US 20110233319A1

(19) **United States**

(12) **Patent Application Publication**

Mantovan et al.

(10) **Pub. No.: US 2011/0233319 A1**

(43) **Pub. Date: Sep. 29, 2011**

(54) **MACHINE FOR WINDING A WIRE FROM A ROLLING MILL INTO A COIL**

(75) Inventors: **Gianfranco Mantovan**, Busto Arsizio (IT); **Remo Tiziani**, Castellanza (IT)

(73) Assignee: **SIEMENS VAI METALS TECHNOLOGIES S.R.L.**, Marnate (VA) (IT)

(21) Appl. No.: **13/056,712**

(22) PCT Filed: **Jul. 8, 2009**

(86) PCT No.: **PCT/EP09/58643**

§ 371 (c)(1),
(2), (4) Date: **Mar. 24, 2011**

(30) **Foreign Application Priority Data**

Jul. 29, 2008 (IT) 2008A1388

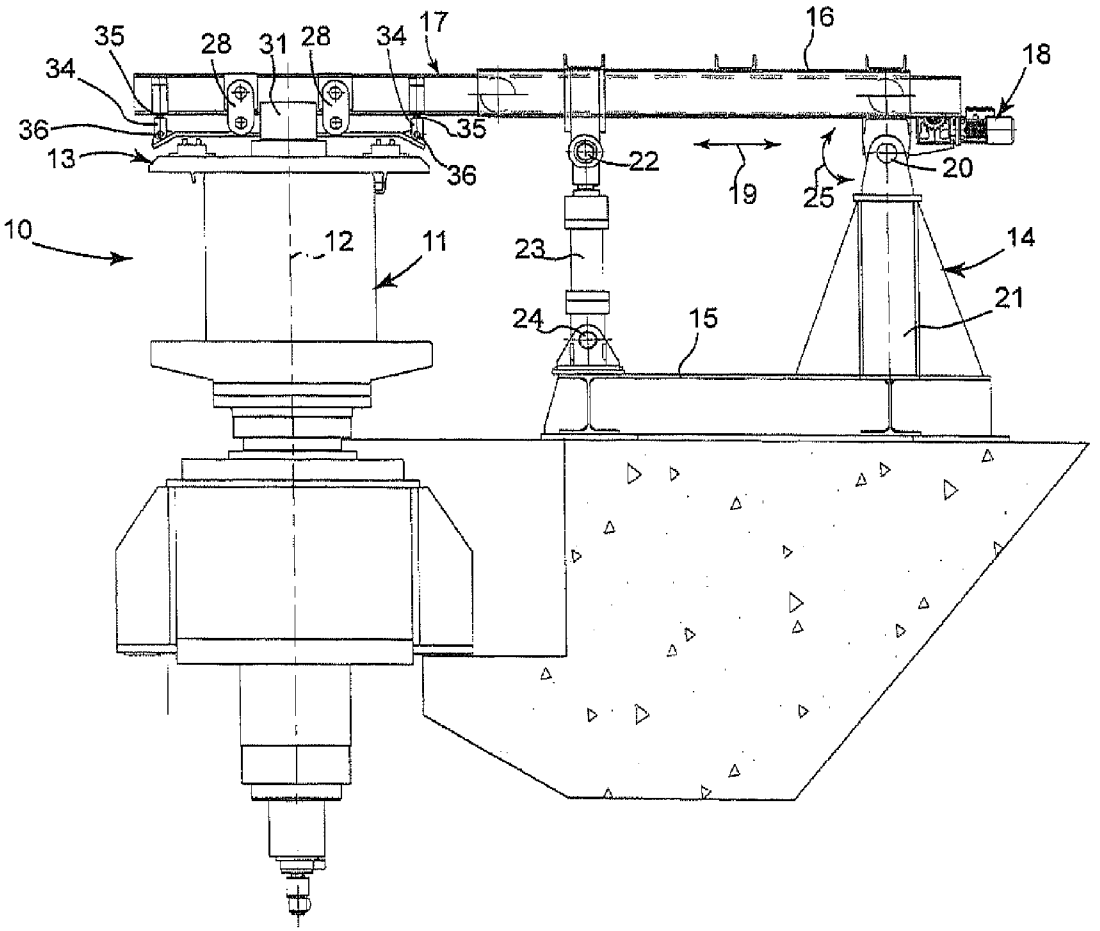
Publication Classification

(51) **Int. Cl.**
B21C 47/02 (2006.01)
B65H 65/00 (2006.01)

(52) **U.S. Cl.** **242/476.6**; 242/476.1

(57) **ABSTRACT**

A machine for winding a wire from a rolling mill into a coil contains spindle with a seat for threading the head end of the wire with related binding devices. The threading seat and the binding devices are linked to an independent cover module that is coupled moveably to the spindle.



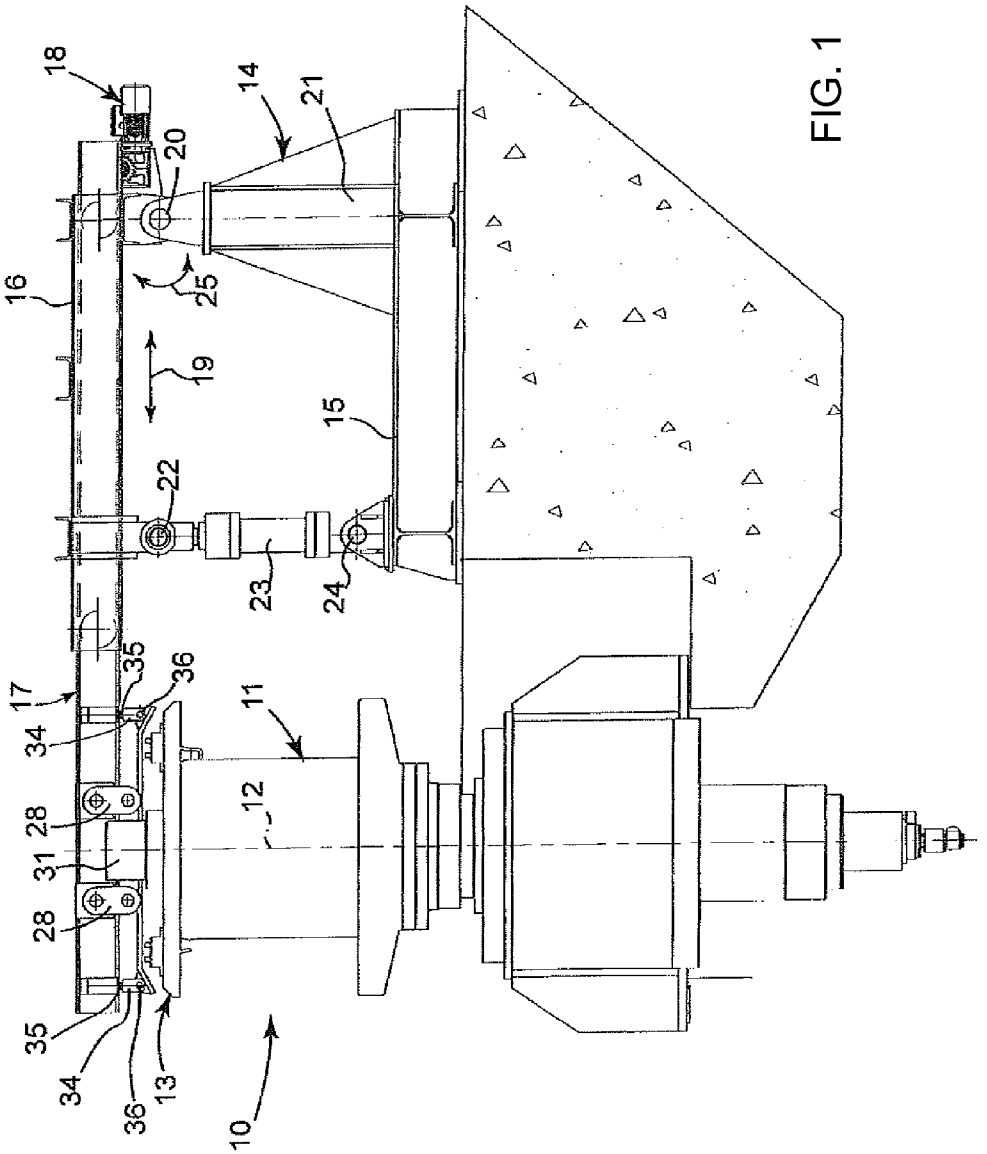

18
14
21
20
16
25
19
15
22
23
24
35
36
17
34
11
12
28
31
28
35
34
36
13
10

FIG. 1

FIG. 2

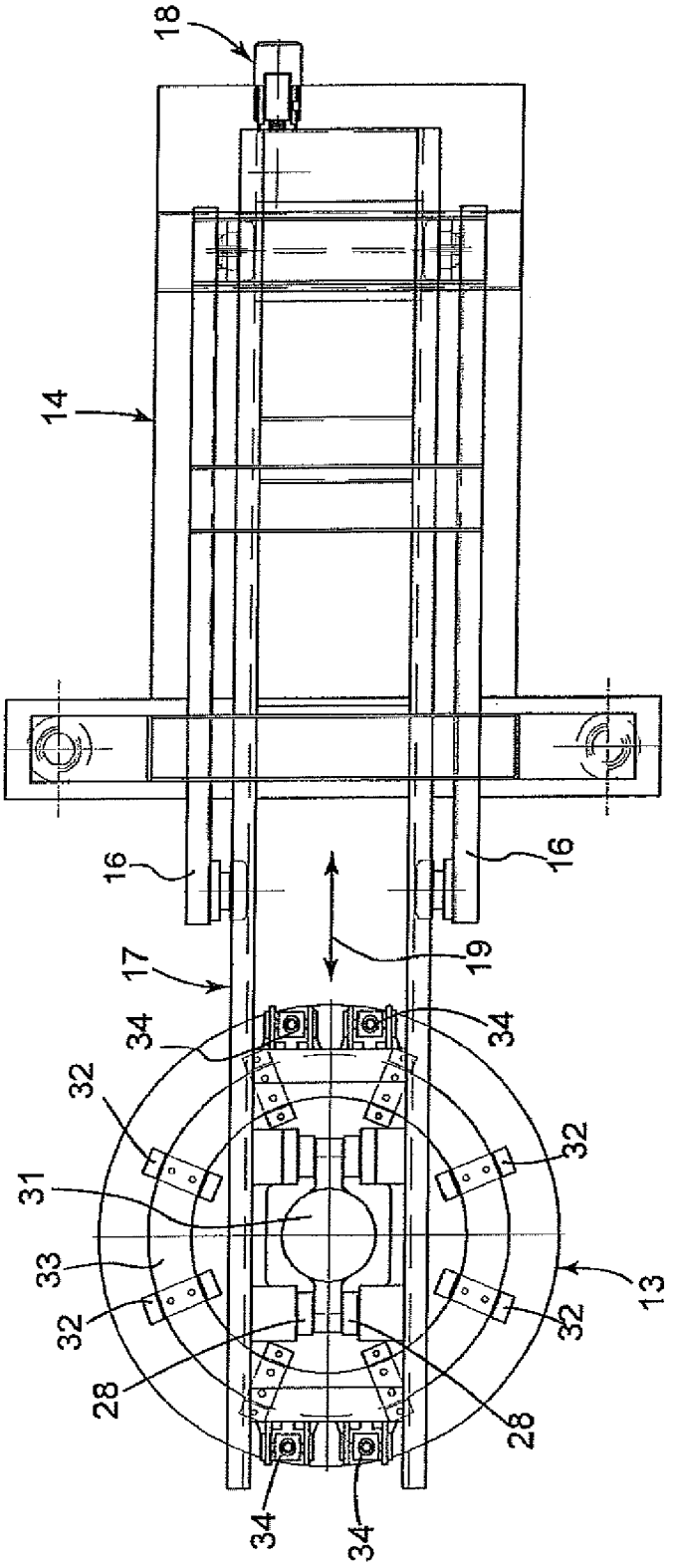


FIG. 3

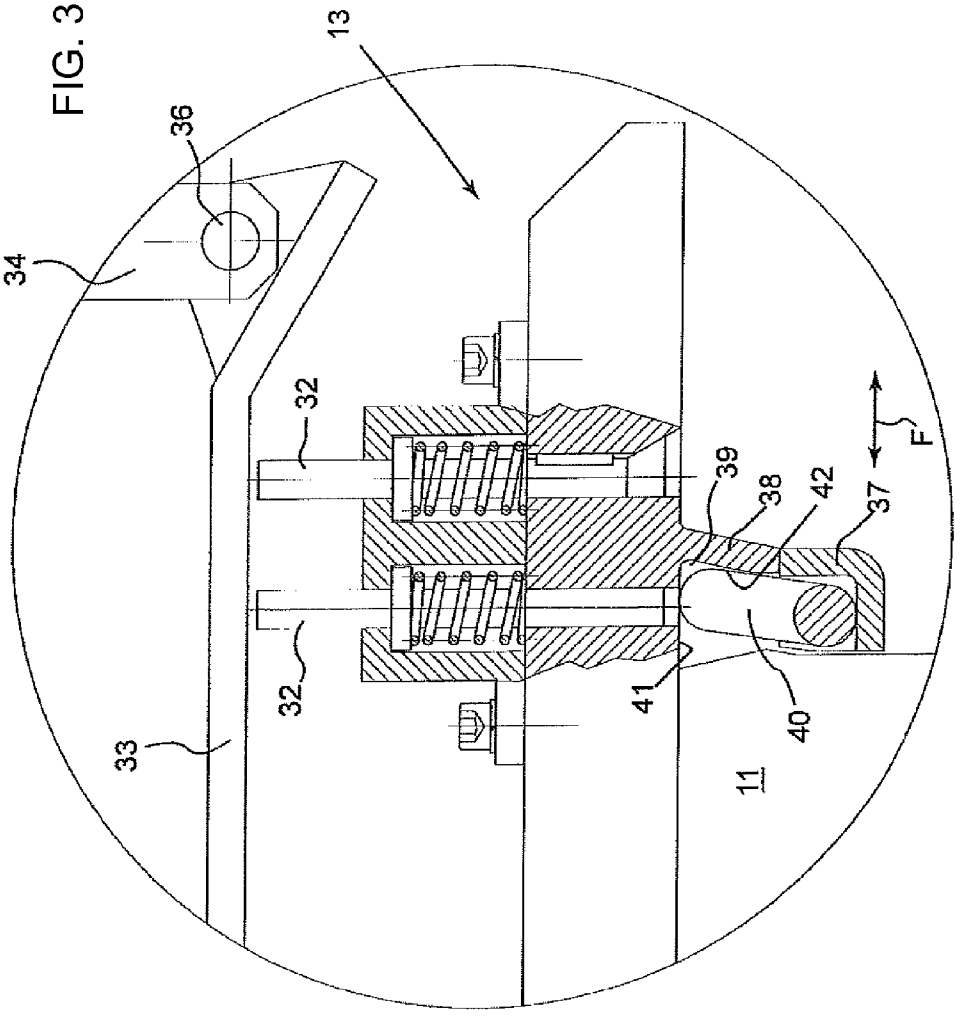
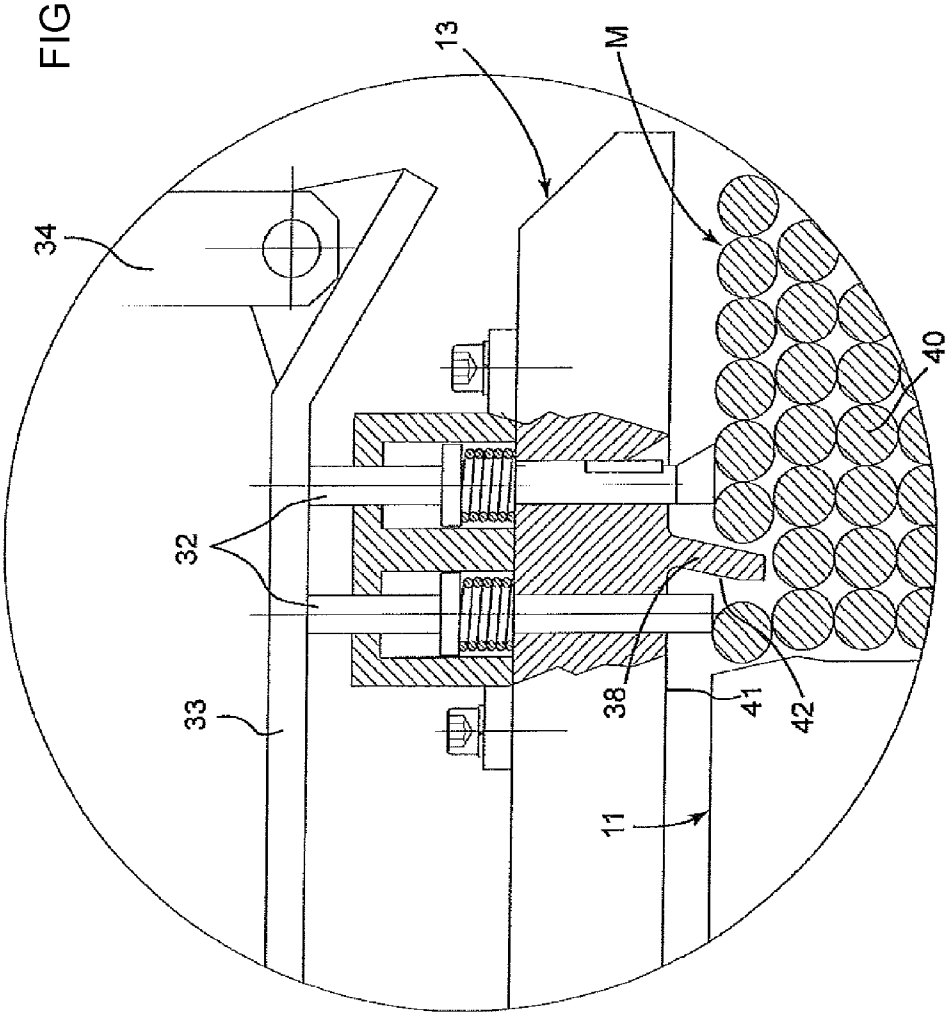


FIG. 4



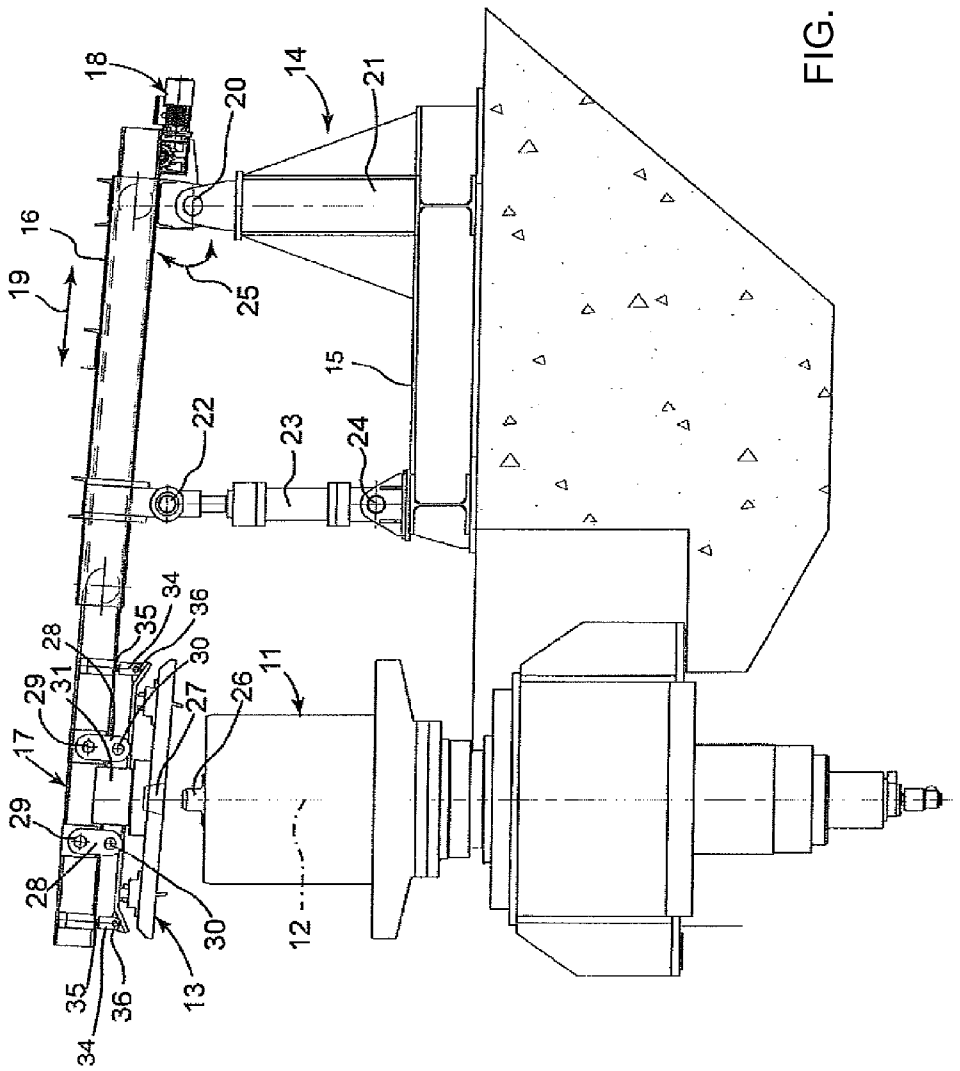
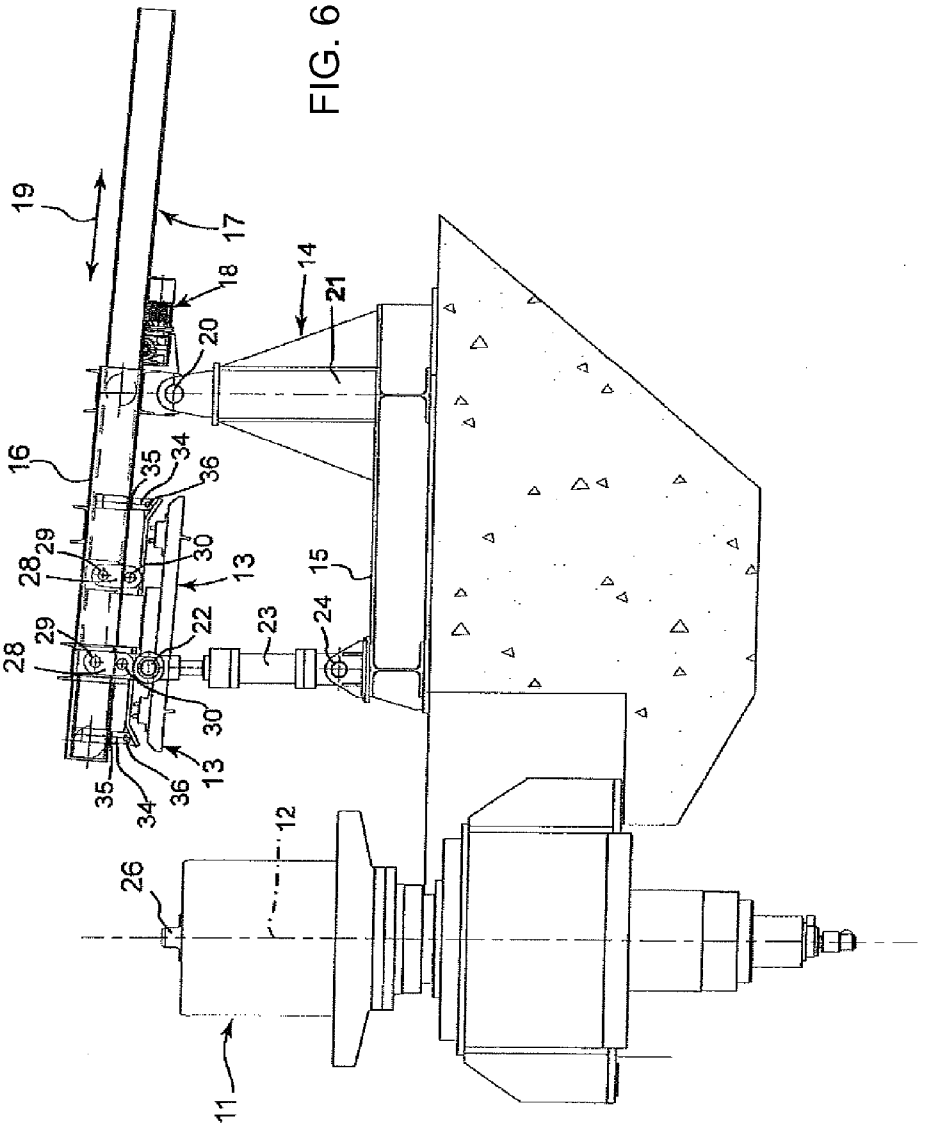

18
20
14
21
16
19
25
15
22
23
24
34
35
36
28
31
29
30
27
26
11
17
29
28
30
12
13
35
36
34

FIG. 5

FIG. 6



MACHINE FOR WINDING A WIRE FROM A ROLLING MILL INTO A COIL

[0001] This invention relates to a machine with an improved wire-engagement system for winding a wire from a rolling mill into a coil.

[0002] As is well known by persons skilled in the art, the wire from a rolling mill has to be wound on commercial-weight coils, that are then individually bound by strapping and placed in storage.

[0003] For this purpose, downstream of the wire stabilization cooling system there are usually two winding machines to which the wire is fed—alternately—using a diverter.

[0004] The two winding machines therefore work alternately, i.e. while the coil is being created on one, on the other a completed coil is removed and taken to the binding station. Machines and plant of this type are for example described and illustrated in patent applications PCT WO2004/108314A, WO2004/108315A, WO2004/108316A, WO2004/108317A, WO2005/084843A, to which reference should be made, by way of example, if any general clarification is required regarding the technical field in question.

[0005] One of the most significant technical issues to be resolved when building these winding machines relates to attaching the head end of the wire coming from the rolling mill to the coil winding spindle.

[0006] According to the prior art, using a threading unit, the head end of the wire is threaded and attached in a seat provided directly on the sleeve of the body of the machine spindle.

[0007] Threading and fixing the head end of the wire directly to the spindle (sleeve) of the machine, as described briefly above, has the major disadvantage of requiring the machine to be stopped for a relatively long time when changing the dimensional characteristics of the product being worked, which involves adapting the seat of the wire head end.

[0008] The same is true when the seat of the wire head end and related fixing systems require maintenance and/or replacement parts.

[0009] The purpose of this invention is to avoid the drawbacks in the prior art summarized above by creating a machine for winding a wire from a rolling mill into a coil, in which the system for threading and attaching the wire head end to the spindle does not cause lengthy stoppages of the machine, in the event of product changes, or the need to carry out maintenance work and/or replace parts.

[0010] This objective, according to the invention, is achieved by making the system for threading and attaching the wire head end structurally independent from the body of the spindle of the machine.

[0011] More specifically, the scope of the invention is achieved by a machine with the features set out in the main claim and the sub-claims attached.

[0012] The structural and functional features of the winding machine according to the invention, and its advantages compared to the prior art, will become even more evident by examining the description below, which refers to the schematic drawings attached, which illustrate a sample practical implementation of the invention. In the drawings:

[0013] FIG. **1** is a longitudinal section showing an example of the machine according to the invention in an operating position winding the wire onto the coil;

[0014] FIG. **2** is a plan view of the machine in FIG. **1**;

[0015] FIG. **3** is an enlarged cross-section detail of the cover module of the machine showing the seat for threading and attaching the wire head end to the module, at the beginning of the coil winding phase;

[0016] FIG. **4** is a detail like FIG. **3**, showing the cover module during the spindle separation phase, once the coil has been wound; and

[0017] FIGS. **5**, **6** are cross-sections like FIG. **1**, showing the sequence for removing the cover module from the spindle to enable the coil formed to be removed from the top.

[0018] With reference, primarily, to FIG. **1** of the drawings, the coil winding machine, according to a possible example of a practical implementation of the invention, is shown in full as **10**, and is structurally formed by a motorized spindle **11** that, in the example shown, rotates around a vertical axis **12**, but that could also rotate around a horizontal axis.

[0019] According to the invention, the spindle **11** is closed at the top by a cover module **13**, which can be moved using a movement structure **14** cooperating with the spindle **11**.

[0020] As clearly shown in FIGS. **1**, **2**, **5** and **6**, the structure **14** is made up of a base **15** bearing a track **16** on which a frame **17** is controlled by a motor **18** to move forwards and backwards in the directions of the arrow **19**.

[0021] The rear of track **16** is connected pivotally at **20** to a pair of lateral supporting pillars **21**, while the front is connected pivotally at **22** to a pair of lateral hydraulic actuators (cylinders) **23**, in turn connected pivotally at **24** to the base **15**.

[0022] In this way, the track **16**-frame **17** combination can be commanded to pivot around 20, in the direction of the arrow **25**, and the frame **17** to move—as mentioned above—in the directions of the arrow **19** (FIGS. **1**, **5**, **6**). As clearly illustrated, the rear of the cover module **13** according to the invention is supported on the frame **17** and is engaged (coupled) by rotation around the spindle **11**, in an easily removable manner, for example by means of a self-centering jaw coupling, which may be of any type known to persons skilled in the art and is not illustrated in detail. In the drawings, said jaw coupling is schematized by a male element **26**, connected axially to the spindle **11**, and a matching female element **27**, arranged centrally on the cover module **13**, which rotates on bearings (not shown) inside a body **31** of said element **27**.

[0023] The cover module **13** is mounted on the free end of the frame **17**, in a self-centering and pivoting manner, using pairs of arms **28**. Said arms **28** are connected pivotally at one end, at **29**, to the frame **17**, and at the opposite end, at **30**, to the body **31** of the bearings of the female element **27** of the joint connecting the cover module **13** to the spindle **11**.

[0024] The top of the cover module **13** is also linked to a pivoting disk **33** supported by the frame **17** by means of diametrically opposed pairs of hydraulic actuators (cylinders) **34**.

[0025] Said actuators **34** are connected pivotally at **35** to the frame **17** and at **36** to the disk **33** and they cooperate with underlying elastic pins **32** of the cover module **13**, acting on the uppermost coils of the wire **40** to prevent any hindrance when removing the cover module **13** from the spindle **11** (FIG. **4**).

[0026] With reference to the details of the FIGS. **3**, **4** of the drawings, in proximity to the top of the spindle **11**, a mobile vane **37** of a threading unit, which in turn cooperates with a corresponding opposing annular collar **38**, cooperates with the spindle in a known manner, extending from beneath the

cover module **13**, such as to define an annular seat **39** for threading and binding the first coil of the wire **40** coming from the rolling mill. The binding or locking of the wire head end **40** in the seat **39** may be effected by any known means, for example by wedging and fixing the wire head end **40** between angled wedge-shaped walls or surfaces **41**, **42**. In the non-limiting example shown, surface **41** is the underside of the cover module **13**, while surface **42** is the internal surface of the annular collar **38** that forms an acute angle with surface **41**.

[0027] Indeed, as shown in FIG. **3**, the wire head end **40** is moved by the mobile vane **37** in the directions of the arrow F, to be threaded and locked by friction between the surfaces **41**, **42** in the seat **30**, after which the vane **37**, in a known manner, leaves the spindle **11**, such as to allow the winding of the coils of the wire **40**, as shown in FIG. **4**.

[0028] The operation used to thread the wire head end **40** using the mobile vane **37** is of a type known to persons skilled in the art and is not described here in greater detail. The operation of the coil winding machine according to the invention is clear from the above description with reference to the drawings, and can be summarized as follows. The coil is created with the machine in the position shown in FIG. **1**, i.e. with the spindle **11** closed at the top by the cover module **13**, and with the vane **37** removed from the sleeve of the spindle **11** (FIG. **4**).

[0029] Once the coil M has been wound (FIG. **4**), the cover module **13** is lifted, as shown in FIGS. **4**, **5** and moved into the position in FIG. **6**, laterally to the spindle **11**.

[0030] Thus, the coil M formed may be removed from the spindle using known systems, after which using operations inverse to the aforementioned operations, the cover module **13** is repositioned on the spindle **11** for a new coil formation cycle.

[0031] By way of a non-limiting example, a system for moving the coil such as the one described in the co-pending patent application filed in Italy by the same applicant and on the same day with the title given below may be used.

[0032] "Machine for winding into a coil a wire from a rolling mill with improved means for locking the wire tail end and containing the coil formed"

[0033] This allows for achievement of the objective set out in the introduction to the description to create a wire coil winding machine in which the times required for maintenance and/or replacing parts, as a result of wear, or a change in the dimensional characteristics of the product being worked, are significantly shortened thanks to the creation of a cover module incorporating the system for binding and threading the wire head end which is independent and can be freely moved away from the sleeve of the body of the spindle of the machine.

[0034] Naturally the section of said wire may be circular (as shown by means of a non-limiting example) or a different shape, such as flat or angled or otherwise.

[0035] The scope of protection of the invention is defined in the following claims.

1-10. (canceled)

11. A machine for winding a wire from a rolling mill into a coil, the machine comprising:

binding means;

an independent cover module; and

a spindle having a seat for threading a head end of the wire with said binding means, said seat and said binding means are linked to said independent cover module connected moveably to said spindle.

12. The machine according to claim **11**, further comprising a movement structure, said independent cover module is supported by said movement structure cooperating with said spindle to move said independent cover module between a coupled operating position for rotation with said spindle for forming coils, and a non-operating position removed from said spindle for removing the coil formed.

13. The machine according to claim **12**, wherein said independent cover module is supported by said movement structure in a rotating and pivoting manner.

14. The machine according to claim **13**,

further comprising a motor;

further comprising a pair of lateral support pillars;

further comprising a pair of lateral hydraulic actuators; and

wherein said movement structure has a base bearing a track and a frame on said track controlled by said motor to move forwards and backwards in directions of an arrow, said track connected pivotally at a rear to said pair of lateral support pillars, while at a front said track is connected pivotally to said pair of lateral hydraulic actuators which are in turn connected pivotally to said base.

15. The machine according to claim **14**, wherein said independent cover module is supported in front of said frame and is engaged by rotation around said spindle, in an easily removable manner.

16. The machine according to claim **15**, further comprising a male male-female joint and said independent cover module is coupled to said spindle using said male male-female joint.

17. The machine according to claim **16**, wherein said male male-female joint has a male element, connected axially to said spindle, and a matching female element having an inside body, and disposed centrally on said independent cover module, which rotates inside said body of said female element.

18. The machine according to claim **17**, further comprising pairs of arms, said independent cover module is mounted on a free end of said frame, in a self-centering and pivoting manner, by means of said pairs of arms, said arms are connected pivotally at one end to said frame, and at an opposite end, to said body of said female element of said male male-female joint connecting said independent cover module to said spindle.

19. The machine according to claim **15**,

wherein said independent cover module has underlying elastic pins;

further comprising diametrically opposed pairs of hydraulic actuators; and

further comprising a pivoting disk, said independent cover module is linked, at a top, to said pivoting disk supported by said frame by said diametrically opposed pairs of hydraulic actuators, said diametrically opposed pairs of hydraulic actuators are connected pivotally to said frame and to said pivoting disk and cooperate with said underlying elastic pins of said independent cover module, acting on top coils of the wire to prevent any hindrance when removing said independent cover module from said spindle.

20. The machine according to claim **11**, further comprising an annular collar disposed underneath said independent cover module and defining said seat being an annular seat for threading and binding a first coil of the wire against said binding means being wedge-shaped surfaces defined by an underside of said independent cover module itself, and by an internal surface of said annular collar.

* * * * *