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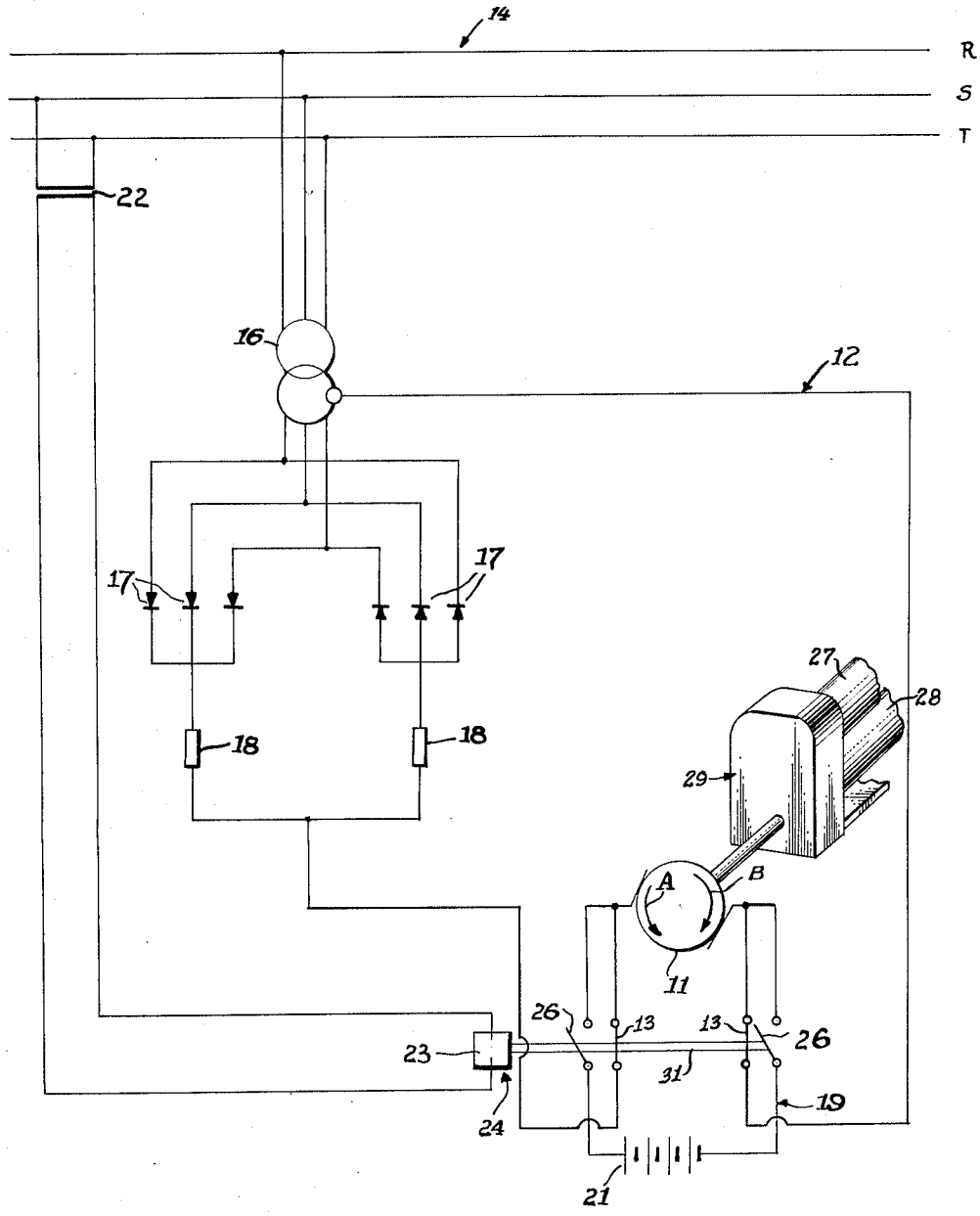
BLOOMING MILL REVERSAL

Filed Aug. 20, 1962



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BLOOMING MILL REVERSAL

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8 Claims. (Cl. 72—19)

The invention relates to the rolling of ingots to blooms, and relates more particularly to methods and blooming mill constructions enabling rapid removal of the partially rolled blooms from the mill upon the occurrence of a stoppage.

In blooming mills for rolling ingots, particularly ingots of aluminum and aluminum alloys, to blooms, hardened steel rolls are now used almost to the exclusion of the previous cast iron rolls, as the latter cannot attain the required surface finish obtained with hardened steel rolls.

Steel rolls, however, are particularly sensitive to thermal stresses.

The rolls of rolling mills usually are driven by electric motors. If there occurs a failure in the power supply during rolling, the ingot between the immobilized rolls will cause each roll to be excessively heated on one side, which may lead to roll fracture unless the ingot is released rapidly. A stoppage of about two to three minutes might be absorbed without damage to the rolls, but any longer stoppage, for instance of five minutes, may easily lead to fracture of the rolls, owing to the excessive heat supplied to the rolls on one side by the bloom. The resulting loss includes not only the expensive rollers but also loss of production.

It is accordingly among the principal objects of the invention to provide means and methods for rapidly removing a bloom from the roll gap upon the occurrence of failure in the power line.

It is another object of the invention to provide for such rapid removal without any need to take apart the rolling mill.

It is a further object of the invention to remove the bloom out of the roll gap with such speed that there will be insufficient time for the heat of the bloom to cause damage to the rolls.

In order to remove the bloom rapidly from the roll gap, it might be proposed to remove the bloom with the aid of tongues or similar instruments; for such removal, however, the roll gap would need to be widened rapidly, for which purpose there may need to be loosened the two-part breaker block. This loosening, on the other hand, is time consuming.

It is accordingly among the further objects of the invention to provide for rapid removal of a bloom from a rolling mill without need to loosen the breaker block.

Further objects and advantages of the invention will be set forth in part in the following specification and in part will be obvious therefrom without being specifically referred to, the same being realized and attained as pointed out in the claims hereof.

With the above and other objects of the invention in view, the invention consists in the novel methods, construction, arrangement and combination of various devices, elements and parts, as set forth in the claims hereof, one embodiment of the same being illustrated in the accompanying drawing and described in the specification.

Generally, the instant invention provides for the switching over of the electrically driven motor from the failing current supply to a storage battery, for driving the rolls in the reverse direction for bloom discharge. As this operation is but brief, the rolls are not subject to overheating.

In the accompanying drawing, the single view is a wiring diagram.

In carrying the invention into effect in one of the embodiments which has been selected for illustration in the accompanying drawing and for description in the specification, and referring to the single view of the drawing, the rolls 27, 28 of a conventional rolling mill 29 are driven in the rolling direction by means of a direct current electric motor 11 rotating in the direction A.

The motor 11 forms part of a first or main electric circuit 12 which includes first or main switch means such as first switches 13, and which connects the motor 11 to a power supply such as a main current supply, for instance a three-phase line 14. The main circuit 12 may include a current transformer 16, rectifying means such as rectifiers 17 and chokes or throttles 18.

A second or auxiliary circuit 19 is provided which is also connected to the motor 11 and includes a direct current storage battery 21. The connection of the auxiliary circuit 19 to the motor 11 is such, however, that, upon completion of the auxiliary circuit 19, the motor 11 will be driven from the battery 21 in the opposite or reverse direction B.

The storage battery 21 is always kept ready, for instance by means of an automatic charging device (not shown) which keeps the battery 21 at full voltage, and on discharge of the battery re-charges the battery 21 to full voltage.

When there is failure in the current supplied by the main circuit 12, for instance due to current failure in the line 14, the main switches 13 will open up automatically, thereby disconnecting the motor 11 from the main current supply, enabling the motor 11 to be connected to the battery 21 to be driven thereby in reverse direction.

A transformer 22 is provided in circuit with an actuator, such as a relay 23. The relay 23 forms part of a second or auxiliary switch means 24 for the anxiliary circuit 19. The auxiliary switch means 24 include the aforesaid relay 23, a relay rod 31 and switches 26.

The main switches 13 are mounted on the same relay rod 31 of the auxiliary switch means 24 as the switches 26; therefore when the switches 26 are being closed by the rod 31, the main switches 13 will at the same time be opened and, conversely, when the rod 31 opens the switches 26 it will simultaneously close the main switches 13, automatically.

When the current in the main circuit 12 fails, the main switches 13 of the main circuit 12, as previously explained, will open automatically. The motor 11 which has up to the failure been rotated in the direction A will come to a standstill, thereby immobilizing the rolls of the rolling mill. The relay 23 furthermore will act automatically in a customary manner and thereby will close the auxiliary switches 26 of the auxiliary circuit 19 and will thus complete the auxiliary circuit 19.

While the switches 13 of the main circuit 12 are normally closed and open only when there is a current failure, the switches 26 of the auxiliary circuit 19, in contrast, are normally open and close only during the aforesaid current failure in the main circuit 12.

The completion of the auxiliary circuit 19, as previously explained, will drive the motor 11 from the battery 21 in the opposite direction B.

It is also possible for the battery 21 to be switched in by manual operation at the control panel of the mill, by suitable well-known manual switching means (not shown).

As an example in one mill with steel rolls having a diameter of 850 mm. and a working length of 2200 mm. and with a driving motor having a cut-off moment of 116 m./t. (corresponding to about 5400 kw.), the maximum current required to turn the rolls back when an ingot is

jammed has been established by tests to be 1300 amperes if the basic speed of the driving motor is 43 r.p.m.; 5 revolutions of the motor are enough to release the ingot even in the most unfavorable case. This current of 1300 amperes is required only on starting up. As the rolls turn back the current required falls by one half.

The line 14 may have 380 volts and 50 cycles.

With such a mill a suitable battery for use in the invention is a nickel cadmium steel battery having a voltage of 96 volts and a capacity of 284 ampere-hours on a one-half hour discharge. This battery can deliver a current surge of 1,600 amperes for 1 minute, the voltage dropping to about 60 volts; thereafter, it can still be discharged for about 12 minutes at 800 amperes and about 80 volts.

I wish it to be understood that I do not desire to be limited to the exact details of construction shown and described, for obvious modifications will occur to a person skilled in the art.

Having thus described the invention, what I claim as new and desire to be secured by Letters Patent, is as follows:

1. In a method of removing a partially rolled bloom from a blooming mill upon the occurrence of a stoppage, said rolls normally being driven in a rolling direction from a main current supply, the steps comprising disconnecting upon such stoppage the rolls from said main supply and reversely driving the rolls from an auxiliary source of energy, thereby discharging the bloom.

2. In a method of removing a partially rolled bloom from the gap between the normally by electric motor driven rolls of a blooming mill upon the occurrence of a failure of the electric current normally feeding said motor from a main current supply, the steps comprising, disconnecting upon such failure the motor from said supply, and reverse driving said rolls electrically from said motor by reverse feeding said motor from an auxiliary source, thereby discharging said bloom.

3. In a method of removing a partially rolled bloom from a blooming mill, said rolls being in driven connection with an electric motor connectable in a first electric circuit to a main current supply for driving said rolls for bloom rolling, said motor alternatively being connectable in a second electric circuit to an auxiliary source of energy for reverse driving said rolls, the steps comprising normally connecting said electric motor to said main current supply thereby to drive said rolls for bloom rolling and, upon the occurrence of a current failure in said first circuit, automatically disconnecting said motor from said first electric circuit and connecting the motor instead in said second electric circuit to said auxiliary source thereby reverse driving the rolls for bloom discharge.

4. In a blooming mill, the combination of a pair of rolls, an electric motor operable for rotating said rolls,

a main electric circuit operable for removably connecting said motor to a main electric current supply to drive the motor in one direction for driving said rolls in the rolling direction for bloom rolling, an auxiliary source of energy, an auxiliary circuit comprising said auxiliary source, and switch means operable upon the occurrence of a failure in said main circuit for interconnecting said motor in said auxiliary circuit thereby completing said auxiliary circuit, said auxiliary circuit being so arranged that upon its completion the motor will be oppositely driven to drive the rolls in the reverse direction for bloom removal.

5. In a blooming mill, the combination of a pair of rolls, an electric motor operable for rotating said rolls, a main electric circuit comprising first switch means operable for removably connecting said motor to a main electric current supply for driving said rolls for bloom rolling, an auxiliary source of energy, an auxiliary circuit comprising said auxiliary source and second switch means operable automatically upon the occurrence of a failure in said main circuit for connecting said motor in said auxiliary circuit thereby completing said auxiliary circuit, said auxiliary circuit being so arranged that upon its completion the motor will drive the rolls for bloom removal.

6. In a blooming mill, as claimed in claim 5, said first switch means being so arranged that they are self-opened upon the failure of current in said main circuit, said auxiliary source being independent from said main current supply, said second switch means automatically operating and completing the auxiliary circuit upon the failure of the current in the main circuit.

7. In a blooming mill, as claimed in claim 5, said motor being a direct current motor, said main circuit including rectifying means for feeding rectified current from said main current supply to said electric motor, and said auxiliary supply being a direct current storage battery.

8. The combination of a rolling mill, a direct current motor for driving the rolls, a storage battery, a switch and means responsive to failure of the current supply to the motor for actuating the switch to connect the storage battery to the motor to drive it in the reverse direction.

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WILLIAM J. STEPHENSON, *Primary Examiner*

CHARLES W. LANHAM, *Examiner.*

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,217,520 November 16, 1965

Adrian Wilden

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

In the grant, lines 2 and 12, and in the heading to the printed specification, line 4, for "Schveizerische Aluminium A.G.", each occurrence, read -- Schweizerische Aluminium A.G. --.

Signed and sealed this 19th day of July 1966.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents