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VERTICAL EDGING MILL.

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Description

This invention relates to edging mills which have a pair of rolls arranged with their longitudinal axes vertical and provision for adjusting the gap between the rolls.

When rolling metal plate, it is usual to include an edging mill provided with vertical rolls to contact the lateral edges of the plate. It is desirable that the plate should be rolled with accurate width dimensions and, consequently, it is desirable that the gap between these vertical rolls should be adjustable in order to provide width control of the plate. Furthermore, it is desirable that the position of the rolls should be adjustable during the time that the edging mill is rolling the plate so as to provide automatic width control of the plate.

The vertical rolls of an edging mill can be rotated from drive motors positioned above or below the rolls but in each case this is undesirable and it is preferred for each roll to be driven through a drive mechanism from a horizontal drive shaft. In this way the drive motor which transmits the torque to the shaft can be positioned to one side of the mill and this is convenient for a number of reasons, one of which being that the motor is not subjected to scale and other debris which falls from the slabs being rolled. With this arrangement the connection between the drive motor and the horizontal shaft is by way of a splined portion of the shaft and this allows the shaft to have limited horizontal displacement relative to the motor when the rolls are displaced towards and away from each other. This drive for an edging mill is satisfactory provided that the roll gap adjustment is effected when the mill is not under load. If, however, it is desired to modulate the roll gap during rolling to provide automatic width control, then excessive wear of the splined portion of the drive shaft occurs and repair of the splined portion is often required.

According to the present invention, an edging mill comprises a pair of vertical movable housings; a pair of rolls arranged with their longitudinal axes vertical and rotatably mounted in respective cassettes; said cassettes being supported from respective movable housings and located inwardly of the housings; means for displacing each movable housing and the cassette associated with it in the horizontal direction towards or away from the other housing; means for displacing each cassette relative to its housing in the horizontal direction towards and away from the other cassette; and each housing having a drive mechanism the output of which is in driving relation with the lower end of the roll in the associated cassette and the input of which is in driving relation with a horizontal drive shaft; and each drive mechanism including a universal joint which permits drive to be transmitted from the shaft to the roll even when the cassette is offset by a limited extent horizontally relative to its

housing.

The provision of the universal joint permits the drive to be transmitted from the shaft to the roll even when the roll in the associated cassette has been displaced horizontally with respect to the housing. This arrangement enables each vertical roll to be displaced horizontally towards and away from the other roll by a limited extent relative to the housing without requiring any horizontal axial movement of the drive shaft.

In order that the invention may be more readily understood, it will now be described, by way of example only, with reference to the accompanying drawing which is a side elevation, partly in section, of one side of an edging mill in accordance with the present invention.

Referring to the figure, the support for one of the vertical rolls of an edging mill is shown in detail and the support for the other roll which is not shown is similar.

A roll (1) is arranged with its longitudinal axis vertical and it is rotatably supported at its upper and lower ends in a "C-shaped cassette" (3). This cassette and the roll are supported in a vertically arranged housing (5). The vertical housing (5) has a pair of wheels which are mounted on cross beams extending between external fixed housings (11). The cassette is connected through a coupling (12) to a vertically extending fluid operable piston-cylinder device (13) mounted on the housing (5).

A pair of screw mechanisms (15) are mounted horizontally on the outer housing (11) and the screws act against cylinders (17) mounted on the housing (5), each cylinder (17) forms part of a hydraulic piston-cylinder device with the piston extending through an opening in the housing (5) and bearing against the adjacent face of the cassette (3). A pull-back cylinder (19) mounted on the external housing (11) has a piston which extends through the housing into engagement with the cassette (3).

The drive for the vertical roll (1) comprises a drive pinion (23) which is internally splined and which is mounted on a splined portion (24) of a horizontal drive shaft (25). The drive pinion is driven by an electric motor (not shown). The shaft (25) is connected through a coupling (26) to the input shaft (27) of a drive mechanism for transmitting drive from the shaft (25) to the roll (1). The horizontal shaft (27) is rotatably supported in bearings in the housing (5) and is connected through 90° gearing (28) to a pinion (29) meshing with a further pinion (30).

The pinions (29) and (30) are arranged with their axes of rotation vertical. The pinion (30) has a recess (31) in its upper surface.

The output of the drive mechanism is a stub shaft (33) which projects into the lower end of the roll (1). The stub shaft is splined at its upper end and this meshes with a splined opening (34) in the lower end

of the roll. The splines permit the roll to be moved vertically with respect to the stub shaft.

The lower end of the stub shaft (33) is connected to the upper end of a double-flanged coupling (35) which includes a universal joint. The lower end of this coupling includes a vertical stub shaft (32) which is mounted at the base of the recess (31) on the axis of rotation of the pinion.

In use, the vertical housing (5) and the cassette (3), and hence the roll (1), can be displaced horizontally in the direction towards and away from the other vertical roll by means of the screw mechanisms (15) acting against the vertical housing. The housing is displaced on its wheels. This displacement of the housing causes the drive shaft (25) to be displaced horizontally and the splined portion (24) of the shaft moves relative to the fixed pinion (23). Adjustment of the roll gap by means of the screws (15) is considered to be rather slow operating and rather coarse and, consequently, fine adjustment of the roll and the cassette in the horizontal direction towards and away from the other roll is brought about by energising the hydraulic devices (17) causing the cassette and the roll to be displaced horizontally with respect to the vertical housing (5). The coupling (12) permits this movement to occur and, as the housing (5) is not displaced, the shaft (25) is not displaced and the lower end of the roll is now no longer in alignment with the stub shaft (32). The provision of the coupling (35) enables this limited misalignment to occur and drive from the motor through the shaft (25) to the roll still takes place.

The coupling (35) including the universal joint may be of the double-flanged design obtainable from Gelenk Wellenbau GmbH, Essen, West Germany or VOITH.

The construction of the mill of the present invention enables accurate automatic width control of rolled plate to be obtained and, at the same time, cuts down on the wear on the splined portion (24) of the drive shaft (25).

Claims

1. An edging mill comprising a pair of vertical movable housings (5);
 - a pair of rolls (1) arranged with their longitudinal axes vertical and rotatably mounted in respective cassettes (3);
 - said cassettes (3) being supported from respective movable housings (5) and located inwardly of the housings (5);
 - means (15) for displacing each movable housing (5) and the cassette (3) associated with it in the horizontal direction towards or away from the other housing (5);
 - means (17) for displacing each cassette

(3) relative to its housing (5) in the horizontal direction towards and away from the other cassette (3); and

each housing (5) having a drive mechanism the output of which is in driving relation with the lower end of the roll (1) in the associated cassette (3) and the input (27) of which is in driving relation with a horizontal drive shaft (25); and

each drive mechanism including a universal joint (35) which permits drive to be transmitted from the shaft (25) to the roll (1) even when the cassette (3) is offset by a limited extend horizontally relative to its housing (5).

2. An edging mill as claimed in claim 1, in which the output of each drive mechanism includes a first stub axle (33) in driving engagement with the lower end of the roll (1), and each mechanism includes a second stub axle (32) rotatable with its axis vertical, said universal joint (35) being connected between the two stub axles (32,33) and 90° gearing (28) connecting the second stub axle (32) to the input (27) of the drive mechanism.
3. An edging mill as claimed in claim 2, in which the second stub axle (32) is mounted on the vertical axis of a pinion (30) driven from said 90°C gearing (28).
4. An edging mill as claimed in claim 3, wherein the pinion (30) has an upwardly facing central recess (31) and the second stub axle (32) extends upwardly from the base of the recess (31).
5. An edging mill as claimed in any preceding claim, wherein the horizontal drive shaft (25) is arranged so that it can be displaced in the direction of its length whilst it is rotated.
6. An edging mill as claimed in claim 5, wherein a portion (24) of the horizontal drive shaft (25) is externally splined along its length and an internally splined pinion (23) is mounted on the splined portion (24) of the drive shaft (25).
7. An edging mill as claimed in any preceding claim wherein the output of each drive mechanism includes a first stub axle (33) which is externally splined and projects into a correspondingly internally splined opening (34) at the adjacent end of the roll (1) so as to permit the roll to be raised and lowered with respect to the first stub axle (33) whilst in driving relation therewith.

Patentansprüche

1. Vertikalwalzstraße mit zwei vertikalen bewegba-

ren Gehäusen (5);
zwei mit ihren Längsachsen vertikal angeordneten und in zugehörigen Kassetten (3) drehbar befestigten Walzen (1);
wobei die Kassetten (3) von den entsprechenden bewegbaren Gehäusen (5) gestützt und innerhalb der Gehäuse (5) angeordnet sind;
einer Einrichtung (15) zum Verschieben jedes bewegbaren Gehäuses (5) und der diesem zugehörigen Kassette (3) in Horizontalrichtung zum anderen Gehäuse (5) hin oder von diesem weg;
einer Einrichtung (17) zum Verschieben jeder Kassette (3) gegenüber ihrem Gehäuse (5) in horizontaler Richtung zur anderen Kassette (3) hin und von dieser weg; und
wobei jedes Gehäuse (5) einen Antriebsmechanismus besitzt, dessen Ausgangsseite sich in Antriebsbeziehung mit dem unteren Ende der Walze (1) in der zugehörigen Kassette (3) und dessen Eingangsseite (27) sich in Antriebsbeziehung mit einer horizontalen Antriebswelle (25) befindet; und
wobei jeder Antriebsmechanismus ein Universalgelenk (35) aufweist, das einen von der Welle (25) auf die Walze (1) zu übertragenden Antrieb ermöglicht, sogar wenn die Kassette (3) um ein bestimmtes Maß horizontal gegenüber ihrem Gehäuse (5) versetzt ist.

2. Vertikalwalzstraße nach Anspruch 1, bei welcher die Ausgangsseite jedes Antriebsmechanismus eine erste Stummelwelle (33) in Antriebseingriff mit dem unteren Ende der Walze (1) umfaßt und jeder Mechanismus eine um ihre vertikal verlaufende Achse drehbare zweite Stummelwelle (32) aufweist, wobei das Universalgelenk (35) zwischen den beiden Stummelachsen (32, 33) geschaltet ist und ein 90°-Getriebe (28) die zweite Stummelachse (32) an die Eingangsseite (27) des Antriebsmechanismus koppelt.
3. Vertikalwalzstraße nach Anspruch 2, bei welcher die zweite Stummelachse (32) an der vertikalen Achse eines vom 90°-Getriebe (28) getriebenen Ritzels (30) befestigt ist.
4. Vertikalwalzstraße nach Anspruch 3, bei welcher das Ritzel (30) eine nach oben gerichtete zentrale Aussparung (31) besitzt und die zweite Stummelwelle (32) sich vom Boden der Aussparung (31) nach oben erstreckt.
5. Vertikalwalzstraße nach einem vorangegangenen Anspruch, bei welcher die horizontale Antriebswelle (25) so angeordnet ist, daß sie in Richtung ihrer Länge während ihrer Rotation verschoben werden kann.

6. Vertikalwalzstraße nach Anspruch 5, bei welchem ein Abschnitt (24) der horizontalen Antriebswelle (25) an seiner Außenfläche entlang seiner Länge kerbverzahnt ist und ein an seiner Innenfläche kerbverzahntes Ritzel (23) auf dem kerbverzahnten Abschnitt (24) der Antriebswelle (25) befestigt ist.

7. Vertikalwalzstraße nach einem vorangegangenen Anspruch, bei welcher der Ausgang jedes Antriebsmechanismus eine erste Stummelachse (33) aufweist, die an ihrer Außenfläche kerbverzahnt ist und in eine entsprechend an ihrer Innenfläche kerbverzahnte Öffnung (34) am benachbarten Ende der Walze (1) hineinragt, damit die Walze gegenüber der ersten Stummelachse (33) angehoben und abgesenkt werden kann, während sie sich in Antriebsbeziehung miteinander befinden.

Revendications

1. Une cage refouleuse comprenant une paire de colonnes mobiles verticales (5);
une paire de cylindres (1) agencés de manière que leurs axes longitudinaux soient verticaux et montés à rotation dans des caissons respectifs (3);
lesdits caissons (3) étant supportés à partir des colonnes mobiles respectives (5) et tournés vers l'intérieur des colonnes (5);
des moyens (15) pour déplacer chaque colonne mobile (5) et le caisson associé (3) dans la direction horizontale pour le rapprocher ou l'éloigner de l'autre colonne (5);
des moyens (17) pour déplacer chaque caisson (3) par rapport à sa colonne (5), dans la direction horizontale, pour le rapprocher ou l'éloigner de l'autre caisson (3); et
chaque colonne (5) comprenant un mécanisme de commande dont la sortie est reliée mécaniquement à l'extrémité inférieure du cylindre (1), dans le caisson associé (3) et dont l'entrée (27) est reliée mécaniquement à un arbre d'entraînement horizontal (25); et
chaque mécanisme de commande comprenant un joint à cardan (35) permettant de transmettre la force motrice de l'arbre (25) vers le cylindre (1), même lorsque le caisson (3) est décalé horizontalement de façon limitée par rapport à sa colonne (5).
2. Une cage refouleuse selon la revendication 1, dans laquelle la sortie de chaque mécanisme de commande comprend un premier moyeu (33) relié mécaniquement à l'extrémité inférieure du cylindre (1), et chaque mécanisme comprend un

deuxième moyeu (32), monté à rotation dans l'axe vertical, ledit joint à cardan (35) étant relié entre les deux moyeux (32, 33) et un renvoi à 90° (28) reliant le deuxième moyeu (32) à l'entrée (27) du mécanisme de commande. 5

3. Une cage refouleuse selon la revendication 2, dans laquelle le deuxième moyeu (32) est monté dans l'axe vertical d'un pignon (30) entraîné à partir dudit renvoi à 90° (28). 10

4. Une cage refouleuse selon la revendication 3, dans laquelle le pignon (30) comprend une cavité centrale (31) tournée vers le haut et le deuxième moyeu (32) est dirigé vers le haut à partir de la base de la cavité (31). 15

5. Une cage refouleuse selon l'une quelconque des précédentes revendications, dans laquelle l'arbre d'entraînement horizontal (25) est agencé de manière à pouvoir être déplacé dans la direction de sa longueur pendant sa rotation. 20

6. Une cage refouleuse selon la revendication 5, dans laquelle une partie (24) de l'arbre d'entraînement horizontal (25) est cannelée extérieurement sur sa longueur et un pignon (23) cannelé intérieurement est monté sur la partie cannelée (24) de l'arbre d'entraînement (25). 25 30

7. Une cage refouleuse selon l'une quelconque des revendications précédentes, dans laquelle la sortie de chaque mécanisme de commande comprend un premier moyeu (33) qui est cannelé extérieurement et fait saillie à l'intérieur d'une ouverture (34) cannelée intérieurement en correspondance à l'extrémité adjacente du cylindre (1) de manière à permettre au cylindre d'être soulevé et abaissé par rapport au premier moyeu (33) tout en restant en relation d'entraînement avec celui-ci. 35 40

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