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(54) PRESSURE DEVICE FOR ROLLING MILL

(57) The invention relates to rolling and can be used in rolling sectional and sheet steels, non-ferrous and non-metal materials.

The technical task of the invention is to update a hydraulic screwdown, increase the travel speed of rolls and consequent precision of rolling operations.

The screwdown mechanism of a stand comprising a hydraulic cylinder located between a stand housing and a chuck of a support roll is comprised of a rod (3) embodied as a permanent magnet, for example the barium oxide one, embraced by an electromagnetic coil (5) connected with a d.c. source (6), at least two coils (9, 10) mounted in the chucks (8) of support rolls coaxially disposed with respect to each other, of which one is connected with the d.c. source (6) and the other is connected with a capacitor bank (11).

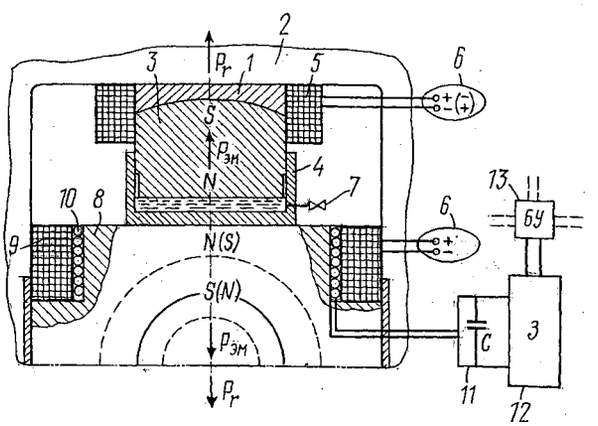

FIG.1

EP 1 398 089 A1

Description

Technical Field

[0001] The invention relates to rolling and can be used in rolling sectional and sheet steels, non-ferrous and non-metal materials.

Background Art

[0002] Known in the art is a stand comprising a housing, rolls, a roll drive means and a screwdown mechanism in the form of a screw (A.N.Tselikov "Machines and Aggregates of Metallurgical Plants", vol. 3, Moscow, METALLURGIYA Publishers, 1981).

[0003] A disadvantage of the screwdown mechanism of a conventional stand is a low speed and accuracy of adjusting a clearance between rolls. For instance, the travel speed of housing screws in the QUARTO stands of hot rolling finishing mill group 2000 is from 0.5 to Imm/s. (P.I. Poloukhin "Rolling", Moscow, METALLURGIYA Publishers, 1982). A low accuracy of rolling is also explained by an appreciable amount of springing of said stand screwdown mechanism elements.

[0004] Also known is a hydraulic screwdown replacing housing screws or working in combination therewith. (Firm SMS-Demag, the Third Congress of Rolling Mill Operators, Lipetsk, 19-22 October, 1999. The report by Pelking "The Latest Technologies in Cold Rolling"; the technological instruction TI 105-PHL-16-96, OAO Severstal, "Rolling of Strips on Five-stand Cold-Rolled Sheet Production Mill 1700", 1996).

[0005] The travel speed of rods of hydraulic screwdowns (HS), according to these sources, is 2.5 mm/s. Accuracy of adjustment is limited by the springing of elements of a hydraulic screwdown and a degree of elastic deformation of oil accounting for about 0.5 to 1%.

[0006] Known is a stand (Patent RF 2138346, published 27.09.99. Bulletin No 27) which is provided with two permanent magnet means located at the periphery of contact, with respect to each other, with like poles, of which one is situated close to a press roll and the other—close to a stand housing, both magnet means being provided with field coils for magnetizing, demagnetizing, reversing the sense of magnetization and neutralizing the magnetic fields and also with hydraulic cylinders for lifting and lowering repulsion magnet means.

[0007] A disadvantage of the conventional screwdown mechanism is the impossibility to use it in updating the existing stands equipped with housing screws with an electromechanical drive means and hydraulic screwdowns which directly impact upon the rolls via chucks.

Contents of the Invention

[0008] An object of the invention is to update a screwdown, increase the travel speed of rolls and consequent precision of rolling.

[0009] Said object is achieved owing to the fact that the screwdown mechanism of a stand comprising a hydraulic cylinder disposed between a stand housing and a chuck of a support roll is made up of a rod implemented from a permanent magnet, such as a barium oxide magnet, encompassed by an electromagnetic coil, at least two coils mounted in the chucks of support (press) rolls, which are disposed installed with respect to each other, and, along with this, one of them is connected with a d.c. source and the other - with a capacitor bank. The electromagnetic coil embracing the rod-magnet provides for regulating a rolling force within a tolerance zone by a thickness of strip, the electromagnetic coil connected with the d.c. source and mounted in the roll chuck provides the attraction or repulsion of the chuck from a hydraulic cylinder piston, and the coil connected with a capacitor bank contributes to delicately adjusting a clearance between rolls (i.e. a thickness of strip) owing to issuing thereinto large quantity narrow current pulses of a corresponding sign.

Brief Description of the Drawing

[0010] A concept of invention is explained in Fig. I showing a general diagram of a screwdown mechanism.

Description of Preferable Alternative

Embodiment of Invention

[0011] The screwdown mechanism comprises a spherical bearing I supported by a frame 2 of a stand, a rod 3 composed of a permanent magnet means (for example, the barium oxide one), a body 4 of a hydraulic cylinder, a coil 5 connected to a d.c. source 6, a hydraulic system 7, a chuck 8, a coil 9 and a coil 10 both mounted in the chuck 8, a capacitor bank 11, a charging device 12, a control unit 13. Said frame 2, bearing I, body 4, chuck 8 are made of non-magnetic materials.

[0012] The screwdown mechanism is operated in the following manner.

[0013] The coarse adjustment of a clearance between rolls is carried out by feeding oil under pressure from a hydraulic system 7 for a rod 3, said coarse adjustment providing, at the time of rolling, a rolling force P_h. With variations of a thickness of strip within thickness tolerance limits its adjustment is performed by supplying into coils 5 and 9, the continuous currents of a corresponding sign, which permits obtaining a rolling force $P=P_h+P_{em}$ or $P=P_h - P_{em}$. With a polarity N-N, a chuck 8 is repulsed from the rod 3 with a force P_{em} and then $P=P_h+P_{em}$, thus reducing a thickness of strip; with a polarity N-S, the chuck 8 is attracted to the rod 3 with a force P_{em} and then $P=P_h-P_{em}$, thus increasing the strip thickness.

[0014] In the event of an abrupt (unexpected) change, during rolling, in a thickness of strip, a discharge current pulse is sent to a coil 10 from a capacitor bank 11 of a corresponding sign and a clearance between rolls is

changed in a stand in a very short time span ($1 \approx 10^5$ A, $\tau \approx 10^{-5}$s).

[0015] It is hence only logical to see that the invention allows one to use on the existing mills, in addition to hydraulic screwdowns (HS), an electromagnetic screwdown to carry out a more accurate rolling of strips.

Claims

1. The screwdown mechanism of a stand comprising a hydraulic cylinder disposed between a stand housing and a chuck of a support roll, **characterized in that** it is made up of a rod implemented from a permanent magnet means, say, the barium oxide one, which is embraced by an electromagnetic coil connected with a d.c. source, at least two coils mounted in the chucks of support rolls coaxially disposed with respect to each other, of which one is connected with the d.c. source and the other is connected with a capacitor bank.

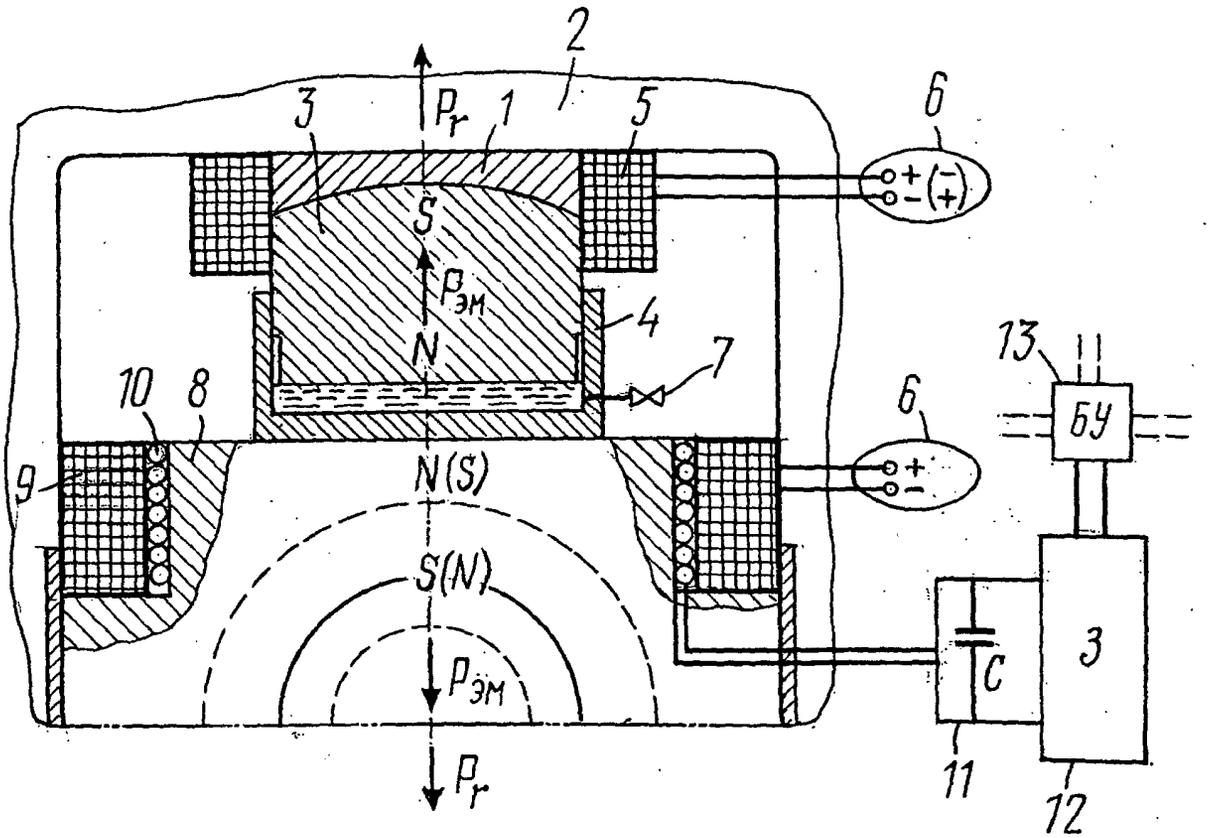

FIG.1

INTERNATIONAL SEARCH REPORT

International application No.
PCT/RU 01/00526

A. CLASSIFICATION OF SUBJECT MATTER
B21B 31/32

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B21B 13/00-13/44, 31/00, 31/02, 31/16, 31/20, 31/32; G01F 1/56

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	RU 2146971 C1 (OTKRYTOE AKTSIONERNOE OBSCHESTVO "SEVERSTAL") 27.03.2000, the abstract, figure 1	1
A	RU 98105467 A (SERPUKHOVSKOE VYSSHEE VOENNOE KOMANDNO-INZHENERNOE UCHILISCHE RAKETNYKH VOISK.) 10.01.2000, the abstract	1
A	US 4748840 A (MANNESMANN AG) Jun. 7, 1988, the abstract	1
A	EP 0444420 A1 (DANIELI & C. OFFICINE MECCANICHE S.P.A.) 04.09.1991, the abstract	1

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier document but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
26 February 2002 (26.02.02)	**28 February 2002 (28.02.02)**
Name and mailing address of the ISA/ **RU**	Authorized officer
Facsimile No.	Telephone No.

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