, wire unwinding and wire path, only those of any one pair 23+64 of such spools lying within the longitudinal section of length l of Figure 2 will be considered.

[0018] The movement of each spool 23 or 64, which because of its constraints can only be rotary about its axis coinciding with the general machine axis 1 and is used to unwind or wind the wire from or on the spool, is totally independent of that of the cylinder 2 which contains it and also of the parallel movement of the equipment 25+27+29 (or 65+68+70) which supports it because the spool is rotationally isolated from it.

[0019] It should be noted that for braking, the entire structure uses a disc brake 80, the shoes 82 of which, rigidly supported on the ground, act on the disc 81 which forms an integral part of the cylinder section 50, rigidly fixed to the cylinder 2; to prevent each spool, this notwithstanding, from continuing to rotate within the cylinder when this is locked, means for braking are carried by each disc and compelled to slide against one of the spool flanges, in order to brake the spool movement relative to the cylinder. These means for braking consist, for each of the right spools 23 and left spools 64, of devices 45 and 46 supported respectively by the relative support discs 25 and 65 which are able to cause the right rubbing pad 47 or left rubbing pad 48 to advance towards the flange of the adjacent spools 23 and 64 respectively, and hence generate braking friction with them.

[0020] Within the cylinder, in each longitudinal section of length l between two consecutive cylindrical discs 25 and 65 in an intermediate position thereof, two sets of three opening or windows (of which the drawing of Figure 2 shows only the three currently visible), 31 and 71 respectively, of length less than the length l/2, of such length and width as not to weaken the cylinder structure but to be able, during machine construction, to fix the equipments 23+27+29 and 64+68+70 to the cylinder 2; and also, during use and when the spools are empty, to allow access to the spools to enable the necessary welding of the wire end of the empty spool to the newly fed wire.

[0021] Unwinding equipments, one provided for each spool in a position overlying it in correspondence with the windows of type 31, are fixed rigidly to the cylinder 2 and rotate with it.

[0022] Each of these consists of a roller of type 32 (element for detaching the wire from the spool along a centrifugal path, given the movement relative to the cylinder 2 imposed on the spool for its unwinding), of the centrifugal retaining eyelet 33, of the pulley 34 (for deviation in the plane perpendicular to the axis 1) and of the final pulley 35 for 90° displacement into a new longitudinal path parallel to the machine axis 1, virtually along a straight generating line of the cylinder 2, along which eyelets, the outline 36 of which can be seen in the drawing, are disposed at regular intervals (Figure 3 showing a section through the machine in a plane perpendicular to the axis 1).

[0023] The path of each wire continues, in a manner identical to that of normal tubular stranding machines, along its own independent rectilinear trajectory along all the corresponding eyelets of type 36 applied in banks on the outer surface of the cylinder 2 and disposed along the same straight line to define a rectilinear path up to the machine exit, by straddling the intermediate ground supports 9 via through the cavities 37 provided in the rings 38 of the cylinder 2; and straddling the final support 6 via the cavities 39 disposed cone-like within the end rotor 40 supported on the support 6, to arrive undisturbed at the combining die 52 where the stranding action takes place, under the extraction action of the take-up unit 53.

[0024] In a manner identical to that of normal tubular stranding machines, these linear paths are disposed along those portions of outer surface of the cylinder 2 free of windows.

[0025] As all the wires lead to the die 52 at rest on the ground, and with the following definitions:

O = speed (referred to the ground, i.e. absolute) of angular rotation of the cylinder (r.p.m.) and hence of the wires about the axis of the cable under formation
p = desired stranding pitch (m/min)
d_c = diameter of the cable under production
P = length of wire required for each pitch (so that $P^2 = p^2 + \pi^2 d_c^2$) the speed V of wire linear advancement along the cylinder (relative to the ground) must be:

$$V=PO$$

[0026] To achieve spool unwinding, it must move relatively to the cylinder 2, and as it is convenient that the rotation speed of the spool be inferior to the rotation speed of the cylinder 2, the unwinding rotation of each spool 23 (or 24), i.e. its angular speed relative to that of the cylinder, where d is the instantaneous unwinding diameter of the spool (compare Figure 4), is such that:

$$d\,(O-o) = p\,O$$

$$O-o = p\,O/d \quad o = O\,(1-p/d) \qquad \text{formula (1)}$$

[0027] Given that normally p<d, o must be less than O by a fractional amount. This means that it must be close to O or only slightly less than it.

[0028] In other words, this unwinding movement can be obtained by rotating the spool almost at the same speed O as the cylinder 2, by dragging it non-rigidly by it and making it lag behind by the fractional amount p/d by a braking action: and as the required wire quantity is pulled from the outside by the overall take-up unit 53, this take-up unit automatically exerts the necessary braking action. The only limitation is that the pull by the take-up unit must not exceed the maximum pull which can be exerted on the wire in order not to damage its performances; this can be controlled by simply limiting the pull to apply, i.e. the maximum dragging action exerted by the cylinder 2 on the spools.

[0029] Spool movement is obtained by simple entrainment action by the cylinder 2 via an apparatus 41 (or 42) fixed rigidly thereto in a suitable position on the respective discs 25 (or 65), able to force a sliding element 67 (or 69) to exert an adjustable pressure against the flange 82 or 83 respectively of the spool which it faces.

[0030] The pressure is adjusted either from the outside by a PLC which feeds its signals to each of the apparatuses of type 41 or 42 by passing through contacts sliding on conducting rings 54; or by on-board control programmable to achieve reduction in braking action proportional to the spool emptying and hence to the reduction in the arm exerted by the unwinding wire.

[0031] In either case, with the following definitions applying at any moment during stranding and hence at any remaining spool filling level:

b = radius of the wire envelope still on the spool, see Figure 6
T = maximum pull exerted on the wire
B = eccentricity of the brake pad, see Figure 6
K = coefficient of friction of the pad
p = pressure exerted by the pad

p must be adjusted such that at any moment:

$$bT = Bkp$$

$$\text{hence } p = bT/BK \qquad \text{formula (2)}$$

meaning that p must decrease linearly as b decreases, as all the other terms are fixed.

[0032] The aforedescribed machine is constructed to carry out at two separate times the stranding action (or spool emptying), and the spool filling which is implemented simultaneously for all spools by, when the spools are empty, halting

the machine in such a position that an entire linear row of windows 71 suitably faces the loading device 56 of Figure 5, and then fixing to each spool the correspondent feed wire, passed through the recess 51 facing it; then rotating all the spools until filled, by an external rotation device passed through one of the other two residual recesses to come into contact with each spool; for example (Figure 5) by means of an externally operated roller 49 able to make contact with one or both the spool flanges (or with the spool central drum and with the envelope of the wire wound on it), and then rotating it; and a wire guide 50 which runs along its ground support 55 such as to undergo a path parallel to the axis 1 and hence able to arrange the wire in an ordered manner along the entire length of the spool drum. After filling the spools (which are fixed on the machine and always remain there) the feed wires merely have to be cut and the wire ends of each spool be fixed to the end of the wire previously unwound from it. For this purpose, the end of the just unwound spool is halted by a suitable wire absence sensor such that it remains projecting from the unwinding equipment 32+33+34+35 relative to the spool in question, and therefore returns available for this operation, without having to rethread the machine. A new stranding cycle then commences.

[0033] In addition to stranding, the machine structure enables other highly important operations not possible on a normal tubular machine to be carried out, for example, if both the general shaft 3 and all the spool support shafts both of type 27 (right hand) and type 68 (left hand) are hollow, their inner space can be used as a direct passage of wires or cables at rest on the ground, without disturbance by rotation of the machine or, better still, or for the inner insertion of another hollow tube coaxial to the machine axis 1.

[0034] In this case the hollow shaft 19 of Figure 7, at rest with respect to the ground and coaxial to the machine axis 1, passes through the centre of all shafts of type 27 (or 68) which in this case must be hollow, and has an outer diameter such as not to be disturbed by the machine rotation and hence less than the inner diameter of these hollow shafts. It is supported in the following manner: at that end now used as inlet for the entry wires, on the left of the drawing of Figure 7, by a fixed ground support 57; along the entire length of the machine by bearings 58 and 59 which isolate the rotary hollow shafts 27 and 68, and inserted only if made necessary by the natural flexure of the shaft due to its weight (i.e. the bearings are inserted only at those points where they would come into contact with the hollow shafts); at the intermediate support 9, by means of a bearing 60 isolating it from the hollow disc 63; at that end to the right in the drawing of Figure 7, by a bearing 66 isolating it from the end supporting rotary disc 40.

[0035] By passing an already formed cable such as that 86 of Figure 8 through the central free space hence formed, either within the shaft 3 and the entire series of shafts 27 and 68, in the case the hollow shaft 19 is not introduced, or, better still, through the hollow shaft 19 if this has been inserted, the machine can operate as an armouring and screening machine for already formed cables (Figure 8) or as a stranding machine for cables with several layers, each deposited in successive passes through the machine onto the cable under formation during the previous passes; a number of sections of this type of machine can also be arranged in series to form a line able to produce multi-layer cables in a single pass, operating also in tandem if required.

[0036] A second embodiment of the machine with N spools double the number n of wires to be stranding (N=2n), shown in Figure 9, presents the advantage of being able to continuously reload the feeding wire during the stranding movement in order to avoid any downtime, drastically increasing its efficiency compared with a normal tubular machine.

[0037] The nucleus of this machine is exactly identical and it could be said to comprise a machine such as that already described and shown in Figure 7 (however necessarily containing the described static central shaft 19, in the stated manner) but of double length. Hence only those mechanisms additional to this latter and which enable its simultaneous loading will be described.

[0038] As this machine can also be considered composed of left hand and right hand spools disposed in pairs, the devices relative of one of these pairs, composed of the left hand spool 64 and right hand spool 23 of Figure 9, will be described (the numbering of Figure 2 has been preserved for similar components precisely to underline identity in the two cases).

[0039] In this case, machine loading takes place only on one of the two series of n spools (for example all those of left hand type such as 64); while the n spools of the other series (in the example the right hand spools such as 23) are subjected to normal stranding movement.

[0040] In contrast, the spools being filled are driven (Figures 10 and 11) by the action of a device supported by the shaft 19, and hence at rest relative to the ground, and consisting of an electric motor 49 supported by a ring base 78 applied to the hollow shaft 19. It drives the sprocket 43 (supported by the hollow upright 75) by means of a toothed belt transmission adaptable to the two alternative positions, rotated through 180° one to the other, which said hollow upright 75 assumes. The sprocket 43 engages the ring gear 44 fixed on the spool flange 72; the wire, fixed to the spool is therefore pulled by it from the feed coils or stempacks by passing within the hollow shaft 19 and therefore is not disturbed by the rotation of the machine.

[0041] When the content of the spools being unwound (in the example, the content of all the right hand spools, of type 23) is exhausted, the overall operation of the machine is automatically halted. At this point the roles of the two series of spools, right hand and left hand, must be changed over, making the already described new connections for the entering and leaving wires. The series of spools on which the dragging and distribution functions for the wire entering the sprockets

of type 43 and wire guides of type 73 are exercised must also be alternated: namely, in the example, by applying them to the right hand spools of type 23 and ceasing to apply them to the left hand spools of the series 64. In this respect the equipments composed of the elements 49+75+43+74+73, which are interposed in each interval between each spool of right hand type 23 or left hand type 64, are able to serve one or the other alternately: in the ring base 78 applied to the hollow shaft 19 which supports them, there is in fact a cross slot into which the upright 75 is drawn and halted by a spring of vertical axis (which enables it to be inserted in two positions rotated through 180° one to the other): the spring has therefore merely to be forced and the equipment rotated through 180° to serve the opposite spool.

[0042] All the entering wires run along the core cylinder 19 through appropriate hollow cylindrical conduits 76 (Figures 10 and 11) of n in number arranged orderly against its inner surface and emerge from them at the appropriate holes 77 provided in it, to run along the hollow upright 75 and arm 74 as far as the distributor wire guide 73 (suitable deviation pulleys are disposed at each bend).

[0043] Again in this case the machine structure, in addition to stranding, also enables the already described screening, laying-up and stranding operations on multi-layer cables, including in tandem, which cannot be done by a normal tubular machine, while being able to be fed continuously during rotation of the cylinder 2. In this respect, an already formed cable has merely to be passed through the free central space of the shaft 19 (or, better still, through an additional likewise hollow shaft 79 coaxial to the general machine shaft 1 and of the same length and likewise supported at its ends by the supports 57 and 40) to enable the machine to operate as a cable armouring and screening machine (Figure 8), or as a stranding machine for cables with several layers, each deposited in successive passes through the machine on cables under formation during the previous passes; a number of sections of this type of machine can also be arranged in series to form a line able to produce multi-layer cables in a single pass, operating also in tandem if required.

[0044] For a done number of spools and hence of constituent cable wires, the machine is also much shorter and compact (with a reduction in overall area) and less costly (the elimination or reduction of the number of intermediate ground supports, additional to those indispensable positioned at the machine ends, reduces by a like number the number of very costly bearings of diameter greater than that of the tube, required for each intermediate support).

[0045] The machine of the invention is therefore able to continuously produce, without downtimes, except for the very short times for changing over the roles of the two sets of spools when the stranding spools are empty: this is done by cutting and connecting the entry wires on the empty spools, and connecting the wire ends of the feed spools, filled in the meantime, to the ends of the cable under formation.

Claims

1. A tubular stranding machine comprising a supporting structure consisting of a hollow cylinders (2) which rotates about its longitudinal axis (1), on supports (6, 5, 9) secured to the ground, said tubular stranding machine also comprising means to rotate said hollow cylinder (2) about its longitudinal axis (1) and maintain it rotating, said hollow cylinder. (2) comprising in its interior at least one functional unit consisting of a spool (23, 24, 64) arranged to house, guide and rotate the wires to be stranded, said at least one spool (23, 24, 64) having its longitudinal axis coinciding with said axis (1) of said hollow cylinder (2) and being associated with said hollow cylinder (2) via support means enabling said at least one spool (23, 24, 64) to rotate independently relative to said hollow cylinder (2), said support means comprising at least one flange or disc (25, 65) rigid with said hollow cylinder (2) and having its central axis coinciding with said axis (1) of said hollow cylinder (2), from said flange or disc (25, 65) rigidly extending axially at least one projecting shaft (27, 68) with longitudinal axis coincident with said axis (1) of said hollow cylinder (2), on said projecting shaft (27, 68) being retained said at least one spool (23, 24, 64) in a rotationally independent manner, **characterized by** further comprising means for braking (45, 46) the rotation of said at least one spool (23, 24, 64) relative to said hollow cylinder (2), said means for braking (45, 46) the rotation of said at least one spool (23, 24, 64) relative to said hollow cylinder (2) comprise rubbing pads (47, 48) rotating rigidly with one of said flange or disc (25, 65) adjacent to said at least one spool (23, 24, 64) and arranged to come into contact with said at least one spool (23, 24, 64) to create friction between said at least one spool (23, 24, 64) and said flange or disc (25, 65).

2. A tubular stranding machine as claimed in claim 1, **characterised in that** from said flange or disc (25, 65) two of said projecting shafts (27, 68) are extended, one for each side of said flange or disc (25, 65).

3. A tubular stranding machine as claimed in any one of the preceding claim, **characterised in that** said hollow cylinder (2) comprises, positioned in correspondence with each of said at least one spool (23, 24, 64), an opening or window (31, 71) allowing access to said at least one spool (23, 24, 64) from the outside of said cylinder (2), and simultaneous passage of said wires towards the outside.

4. A tubular stranding machine as claimed in claim 1 **characterised in that** said projecting shafts (27, 68) are hollow.

5. A tubular stranding machine as claimed in claim 4, **characterised in that** a static central shaft (19) passes through the interior of said projecting shafts (27, 68) coaxially therewith.

Patentansprüche

1. Rohrförmige Verseilmaschine mit einer tragenden Struktur bestehend aus einem Hohlzylinder (2), welcher entlang seiner Längsachse (1) auf gegenüber dem Boden gesicherten Auflagern (6, 5, 9) rotiert, und Mittel aufweist, um den Hohlzylinder (2) entlang seiner Längsachse (1) rotierenden anzutreiben und die Rotation beizubehalten, wobei der Hohlzylinder (2) in seinem Inneren mindestens eine funktionale Einheit mit einer Spule (23, 24, 64) hat, welche die zu verseilenden Drähte ummantelt, führt und rotiert, wobei mindestens eine Spule (23,24,64) mit ihrer Längsachse übereinstimmend mit der Achse des Hohlzylinders (2) ist und mit dem Hohlzylinder über tragende Mittel verbunden ist, die es ermöglichen mindestens eine Spule (23, 24, 64) unabhängig relativ zu dem Hohlzylinder (2) zu rotieren, wobei die tragenden Mittel aus mindestens einem Flansch oder Scheibe (25, 65) in fester Verbindung mit dem Hohlzylinder (2) bestehen und die Hauptachse übereinstimmend mit der Achse (1) des Hohlzylinders (2) ist, wobei ausgehend von diesem Flansch oder der Scheibe (25, 65) sich in axialer Richtung mindestens eine feste vorstehende Welle (27, 68) erstreckt, deren Längsachse übereinstimmend mit der Achse (1) des Hohlzylinders (2) auf der vorstehenden Welle (27,68) ist, an welcher mindestens eine unabhängige rotierende Spule (23, 24, 64) angeordnet ist, **dadurch gekennzeichnet, dass** weitere Merkmale wie Rotationsbremsmittel (45, 46) vorhanden sind, welche die mindestens eine Spule (23, 24, 64) relativ zu dem Hohlzylinder (2) abbremsen und die Gummikissen (47, 48) aufweisen, die fest verbunden mit einem der Flansche oder Scheiben (25, 65) rotieren und die angrenzend an mindestens eine Spule (23, 24, 64) angeordnet sind, um in Kontakt mit der mindestens einen Spule (23, 24, 64) zu kommen, um eine Reibung zwischen der mindestens einen Spule (23, 24, 64) und dem Flansch oder Scheibe (25, 65) zu erzeugen.

2. Rohrförmige Verseilmaschine nach Anspruch 1, **dadurch gekennzeichnet, dass** sich von jeder Seite des Flansches oder der Scheibe (25, 65) jeweils eine von zwei vorstehenden Wellen (27,68) erstreckt.

3. Rohrförmige Verseilmaschine nach einem der vorherigen Ansprüche, **dadurch gekennzeichnet, dass** der Hohlzylinder (2) so in Übereinstimmung mit jeder der mindestens einer Spule (23, 24, 64) positioniert ist, wobei eine Öffnung oder ein Fenster (31, 71) einen Zugang von außerhalb des Zylinders zu mindestens einer Spule (23, 24, 64) erlaubt und gleichzeitig Passagen der Drähte in Richtung nach außen freigibt.

4. Rohrförmige Verseilmaschine nach Anspruch 1, **dadurch gekennzeichnet, dass** die vorstehenden Wellen (27, 68) hohl sind.

5. Rohrförmige Verseilmaschine nach Anspruch 4, **dadurch gekennzeichnet, dass** eine feststehende Hauptwelle (19) durch den Innenraum der vorstehenden Wellen (27, 68) gleichachsig hindurch verläuft.

Revendications

1. Toronneuse tubulaire comprenant une structure de support constituée d'un cylindre creux (2) qui tourne autour de son axe longitudinal (1), sur des supports (6, 5, 9) fixés au sol, ladite toronneuse tubulaire comprenant également des moyens pour faire tourner ledit cylindre creux (2) autour de son axe longitudinal (1) et le maintenir, ledit cylindre creux (2) comprenant dans sa partie intérieure au moins une unité fonctionnelle constituée d'une bobine (23, 24, 64) agencée pour loger, guider et faire tourner les fils destinés à être toronnés, ladite au moins une bobine (23, 24, 64) ayant son axe longitudinal coïncidant avec ledit axe (1) dudit cylindre creux (2) et étant associé audit cylindre creux (2) par l'intermédiaire de moyens de support permettant à ladite au moins une bobine (23, 24, 64) de tourner indépendamment par rapport audit cylindre creux (2), lesdits moyens de support comprenant au moins une bride ou un disque (25, 65) rigide avec ledit cylindre creux (2) et ayant son axe central coïncidant avec ledit axe (1) dudit cylindre creux (2), au moins un arbre saillant (27, 68) s'étendant à partir de ladite bride ou duquel disque (25, 65) rigidement et de façon axiale avec un axe longitudinal coïncidant avec ledit axe (1) dudit cylindre creux (2), ladite au moins une bobine (23, 24, 64) étant retenue sur ledit arbre saillant (27, 68) de manière indépendante en rotation, **caractérisée en ce qu'**elle comprend en outre des moyens pour freiner (45, 46) la rotation de ladite au moins une bobine (23, 24, 64) par rapport audit cylindre creux (2), lesdits moyens pour freiner (45, 46) la rotation de ladite au moins une bobine (23, 24, 64) par rapport à audit cylindre creux (2) comprenant des plaquettes de frottement (47, 48) tournant rigidement avec un élément parmi ladite bride ou ledit disque (25, 65) de façon adjacente à ladite au

moins une bobine (23, 24, 64) et agencées pour entrer en contact avec ladite au moins une bobine (23, 24, 64) pour créer un frottement entre ladite au moins une bobine (23, 24, 64) et ladite bride ou ledit disque (25, 65).

2. Toronneuse tubulaire selon la revendication 1, **caractérisée en ce que** deux desdits arbres saillants (27, 68) s'étendent à partir de ladite bride ou dudit disque (25, 65), un de chaque côté de ladite bride ou disque (25, 65).

3. Toronneuse tubulaire selon une quelconque des revendications précédentes, **caractérisée en ce que** ledit cylindre creux (2) comprend, positionnée en correspondance avec chacune de ladite au moins une bobine (23, 24, 64), une ouverture ou fenêtre (31, 71) permettant l'accès à ladite au moins une bobine (23, 24, 64) à partir de l'extérieur dudit cylindre (2), et le passage simultané desdits fils vers l'extérieur.

4. Toronneuse tubulaire selon la revendication 1, **caractérisée en ce que** lesdits arbres saillants (27, 68) sont creux.

5. Toronneuse tubulaire selon la revendication 4, **caractérisé en ce qu'**un arbre central statique (19) passe à travers la partie intérieure desdits arbres saillants (27, 68) de façon coaxiale avec ceux-ci.

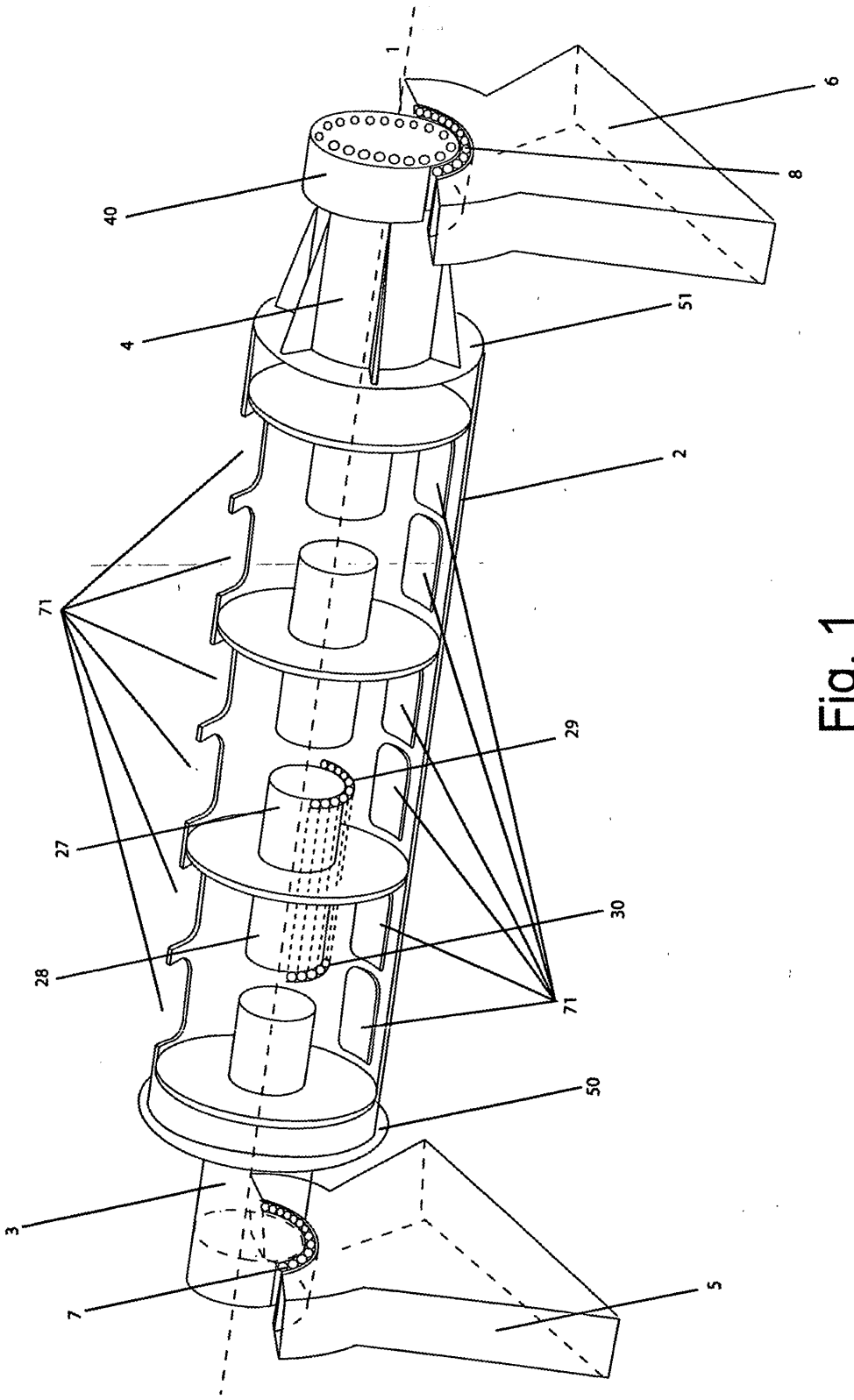


Fig. 1

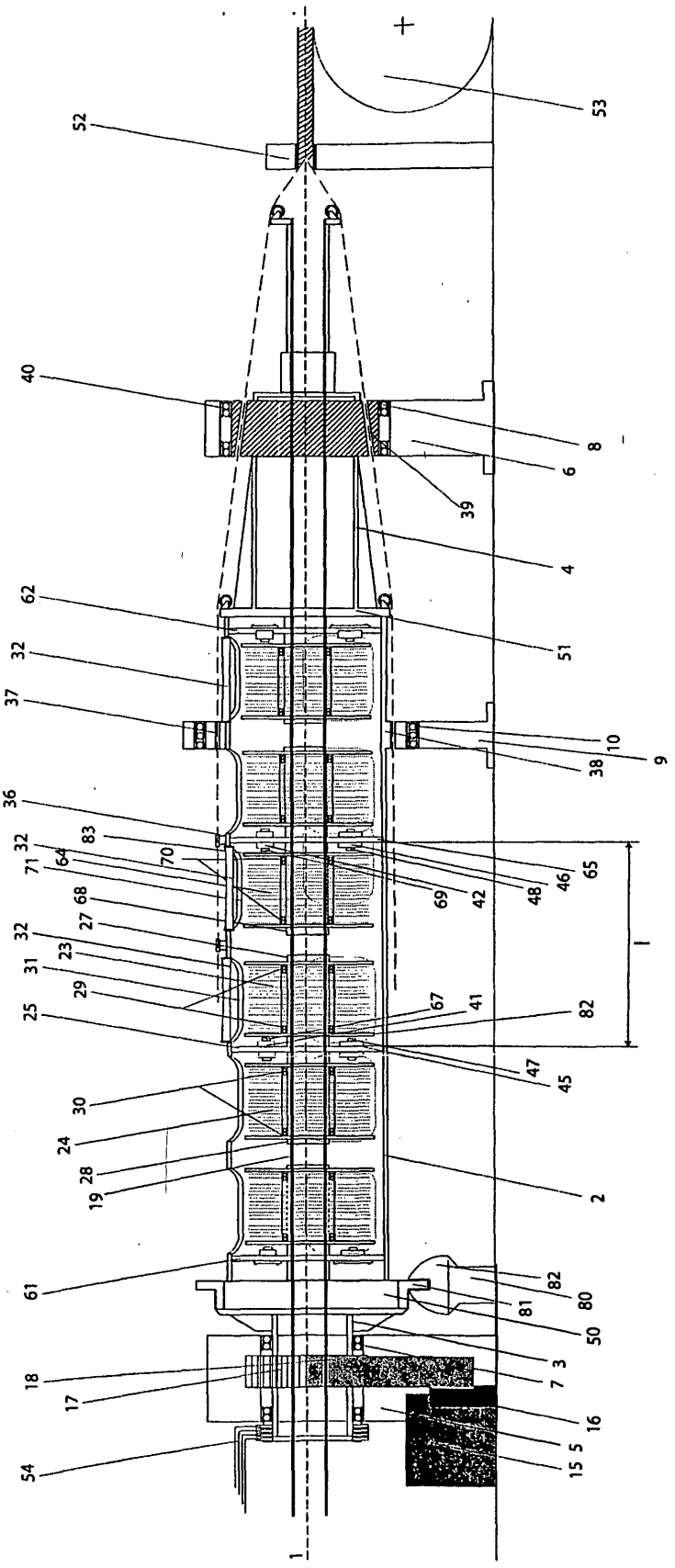

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Fig. 2

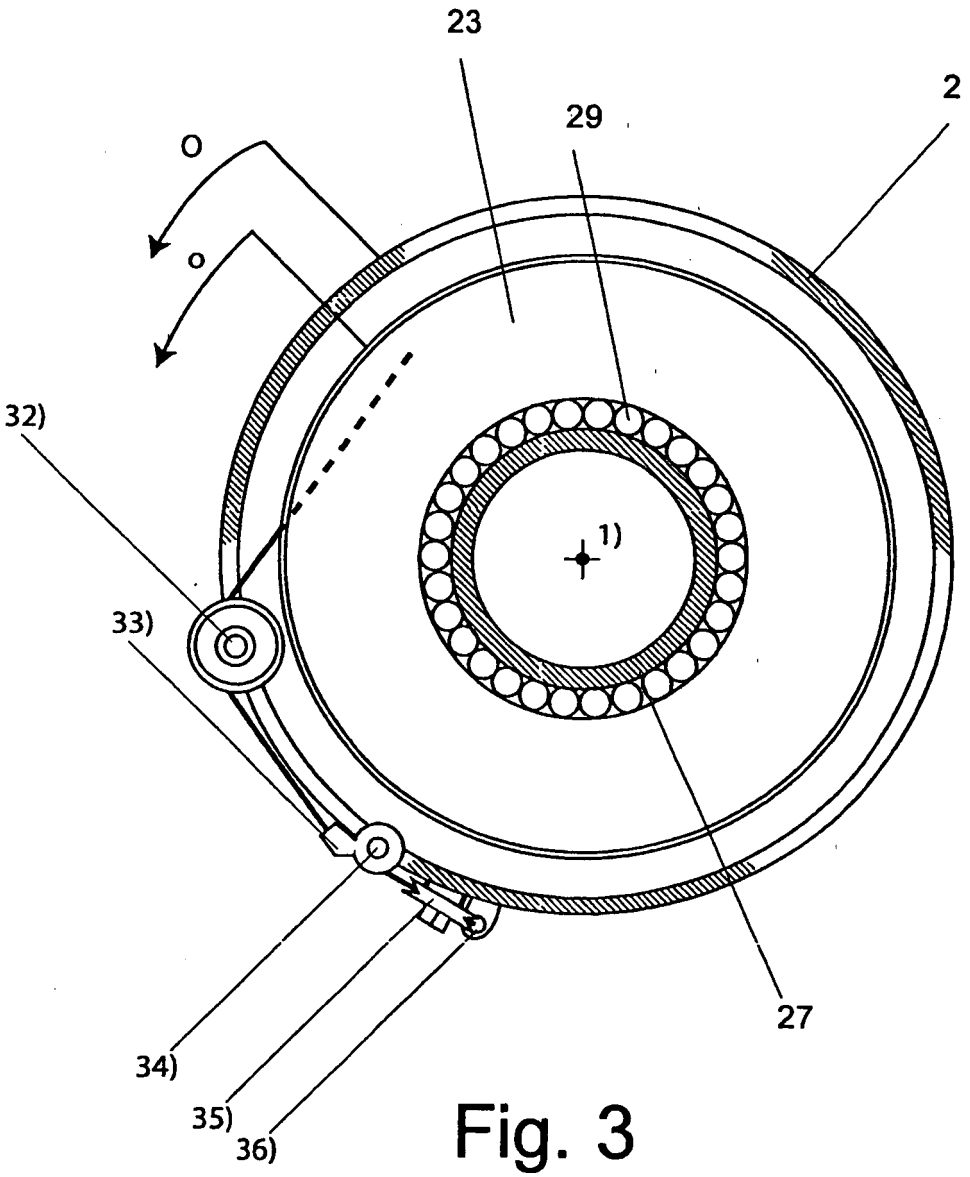


Fig. 3

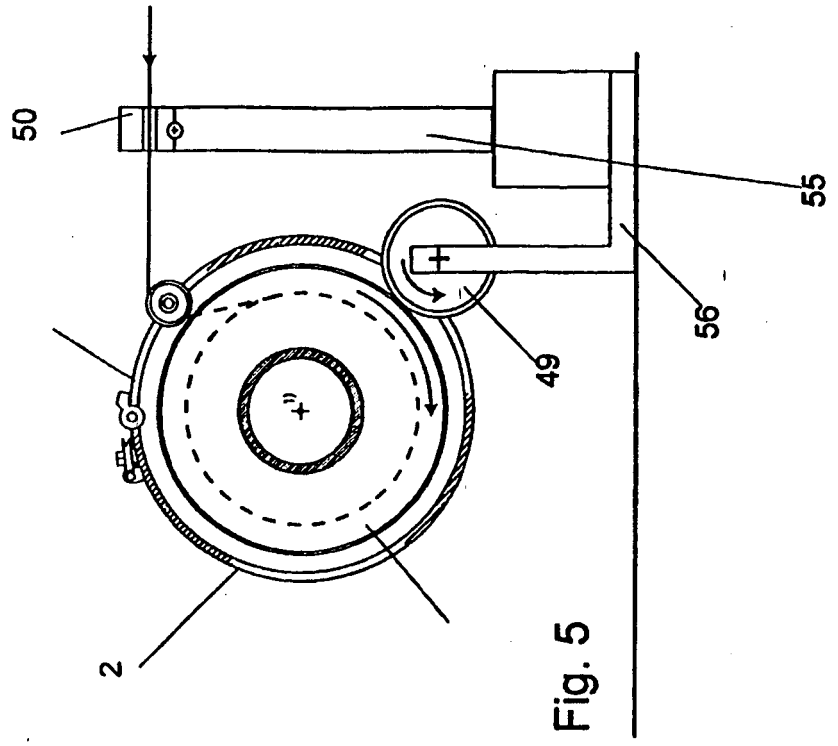


Fig. 5

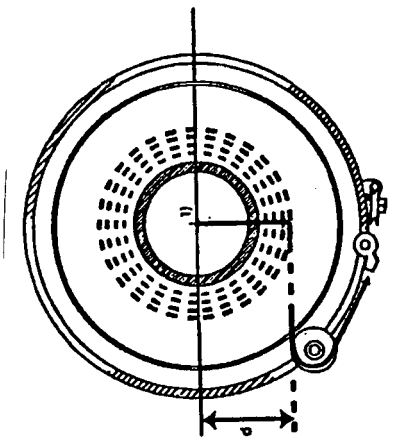


Fig. 4

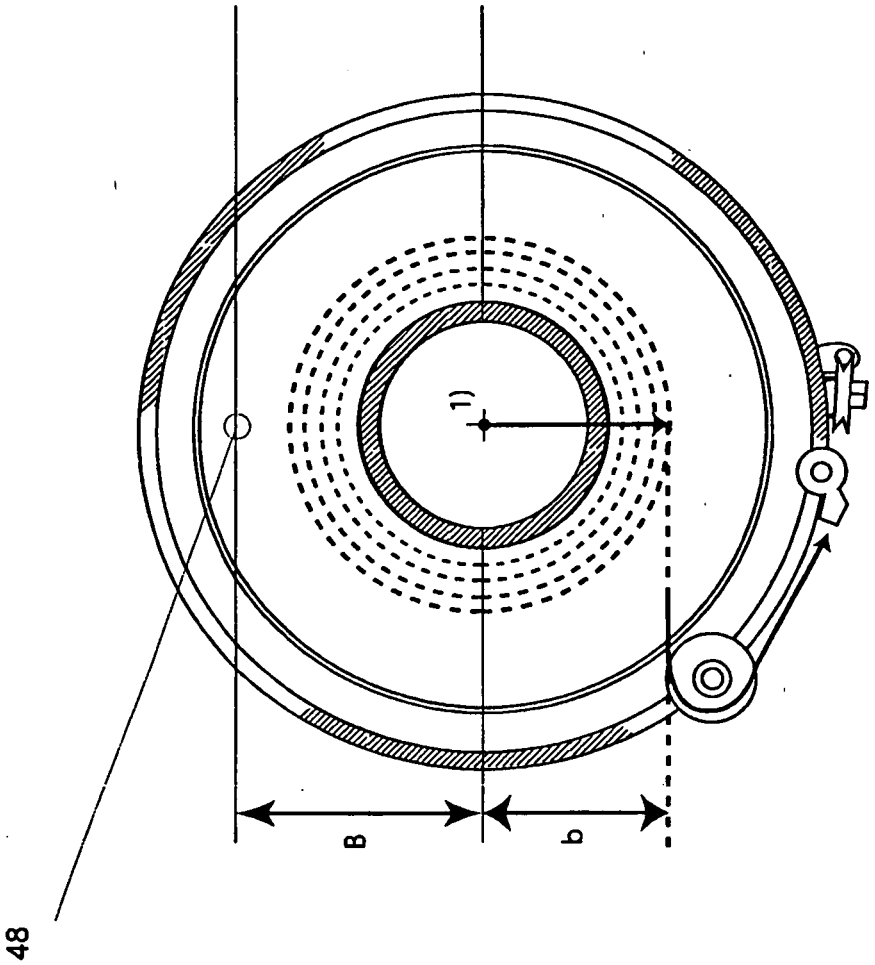


Fig. 6

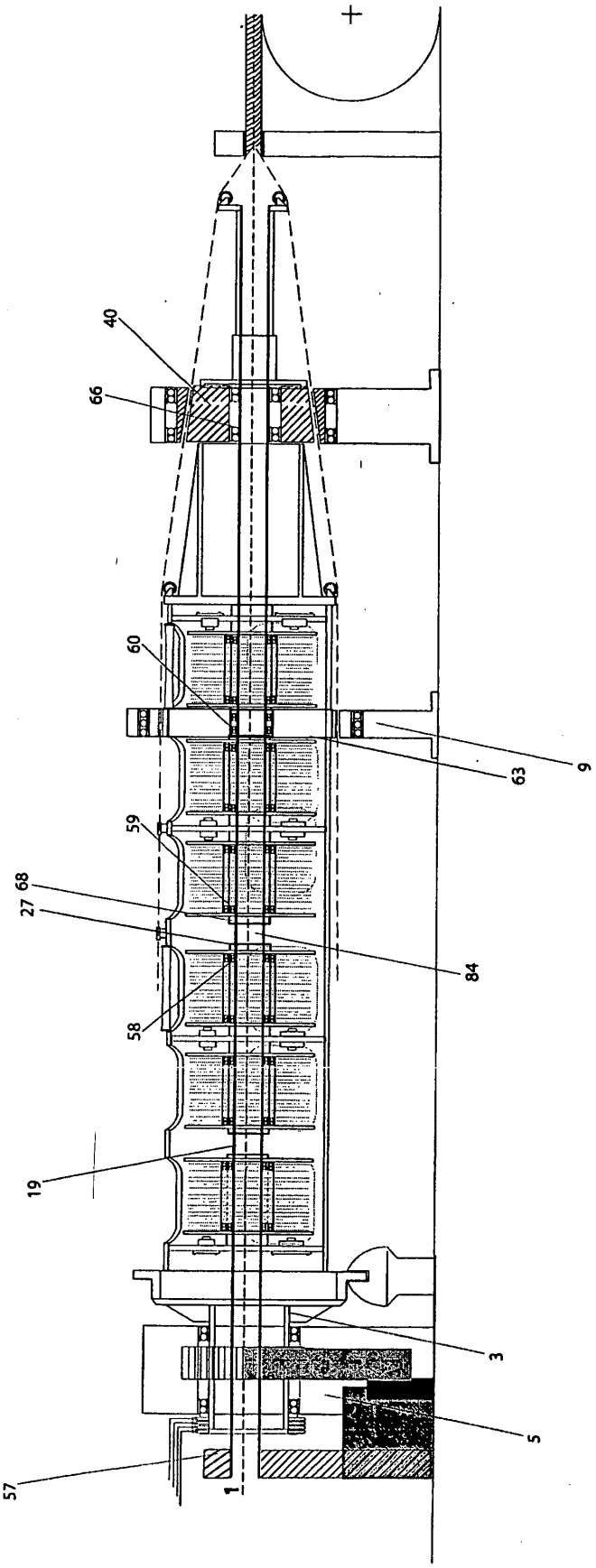


Fig. 7

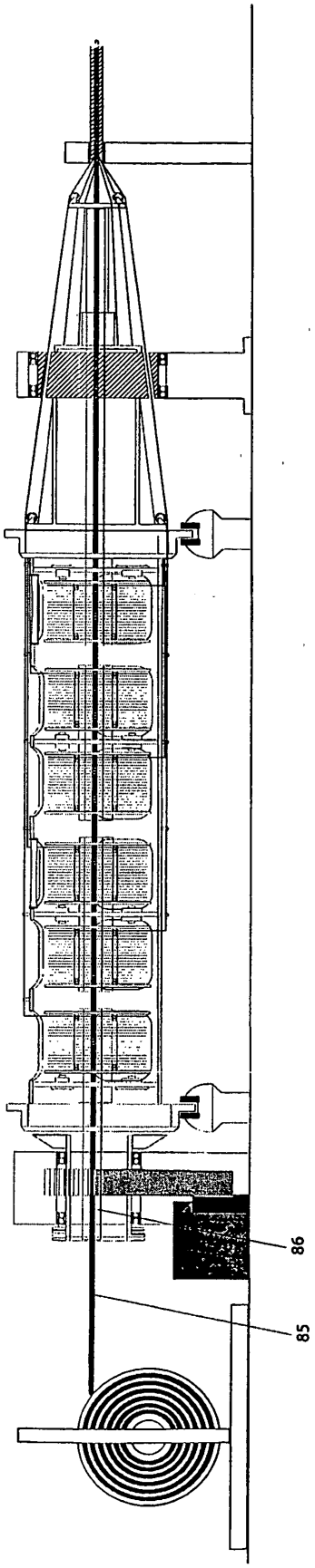


Fig. 8

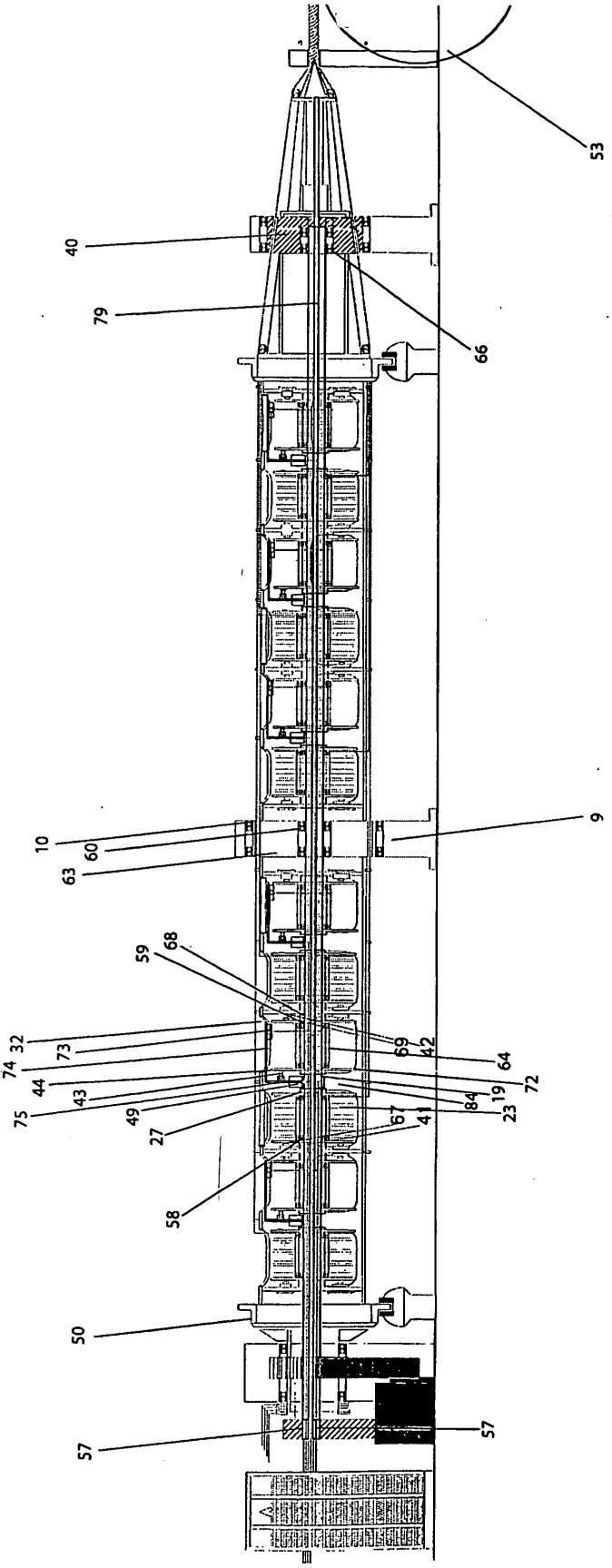

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Fig. 9

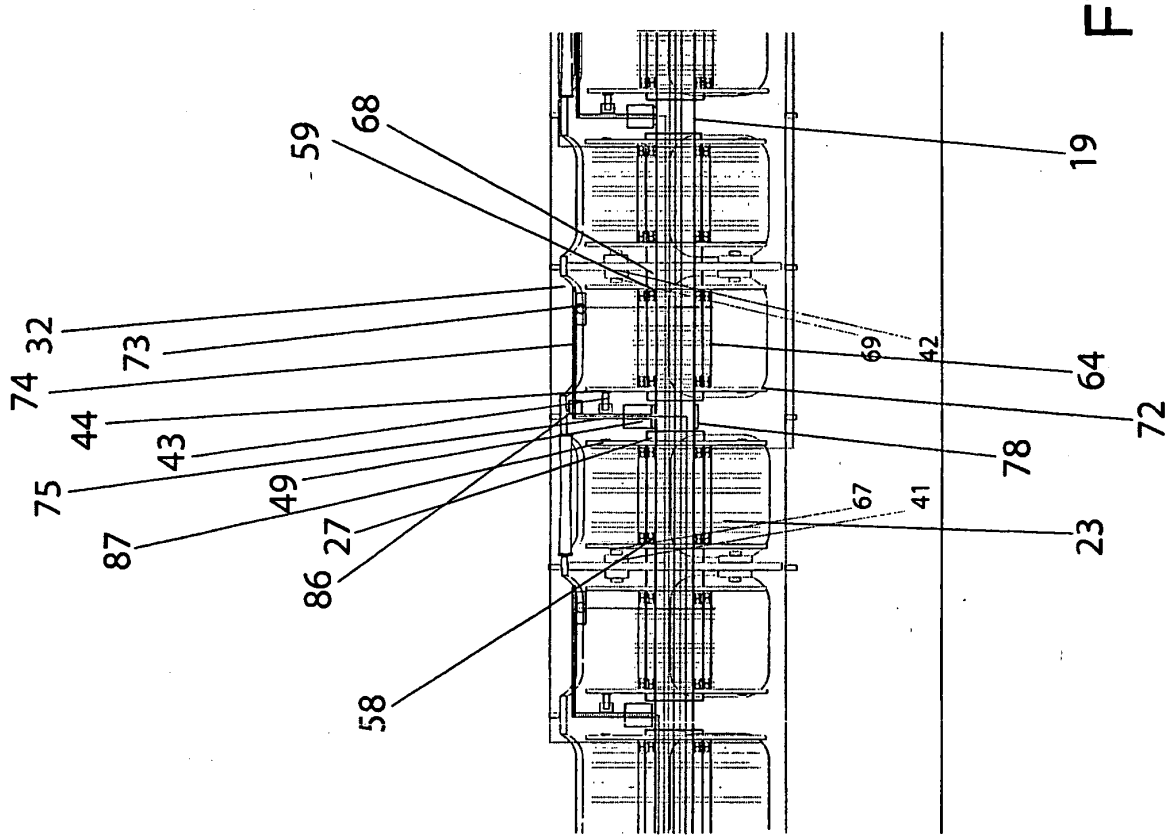


Fig. 10

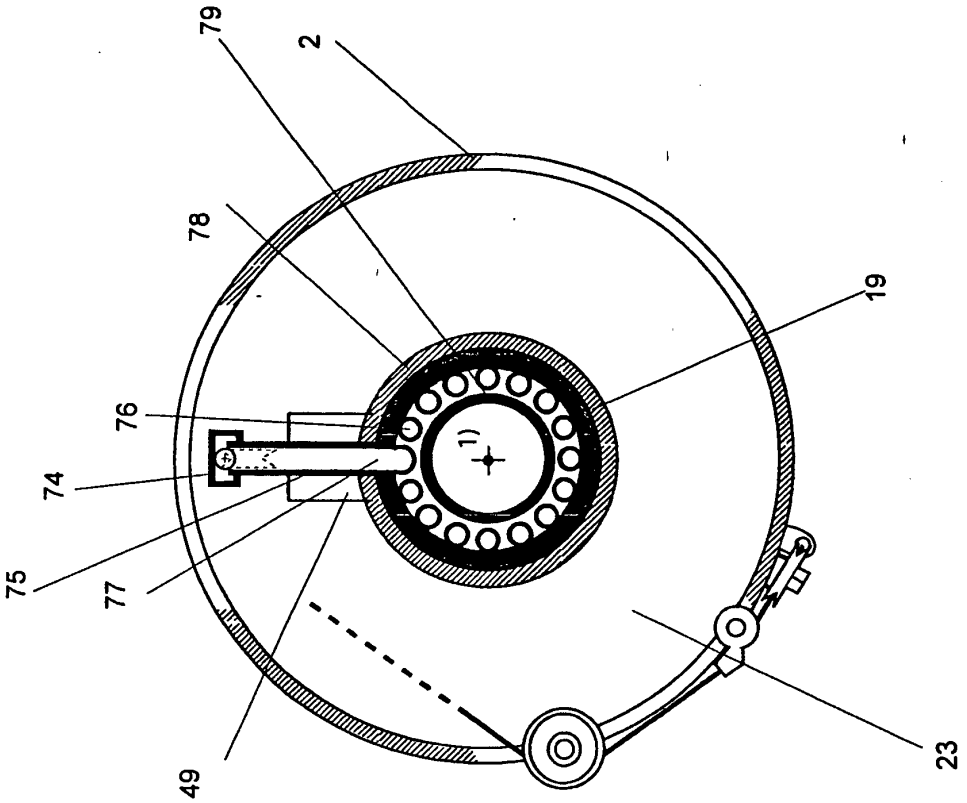


Fig. 11

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- GB 1001636 A **[0004]**