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PROCESS FOR HOT ROLLING VERY LONG THIN STRIPS

Serial No. 470,621

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Fig. 1

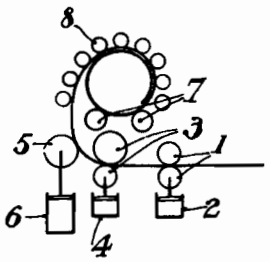


Fig. 2

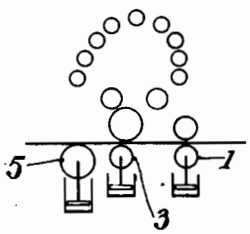


Fig. 3

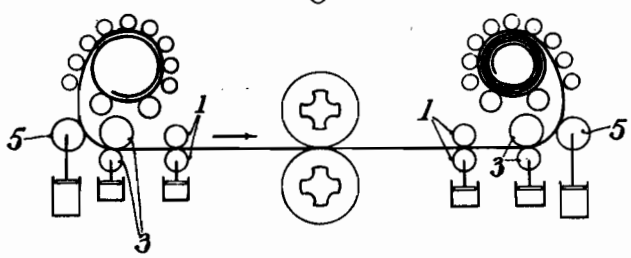
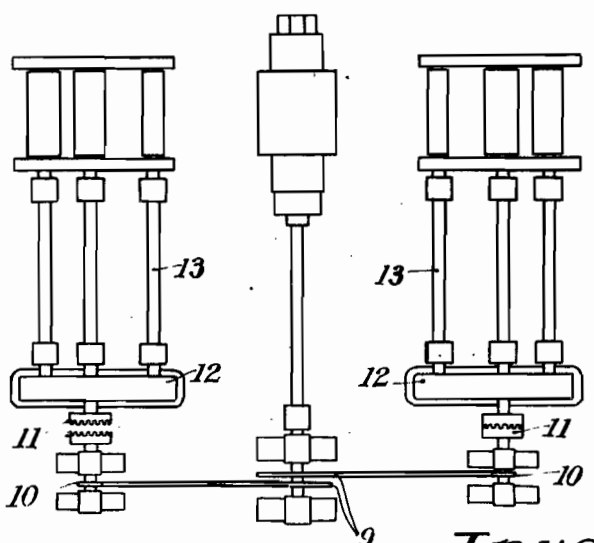


Fig. 4



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ALIEN PROPERTY CUSTODIAN

PROCESS FOR HOT ROLLING VERY LONG THIN STRIPS

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When hot rolling very long thin strips the inconvenience is encountered consisting in the rapid cooling of the metal in course of rolling, cooling which is due, in particular, to the intense radiation of the surface of the strip which, for a given weight of the blank, increases very rapidly when the thickness diminishes.

According to a known process the cooling of the strip in course of rolling is slackened by storing the latter in furnaces placed on either side of the reversible rolling-mill serving for rolling the strips, instead of allowing it to develop freely on the lines of cylinders or on the tiles of the workshop. The strip is wound according to this process on drums placed in the furnaces in question; said drums are themselves heated by the furnace and are actuated by an electric control which effects the required synchronism between the drums and the rolling-mill.

The present invention has for object a process according to which the strip is wound without the aid of drums during rolling, by means of bending-winding machines, preferably placed on either side of the housing of the rolling-mill and in the immediate vicinity thereof, the strip winding up in one of the machines in question while it unwinds from the other. The cooling of the strip is therefore slackened, according to this process, solely by the effect of the reduction of the radiating surface of the blank in course of rolling.

The control for the bending-winding machines is preferably devised in such a manner that the machine which winds the strip has a peripheral speed slightly greater than the speed of the strip issuing from the rolling-mill; said machine thus exerts a pull on the rolled strip, whereas the machine which unwinds the strip has a peripheral speed equal to the speed of the strip when it enters the rolling-mill and exerts on the latter a braking stress.

This result is very simply obtained, for instance by actuating the machine which winds the strip, from the control of the rolling-mill itself by means of gears or through the medium of a chain transmission imparting the required ratio between the number of revolutions of the cylinders of the rolling-mill and of the cylinders of the bending-winding machine, and by allowing the machine unwinding the strip to be set in action by the stress exerted on its cylinders by the strip itself.

Of course, the controls are so devised that the machines can alternately act as winding and unwinding machines.

In the accompanying drawing, by way of demonstration, Fig. 1 diagrammatically illustrates one of the possible forms of construction of the bending-winding machines in question, it being understood that other embodiments are possible without departing from the principle of the present invention as long as the strip is wound without the coil being in contact with an inner drum, which is the cause of cooling.

The following description applies to the use of a reversible rolling-mill train, but it is also to be understood that the use of bending-winding machines for any other type of rolling-mill train, for instance a three-high Lauth mill, is also included in the scope of the present invention.

The bending-winding machine comprises a pair of gripping cylinders 1, the lower cylinder being capable of rising and lowering under the action of a compressed air piston 2. It is provided with a set of three bending cylinders 3, 3 and 5, two of which, the lower cylinder 3 and cylinder 5 can move up and down under the action of compressed air pistons 4 and 6. The cylinders 7 are intended to support the coil which forms within the cover 8. All the cylinders 1, 3, 5 and 7 are controlled.

The cylinders which can move up and down under the action of compressed air pistons can retract downwardly as indicated in Fig. 2 so as to allow the passage of rectilinear bars between them and the two upper cylinders of the pairs 1 and 3.

Fig. 3 diagrammatically shows in elevation the assemblage of the bending-winding machines on either side of the rolling-mill housing.

Fig. 4 is a plan view of the same plant.

At 9 can be seen two toothed wheels actuating by chain two pinions 10 respectively placed on shafts controlling the bending-winding machines. 11 illustrates clutches which can drive the bending-winding machines in one direction and in the other, or uncouple them from the shafts actuated by the pinions 10. At 12 can be seen the casings containing the gears which control, through the medium of coupling-rods 13, the cylinders of the bending-winding machines.

The rolling of a strip is effected in the following manner: the blank obtained for instance from a preparing housing and which has been rolled on said housing to a suitable thickness, for instance 50 m/m, is led to the housing equipped with two bending-winding machines diagrammatically illustrated in Fig. 3. The movable cylinders of the bending-winding machines being withdrawn into their lower position, as they are illustrated in Fig. 2, a few rolling passes are first

of all effected without winding, by allowing the strip, which finds its passage between the cylinders of the bending-winding machines, to spread on the cylinders reserved for the rolling-mill housing. As soon as the thickness has reached a certain value for the strip to be wound, for instance 20 m/m, the cylinders 1, 3 and 5 of the bending-winding machine located on the opposite side to that of the strip to be rolled, are lifted, said machine is thrown in gear by the corresponding clutch 11, then the strip is introduced in the rolling-mill. Said strip passes between the gripping cylinders 1, then is bent by the set of bending cylinders 3, 3 and 5 and winds in a coil in the space comprised between the cover 8 and the supporting cylinders 7. As soon as the rear end of the strip issues from the cylinders of the train, the clutch 11 corresponding to the bending-winding machine containing the strip, is uncoupled, and this in such a manner that the end of the strip remains between the gripping cylinders 1. The direction of rotation of the rolling-mill is then reversed. The cylinders 1, 3 and 5 of the bending-winding machine which is actually empty are lifted, the clutch 11 corresponding to said machine is actuated, then, by means of the clutch 11 corresponding to the bending-winding machine which contains the strip at the moment, the latter is engaged in the cylinders of the rolling-mill housing. As soon as the rolling pass has begun, the machine from which the strip unwinds is uncoupled, said machine remaining actuated by the pull exerted by the strip itself during all the remainder of the unwinding period, then the rolling is continued by allowing the strip to wind up into one of the bending-winding machines whilst it unwinds from the other. The cylinders 1, 3 and 5 of both machines remain in the upper position. Use is made every time of the clutches 11 on the machine which is to unwind the strip to send the end of the strip into the rolling-mill, then for releasing said machine from the control, and said clutches are used on the machine which is to wind up the strip for actuating said machine during the winding up, then for uncoupling it as soon as the strip leaves the cylinders of the rolling-mill.

The last pass being effected, the strip is allowed to completely wind up in the corresponding bending-winding machine. After having lifted the cover 8 the coil obtained can then be evacuated, then the cover being lowered, the plant is ready to roll another strip.

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