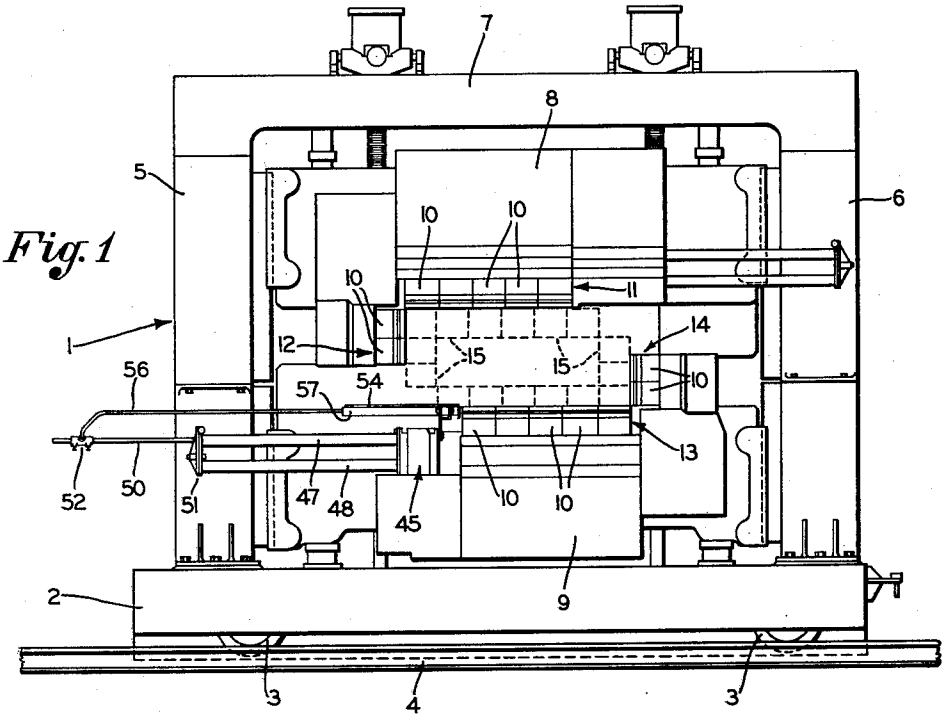
Oct. 30, 1962 H. A. GORDON 3,061,297

SCARFING NOZZLE COVER

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Fig. 1



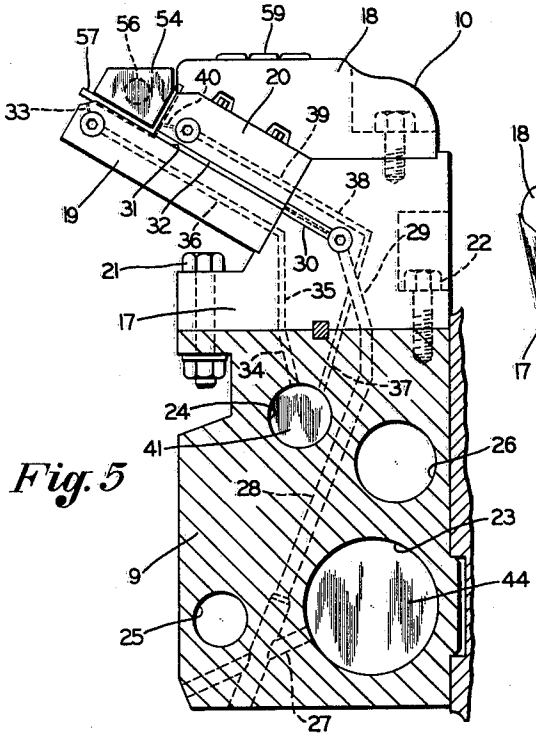


Fig. 5

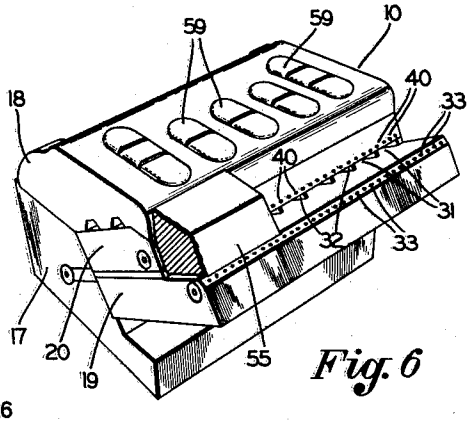


Fig. 6

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SCARFING NOZZLE COVER

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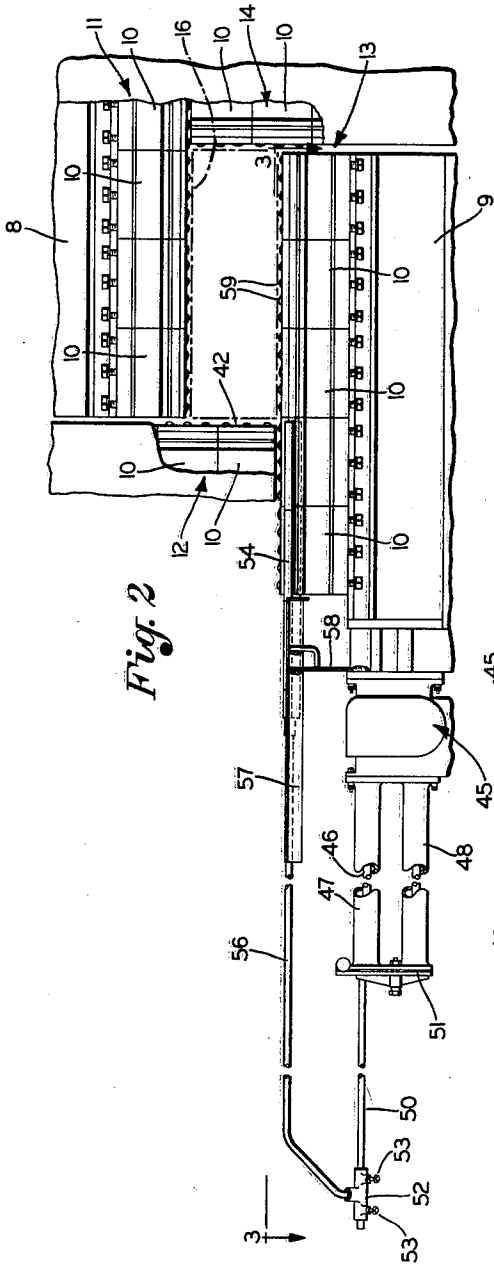


Fig. 2

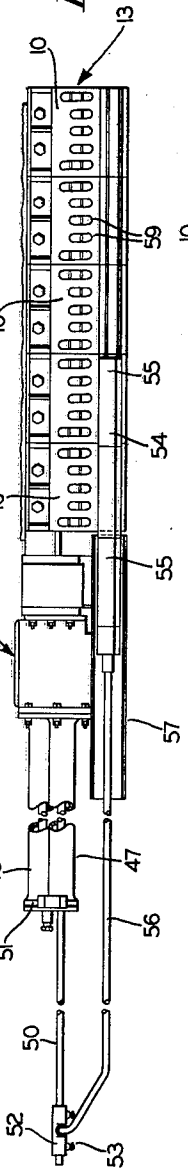


Fig. 3

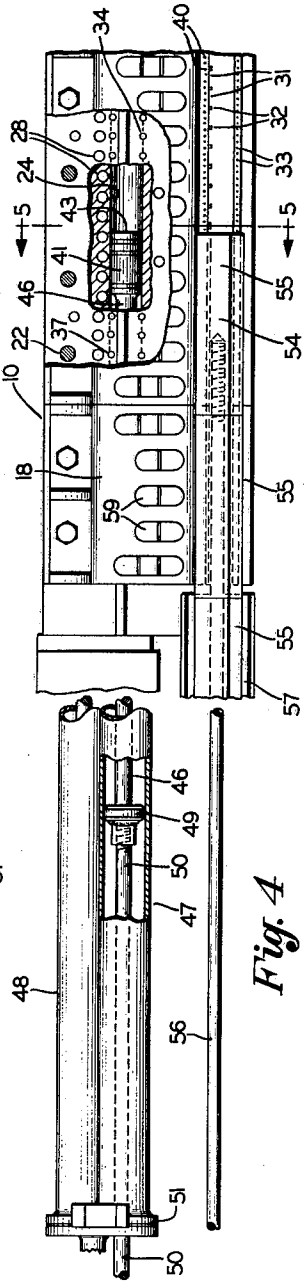


Fig. 4

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SCARFING NOZZLE COVER

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2 Claims. (Cl. 266—23)

This invention relates to scarfing apparatus for steel blooms, billets, slabs, and the like. More particularly it pertains to a cover for unused portions of units of scarfing nozzles.

Scarfing machines are used to remove surface defects from hot steel by gas cutting. Ordinarily the machines are located in the conveyor line of a rolling mill so that ingots, blooms, billets, etc. may be scarfed when deemed necessary. The machines are provided with a plurality of scarfing units mounted in banks to surround four sides of a slab to be scarfed. Each unit is separately mounted and is provided with a series of nozzles that project many small desurfacing gas streams against the slab surfaces. The series of nozzles in each unit are aligned with similar nozzles in adjacent units to provide a straight line cut resulting in a flat smooth surface.

Inasmuch as slabs of varying width may be rolled and scarfed, a scarfing machine is provided with the number of scarfing units necessary to accommodate the widest slab rolled by the mill. Each bank of scarfing units is then moved with respect to the other banks to accommodate wider or narrower slabs as they move through the conveyor line.

It has been found that the nozzles in the unused units become filled with slag produced during scarfing of the narrower slabs, because the scarfing gases are automatically shut off from the unused nozzles. Subsequent attempts to scarf wider slabs result in scarfed surfaces having unscarfed areas due to the slag-filled nozzles.

Various attempts have been made to overcome the difficulty in order to facilitate adapting the scarfing machine to rolling of slabs of various widths. All prior attempts, however, have been unsuccessful for various reasons. Suffice it to say, it had become common practice to simply remove and replace the scarfing units each time the nozzles became clogged between the rolling of slabs of various widths. Such a procedure caused delays in mill operation and was exceeding costly.

The device of the present invention provides a cover for the unused nozzles which prevents the nozzles from becoming filled with slag and other debris resulting from scarfing. The cover is so constructed that it operates automatically to cover the nozzles of a scarfing unit or portion thereof adjacent other units or portions being used for a particular scarfing operation. When the scarfing machine is adjusted to scarf a narrow slab, the cover moves automatically to protect the unused nozzles adjacent the scarfing area. As a result, any unused scarfing unit or portion thereof may be used intermittently without replacement or maintenance.

Accordingly, it is a general object of this invention to provide a cover for scarfing nozzles which completely protects unused nozzles in the area adjacent the scarfing operation from becoming filled with slag resulting from the scarfing operation.

It is another object of this invention to provide a cover for scarfing nozzles which operates automatically to cover the unused nozzles or portions thereof.

It is another object of this invention to provide a cover for scarfing nozzles which is inexpensive to install and maintain and which is readily adapted to the operation of the current automatic scarfing machines.

Finally, it is an object of this invention to provide a cover for scarfing nozzles which substantially eliminates

the difficulties enumerated and which obtains the foregoing desiderata in a simple and effective manner.

These and other objects and advantages apparent to those skilled in the art from the following description and claims may be obtained, the stated results achieved, and the described difficulties overcome by the discoveries, principles, apparatus, parts, elements, combinations, and subcombinations which comprise the present invention, the nature of which is set forth in the following general statement, a preferred embodiment of which—illustrative of the best mode in which applicant has contemplated applying the principles—is set forth in the following description and shown in the drawings, and which is particularly and distinctly pointed out and set forth in the appended claims forming part hereof.

The scarfing nozzle cover of the present invention may be stated in general terms as including in a machine for scarfing metal slabs of varying width, walls forming spaced rows of gas nozzles extending transversely of the direction of slab movement, and valve means for controlling portions of rows of nozzles, the improvement of a nozzle cover in which an elongated member coextensive with the spaced rows of gas nozzles is movable longitudinally in a direction transversely of the direction of movement of a slab over unused portions of rows of nozzles extending beyond the edge of a slab, and means operatively connecting the nozzle cover with the valve means for the gas nozzles.

A preferred embodiment of the invention is shown in the several views of the drawings, in which:

FIGURE 1 is an elevational view of a scarfing machine showing the scarfing units in retracted positions and in operative positions in broken line;

FIG. 2 is an enlarged fragmentary view showing the scarfing units positioned for scarfing a slab shown in broken line;

FIG. 3 is a horizontal view taken on the line 3—3 of FIG. 2, showing the position of a cover for the nozzles and the manner in which the cover is connected to the machine for automatic operation;

FIG. 4 is an enlarged fragmentary view of FIG. 3 and broken away to show the relative positions of the nozzle cover and gas control piston;

FIG. 5 is a vertical sectional view taken on the line 5—5 of FIG. 4; and

FIG. 6 is a perspective view of one scarfing unit having a portion protected by a nozzle cover.

Similar numerals refer to similar parts throughout the various views of the drawings.

In FIG. 1 a scarfing machine is generally indicated at 1. It includes a motor-driven carriage 2 mounted on wheels 3 for travel along a track 4 into and out of position in a conveyor line of a rolling mill. Two columns 5 and 6 are mounted on the carriage 2 and are connected across the top by a frame member 7.

Between the columns 5 and 6 a pair of float members 8 and 9 are mounted for vertical and horizontal movement by air operated means not shown in the drawings. A number of similar scarfing units 10 are mounted on each float member 8 and 9.

Several scarfing units 10 are disposed in end-to-end abutment on each float member 8 and 9 in horizontal and vertical banks. On the float member 8 the scarfing units are disposed in a horizontal bank generally indicated at 11 for scarfing the top surface of a slab and in a vertical bank generally indicated at 12. Likewise, the units 10 on the lower float member 9 are disposed in a horizontal bank generally indicated at 13 and in a vertical bank generally indicated at 14. The horizontal bank 13 scarfs the lower surface of a slab and the vertical banks 12 and 14 scarf the edges of the slab. The banks 11–14

of the scarfing units 10 simultaneously scarf four sides of a slab moving through the scarfing machine 1.

As was indicated above, the float members 8 and 9 are movable vertically and horizontally with respect to each other to provide an opening between the units 10 for scarfing a slab of any width or thickness, as shown by the broken line positions 15 of the scarfing units in FIG. 1. One position of the scarfing units 10 is shown in FIG. 2 in which the banks of units are mounted to surround all four sides of a slab 16. In that position, for example, the width of the slab 16 is covered by three scarfing units across the top and bottom and by about one and a half units 10 on each edge thereof.

Each unit 10 has a configuration shown in FIG. 6. The unit is composed of a number of parts including a head 17, a shoe 18, and preheat blocks 19 and 20. The head 17 is mounted by detachable bolts 21 and 22 (FIG. 5) on one of the float members 8 and 9. As shown in FIG. 5 the float member 9 is provided with a plurality of bores 23–26. The bore 23 is connected by various suitable conduits to a source of oxygen gas and the bore serves as a manifold for distributing oxygen to the units 10 through a plurality of conduits 27–30 within the member 9 and head 17. They provide passage means between the bore 23 and a plurality of openings or nozzles 31 (FIG. 6) which are separated by sectioning vanes 32. Each nozzle 31 is disposed between a pair of spaced vanes 32 and is separately connected to the bore 23 by a separate set of interconnected conduits 27–30.

The bore 24 is connected by various hoses to a source of supply of acetylene gas. As shown in FIG. 5, the bore 24 is connected to acetylene nozzles 33 (FIGS. 5 and 6) by a plurality of interconnected passages 34–36 extending through the member 9, the head 17, and the block 19. In FIG. 6 a small number, such as four or five, of holes 33 are disposed in segments aligned with corresponding oxygen nozzles 31. Each segment of holes or nozzles 33 is separately connected by the passages 34–36 to the bore 24.

Likewise, passages 37–39 extend from the bore 24 through the member 9, the head 17, and the block 20 to a plurality of holes or nozzles 40. The nozzles 40 are grouped preferably in a manner similar to the nozzles 33 and are aligned with the same oxygen nozzle 31. Each segment of acetylene nozzles 40 is separately connected by passages similar to the passages 37–39 to the acetylene bore 24 as shown in FIG. 5.

The manner in which the gases, oxygen and acetylene, are confined to the particular scarfing units 10 or portions thereof, depending upon the width of the slab 16, is shown in FIG. 4. As was indicated above, the member 9 is provided with a plurality of bores 23–26, the bore 24 of which is shown more particularly in FIG. 4. A piston 41 is movably mounted in the bore 24 to positions substantially alignable with the inner side 42 of the bank 12 of scarfing units 10. As the float member 8 moves into position horizontally and vertically with respect to the upper and left-hand sides of the slab 16, the piston moves horizontally to alter the length of the acetylene bore 24 and thereby shuts off whatever passages 34 and 37 (FIG. 5) are disposed to the left of the end 43 of the piston. Accordingly, all acetylene gas entering the bore 24 from a source not shown passes through all similar passages 34 and 37 to the respective nozzles 33 and 40 while all similar passages to the left of the end 43 of the piston 41 are blocked from receiving any acetylene whatsoever, for which reason the corresponding nozzles are rendered inoperative so that only the nozzles 33 and 40 between the corners of the slab 16 are operative for scarfing.

The oxygen bore 23 is similarly provided with a piston 44 (FIG. 5) which is aligned with the piston 41 for the purpose of similarly cutting off oxygen gas to the unused oxygen nozzles 31. The mechanism by which the pistons 41—44 are moved within their respective bores 24 and 23 includes a drive assembly (not shown) located within a housing generally indicated at 45. The drive assembly is operatively connected with the means for moving the float members 8 and 9 for synchronous movement of the pistons 41 and 44 through piston rods such as the piston rod 46 for the piston 41.

As shown in FIG. 4, the piston rod 46 is an elongated member and extends to the left of the device within a rod housing 47. A similar housing 48 is provided for the rod of the piston 44 in the oxygen bore 23. The left end of the piston rod 46 as viewed in FIG. 4 is provided with a guide spacer 49 which maintains the rod 46 centrally within the cylindrical housing 47.

In FIG. 4 an elongated rod 50 is secured to the side of the guide spacer 49 opposite the rod 46 and extends through an end closure plate 51 of the housing 47. The outer extremity of the rod 50, as shown in FIG. 2, has a bracket 52 secured thereto by set screws 53.

As shown in FIGS. 2, 3, and 4, a cover 54 for the oxygen and acetylene nozzles 31 and 33 is provided for sliding movement over the surfaces of the blocks 19 and 20 in which the nozzles 31 and 33 are disposed. The cover 54 is an elongated member adapted to cover a greater portion of the rows of nozzles formed by placing the scarfing units 10 in end-to-end abutment. The elongated cover 54 is preferably composed of shorter cover segments 55 which are preferably composed of pressed carbon and readily replaceable when necessary. The cover 54 is secured to an elongated operating rod 56, the outer end of which is secured to the bracket 52 so that when the pistons 41 and 44 move in either direction the cover 54 moves similarly. In FIG. 4 it is preferred that the end of the right segment 55 be in substantial alignment with the ends of the pistons 41 and 44. For example, the right end of the cover 54 is aligned with the end 43 of the piston 41. Accordingly, when the pistons 41 and 44 are located to block oxygen and acetylene from entering the nozzles 31 and 33, the cover extends over and protects the unused nozzles from becoming filled and clogged with slag during the scarfing operation occurring at nearby nozzles. Subsequently, when a wider slab 16 is scarfed, adjustments are made to accommodate the greater dimension whereby the previously unused nozzles are then ready for immediate use due to relocation of the pistons 41 and 44 as well as the cover 54.

As shown in FIGS. 2, 3, and 4, a supporting channel or track 57 is mounted by a bracket 58 in alignment with the V-shaped portion of the units 10 provided by the blocks 19 and 20. The alignment of the channel 57 with the V-shaped portion of the units 10 is shown in FIG. 5.

In FIG. 6 the location and position of the acetylene nozzles 33 and 40 as well as the oxygen nozzles 31 are shown, together with a portion of a cover segment 55. As set forth above, the cover 54 can be moved longitudinally over the nozzles 31, 33, and 40 to cover either a complete scarfing unit 10 or any portion thereof. Due to the fact that portions of any row of nozzles 31, 33, and 40 may be cut off from acetylene or oxygen supply depending upon the width of a particular slab, it is necessary that any portion of the scarfing unit 10 having unused nozzles be covered by the cover 54 to prevent slag and debris resulting from the scarfing operation from falling upon the unused nozzles. It is understood that the unused nozzles could very easily be covered by such slag and debris when they are unprotected by the pressure of the gases issuing therefrom.

In addition to the foregoing, the surface of each scarfing unit 10 adjacent the workpiece or slab 16 is provided with a plurality of spaced riding skids 59 preferably composed of a wear-resistant material.

The cover 54 is provided only for the nozzles 31, 33, and 40 of the lower horizontal scarfing units 10 because such nozzles are more readily exposed to the fall of slag

and debris during the scarfing operation. It is understood, however, that the upper bank **11** of scarfing units as well as the vertical banks **12** and **14** may also be provided with similar cover means, if necessary.

The device of the present invention is an improvement over previous scarfing machines because it provides an effective protective means for the unused gas nozzles during a particular scarfing operation. The cover is completely automatic and adapted to operate with the scarfing machine for any size billet or slab that may be scarfed. With the scarfing nozzle cover **54**, slabs of varying dimensions may be scarfed in sequence or intermittently without clogging the nozzles. Accordingly, the scarfing machine may be used continuously without delays for maintenance and replacement of slag-clogged nozzles which was formerly the usual procedure.

Moreover, the nozzle cover is a relatively inexpensive addition and readily adapted to the automatic operation of the scarfing machine. When properly mounted the nozzle cover operates efficiently and without interfering with the operation of the machine as originally constructed.

In the foregoing description certain terms have been used for brevity, clearness and understanding, but no unnecessary limitations have been implied therefrom as such words are used for descriptive purposes and are intended to be broadly construed.

Moreover, the embodiment of the improved construction illustrated and described herein is by way of example and the scope of the present invention is not limited to the exact construction shown.

Having now described the invention, construction, operation and use of a preferred embodiment thereof and the advantageous, new and useful results obtained thereby; the new and useful scarfing nozzle cover and reasonable mechanical equivalents thereof obvious to those skilled in the art are set forth in the appended claims.

What is claimed is:

1. In a machine for scarfing the surfaces of metal slabs of various cross-sectional dimensions, having scarfing nozzle means with rows of gas and oxygen nozzles extending transversely of the direction of slab movement through the machine, having unused portions of rows of nozzles normally extending beyond the edge of a slab, and having valve means including pistons and piston rods for shutting off the supply of gas and oxygen to the unused portions of the rows of nozzles; the combination therewith of

(*a*) an elongated nozzle cover member,

(*b*) means mounting the cover member for slidable movement on and longitudinally of the unused portion of a row of nozzles, and

(*c*) means for moving the cover member to a position over the unused portions of the nozzles and adjacent to and aligned with the used nozzles and including an elongated rod extending to and connecting the cover member with one of said piston rods; whereby placement of the pistons to shut off gas and oxygen to certain portions of the nozzles automatically moves the cover member over the unused portions of the nozzles to prevent scarfing debris from entering and depositing in the nozzles.

2. The construction defined in claim 1 in which the elongated nozzle cover member is formed of carbon.

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