United States Patent

[11] **3,544,095**

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[33] **Austria**
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[54] **APPARATUS FOR SCARFING SLABS AND INGOTS**
6 Claims, 5 Drawing Figs.

[52] **U.S. Cl.** **266/23,** 148/9.5
[51] **Int. Cl.** **B23k 7/06,** B23k 7/10
[50] **Field of Search** ..... 266/23(H); 148/9.5; 248/327

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ABSTRACT: Apparatus for scarfing slabs and ingots enabling an automatic adjustment of a series of burners to any slope or warping of the surface to be scarfed. The apparatus comprises an articulated frame formed by two side beams suspended with extensible hydraulic jacks on a support and a transverse beam connecting said side beams and holding a series of parallel burners of adjustable inclination. A crossbeam, also jack-mounted on said support, extends between said side beams. A rod linkage on either side of the crossbeam, comprising a lever contacting with one end an adjustable stop on the crossbeam and connected with its other end to a slab or ingot surface feeler resiliently mounted on the pertinent side beam, actuates switch and valve means for controlling the pressure applied to the respective side-beam suspending jack. Thus, an independent feeler-controlled movement of the side beams as well as a communication of any crossbeam motion to the side beams is achieved.

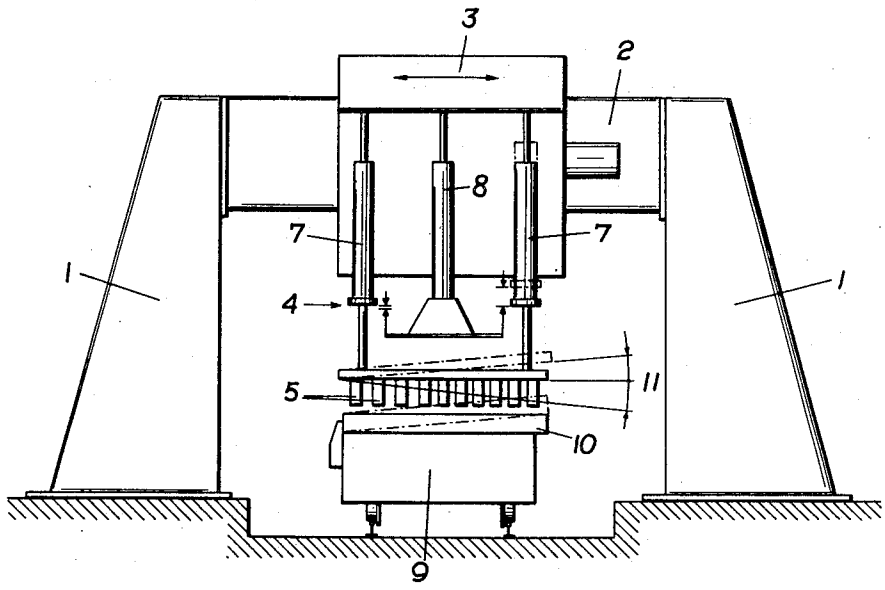

FIG. 1

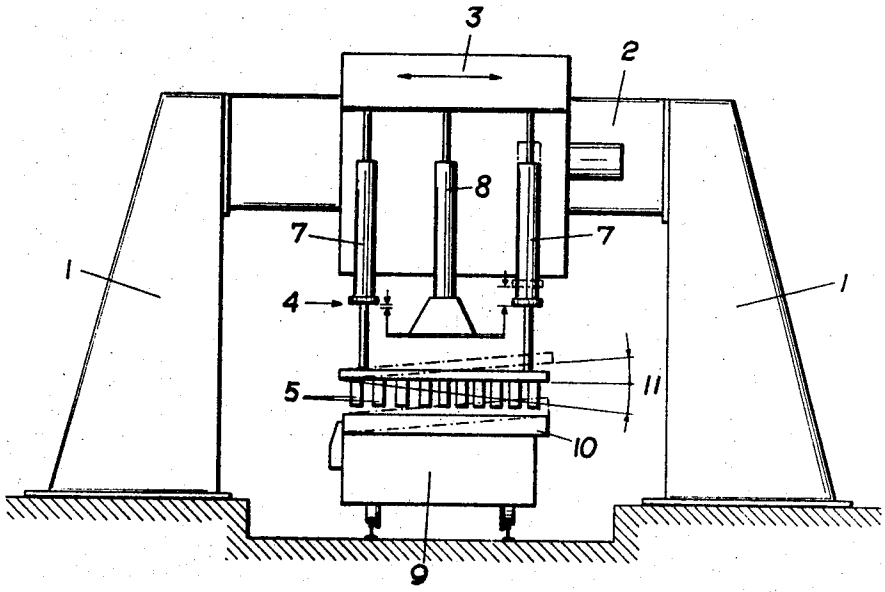

FIG. 2

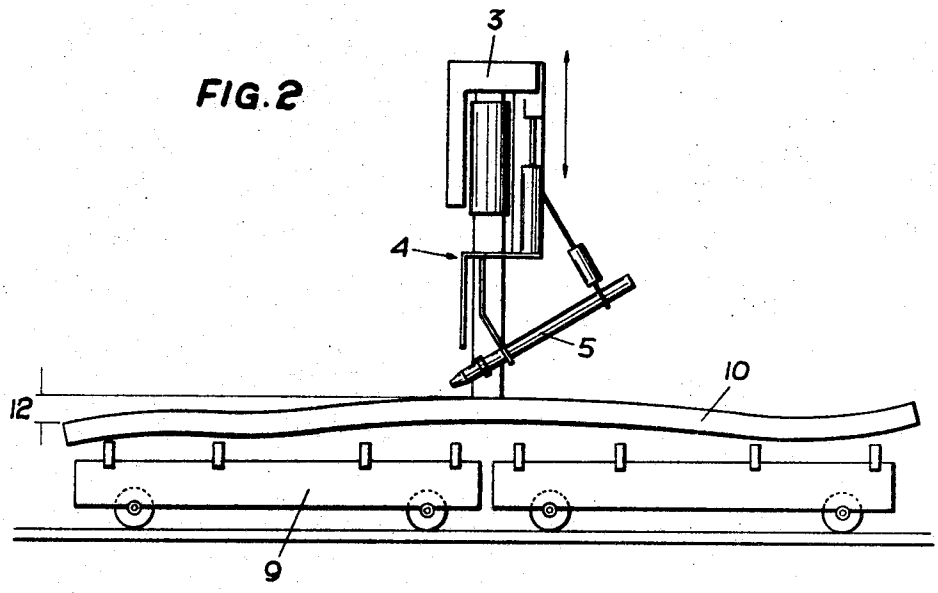

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FIG. 3

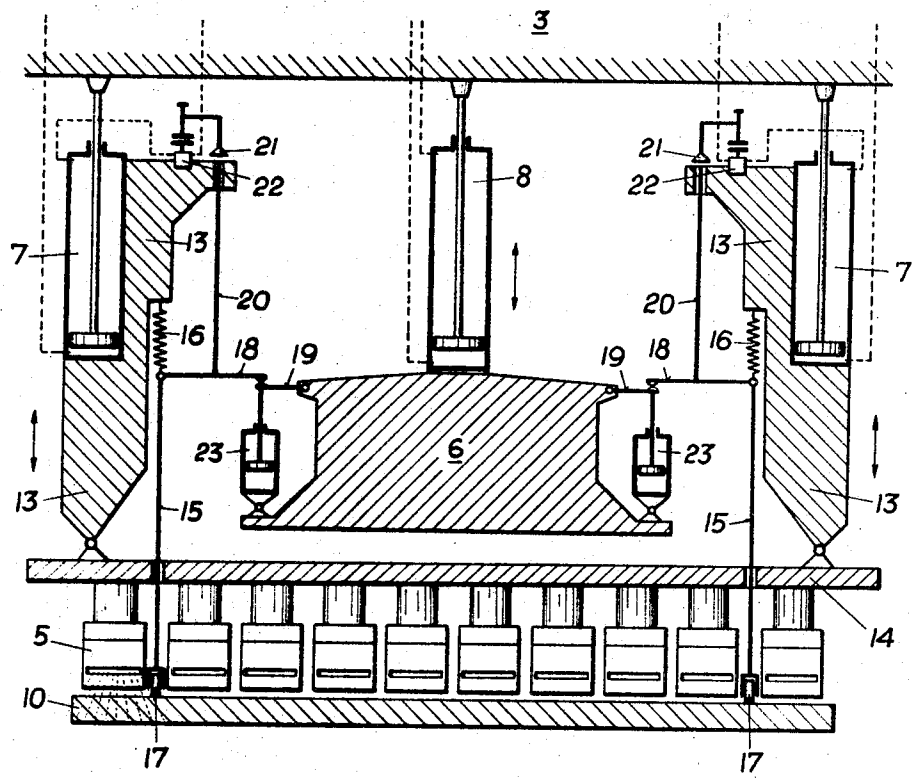

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FIG. 4

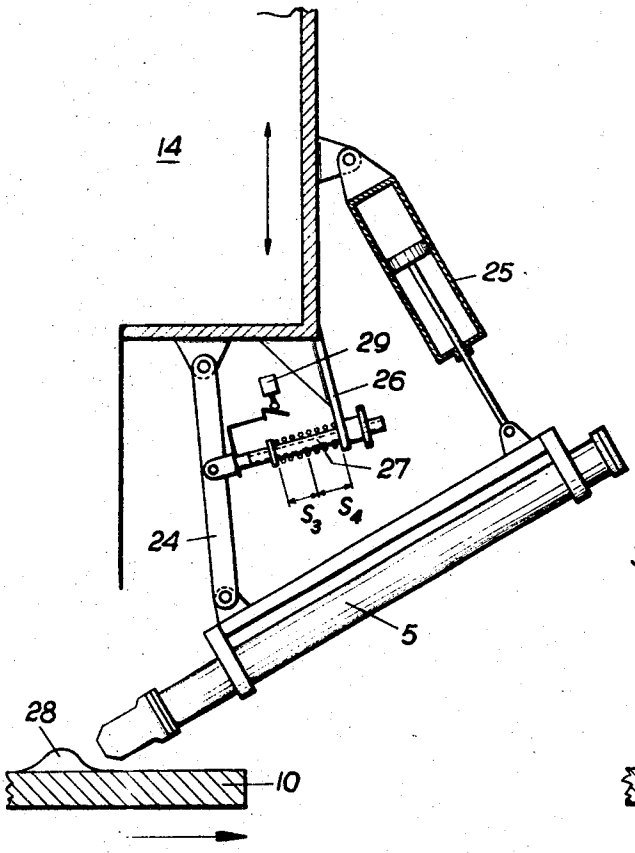
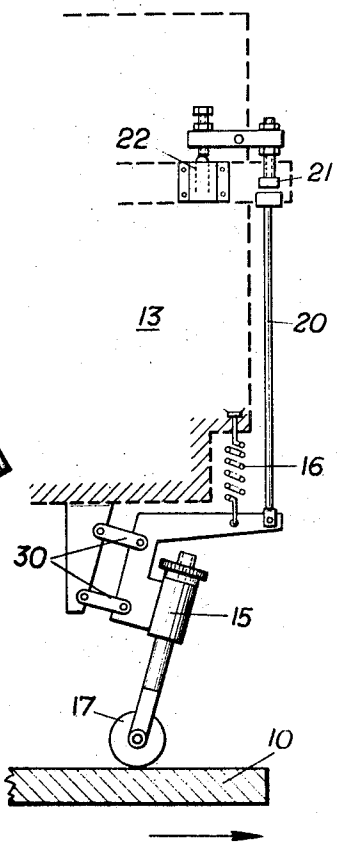


FIG. 5



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APPARATUS FOR SCARFING SLABS AND INGOTS

The present invention relates to to a scarfing apparatus for slabs and ingots with a burner holding device suspended on a scarfing support, on which burner holding device a horizontal row of burners is provided, said burners being arranged to be parallel in respect of one another and slanting in respect of the workpiece to be scarfed.

Known apparatus of such type have scarfing burners, each of which is controlled individually by means of a sensing element forerunning each burner on the surface of the slab, functioning in a manner that the burner is lifted, whenever its respective sensing element encounters a substantial unevenness, e.g. solidified slag. This arrangement involves the disadvantage that strong markings form on the slab surface, which necessitates considerable after-treatment prior to rolling. A further disadvantage of known apparatus consists in that slabs having distorted or warped surfaces cannot be scarfed within one single operational step, since in a cases of more substantial differences in curvature prevailing over the transverse extension of the slab surface no sufficiently great deflection can be provided for the individually movable burners.

The invention has as its object to overcome these disadvantages and difficulties and, in particular to provide a scarfing apparatus, in which the entire horizontal row of burners is automatically controlled in a way that it is possible to scarf, within one step, even such ingots that have distorted or warped surfaces. In a scarfing device for slabs and ingots with with a burner holding device suspended on a scarfing support, on which burner holding device a number of burners is provided in a horizontal row, said burners being arranged to be parallel in respect of each other and slanting in respect of the work piece to be scarfed, this aim is achieved by providing a burner holding device comprising an articulated frame, assembled of two lateral, vertical members and a burner holding beam connecting said members, as well as a crossbeam arranged between the lateral, vertical frame members, said lateral vertical frame members being liftable and lowerable independently of one another, the crossbeam being liftable and lowerable independently of said lateral, vertical frame members, and the movement of the crossbeam being transmissible to both lateral frame members by means of a sequence control.

According to a preferred embodiment of the invention the lateral, vertical frame members and the crossbeam are suspended on the scarfing support by means of hydraulic cylinders.

Each lateral, vertical frame member may be provided with a sensing a element, which, by means of a roller or the like, searches the surface of the piece to be scarfed, which sensing element is connected to a lever linkage for actuation of a switch operating a valve for the supply and discharge of a hydraulic medium to and from the cylinder arranged on the frame member.

For transmission of movement of the crossbeam to the two lateral frame members the crossbeam is suitably provided with two adjustable stops, arranged opposite each other, to which stops the lever linkages of the two lateral frame members are connected, so that upon movement of the crossbeam this movement is equally followed by the switch and the hydraulic valves for the cylinders of the two lateral frame members.

The stops of the crossbeam may be adjustable by hydraulic cylinders.

In order that the invention may be more fully understood it will now be described with reference to the accompanying drawings, wherein:

FIG. 1 is a diagrammatical front view;

FIG. 2 a diagrammatical side view of the scarfing apparatus:

FIG. 3 is a vertical sectional view of the scarfing apparatus in cross scarfing direction;

FIG. 4 illustrates the articulated suspension on the scarfing apparatus of individual burners; and

FIG. 5 shows a sensing element for searching the surface of the workpiece to be scarfed.

With reference to FIGS. 1 and 2 two opposite stanchions 1 are connected to one another by means of a crossbeam 2. The scarfing support 3 is displaceable in transverse direction on this crossbeam by means of rollers, not shown. On the front side of the scarfing support 3 the burner holding device, generally denoted by numeral 4, is suspended by means of hydraulic cylinders 7 and 8 and carries a horizontal row of burners 5. By means of a car 9 the slab 10 to be scarfed deposited thereon, may be moved below the scarfing apparatus. The angle 11 (FIG. 1) and the distance 12 (FIG. 2) indicate a possible deformation or distortion of the slab 10.

As is seen from FIG. 3, the burner holding device 4 comprises an articulated frame and a crossbeam 6, the articulated frame being assembled of two lateral, vertical frame members 23 and a burner holding beam 14 connecting said frame members. On the scarfing support 3 the two lateral frame members 13 are liftably and lowerably suspended by means of the two cylinders 7 and the crossbeam 6, arranged between said frame members, by means of the cylinder 8. The burners 5 arranged in a horizontal row and parallel in respect of each other, are resiliently hinged to the burner holding beam 14. The burner holding device further comprises a sensing and controlling system as described hereinafter.

On each of the two lateral frame members 13 a sensing element 15, having a roller 17 at its end, is supported by means of a spring 16. Each sensing element 15 is hinged to the one end of a tilting lever 18, the other end of which lever being supported on a stop 19 provided on the crossbeam 6. A switch rod 20 extending upwards is hinged to the center of the tilting lever 18. Upon respective movement of the sensing element 15 said switch rod actuates a switch 22 for a valve (not shown) which serves for supplying and discharging a hydraulic medium to and from the cylinder 7. The range of motion of the switch rod 20 is limited by a stop 21.

The stops 19 arranged on opposite sides of the crossbeam 6 are adjustable by means of hydraulic cylinders 23.

FIG. 4 illustrates the suspension of the burners 5 and FIG. 5 the suspension of the sensing elements 15 on the burner holding beam 14. The burners 5 are hingedly connected to the burner holding beam 14 by means of links 24, and cylinders 25. The cylinders 25 serve for adjusting the inclination of the burners 5 in respect of the surface of the slab 10 to be scarfed. A stop 26 against which the link 24 is supported by means of a spring 27, limits the pivot motion of a burner.

Whenever, in the course of scarfing, a burner encounters an obstacle 28, e.g. residual slag, on the slab 10 the burner moves back resiliently over the distance S_3. At the same time a limit switch 29 is actuated inducing a lifting motion of the cylinders 7 via the cylinder 8. In order to overcome inertia until the cylinders 7 start to operate, while the slab moves on, a certain slowdown path S_4 must be provided.

The suspension of the sensing elements 15, according to FIG. 5, is effected by means of two parallel links 30 provided 40 the frame members 13, and by means of the spring 16. At its top end the sensing element 15 is connected to the horizontal tilting lever 18, as described in detail with reference to FIG. 3.

The function of the apparatus according to the invention is a follows: A slab to be scarfed is introduced below the scarfing apparatus. The distance desired between the row of burners and the slab surface is adjusted by actuation of the cylinder 8 for the crossbeam 6 to the effect that a movement of the crossbeam 6 with its stops 19 is transmitted to the tilting lever 18 and the switch rod 20. Thereupon the switch 22 and the valves for the cylinders 7 are actuated, as described hereinbefore, so that the articulated frame member of the burner holding device follows the movement of the crossbeam 6.

Adjustment of the inclination desired for the row of burners 5 in respect of the surface of the piece to be scarfed so as to form as angle as shown in FIG. 1, is again effected by a sequence control via the crossbeam 6, in such way that one of the two cylinders 23 is actuated by a hydraulic medium. Thereby the respective stop 19 and via tilting lever, switch rod

and valve also the respective cylinder 7 are controlled. As soon as height and lateral inclination of the burner holding beam have been adjusted as desired, the scarfing operation is started after having switched on the transport mechanism for the slab. The roller 17 of the sensing elements 15 roll over the passing slab and search the surface contour thereof. Accordingly, the one or the other of the two cylinders is actuated via the rods 18, 20, whereas the position of the crossbeam remains unchanged. In this way a largely automatic adjustment of the row of burners toward a possible slope or distortion of the slab 10 in transverse direction is achieved and the desired distance between burners and slab surface during scarfing is kept constant.

I claim:

1. Apparatus for scarfing slabs and ingots comprising a burner holding device suspended on a scarfing support and supporting a number of burners arranged in parallel in a horizontal row and adjusted to be inclined to a piece to be scarfed, said burner holding device comprising an articulated frame formed by vertical side members and a burner holding beam connecting said side members, and a cross beam interposed between said side members, said side members being individually vertically displaceable and said cross beam being capable of effecting a vertical movement independently of said vertical side members, said vertical movement being transmissible by a sequence control to either of said side members, and sensing means adapted to follow the surface contour of said piece to be scarfed and connected to means controlling the individual vertical displacement of said side members.

2. Apparatus as set forth in claim 1 wherein said vertical side members and said crossbeam are suspended by means of hydraulic cylinders on said scarfing support.

3. Apparatus as set forth in claim 1 wherein each vertical side member is fitted with a sensing means having a roller to follow the surface contour of said piece to be scarfed and connected to a lever linkage for actuation of a switch operating a valve which, in turn, controls the flow of hydraulic medium to and from a hydraulic cylinder movably mounting said side member on said scarfing support.

4. Apparatus for scarfing slab and ingot stock comprising:

a scarfing support:

two vertical side beams suspended by hydraulic cylinders on said scarfing support to be individually vertically displaceable;

a transverse burner holding beam connecting said side beams and supporting a horizontal row of parallel burners adjusted at an inclination to said scarfing stock;

a crossbeam vertically adjustably suspended by a hydraulic cylinder on said scarfing support to be interposed between said side beams and having two adjustable stops facing said side beams;

each side beam supporting a device for sensing the stock surface connected to one end of a lever actuating means for controlling the pressure supply to the respective side-beam suspending cylinder; and

the other end of said lever contacting the respective one of said adjustable stops on said cross beam so that a movement of said crossbeam, through actuation of said pressure controlling means, entrains a consequential movement of said side beam.

5. Apparatus as set forth in claim 4 wherein said stops on said crossbeam are adjustable by hydraulic cylinders.

6. Apparatus according to claim 4 wherein said sensing devices are mounted on said side beams by means of springs.