

Aug. 4, 1959

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2,897,883

THERMOCHEMICAL DESURFACING HEAD

Filed Oct. 17, 1957

2 Sheets-Sheet 1

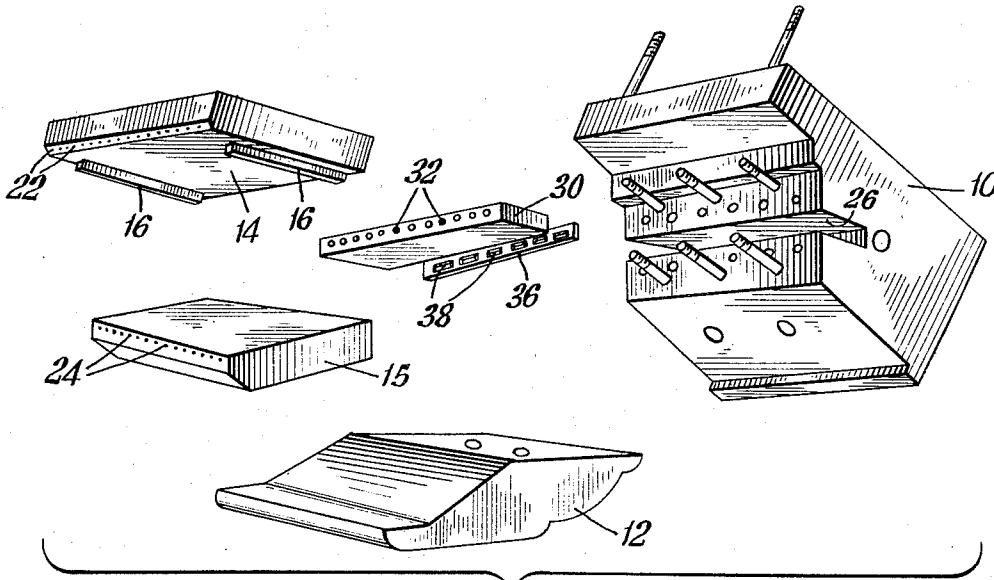


Fig. 1.

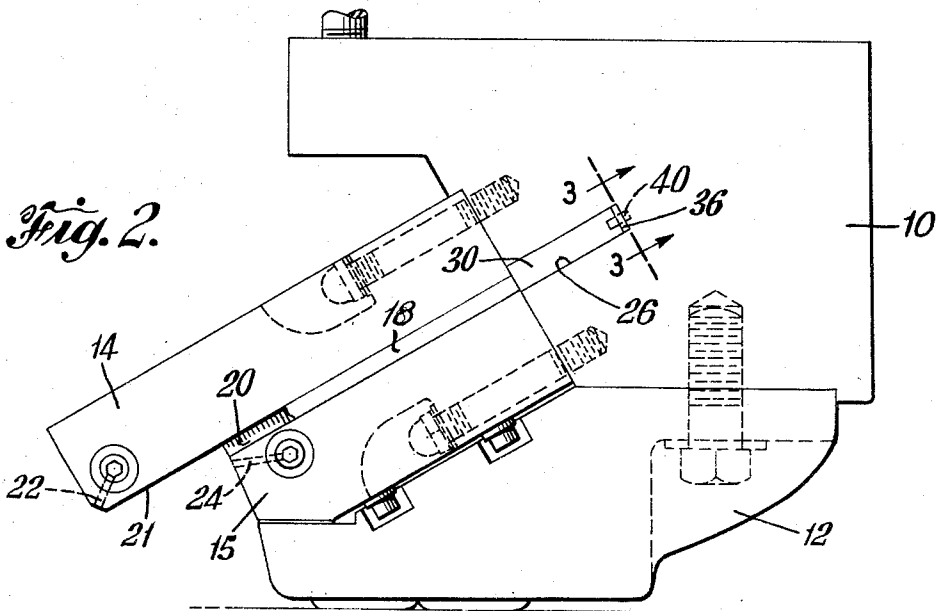


Fig. 2.

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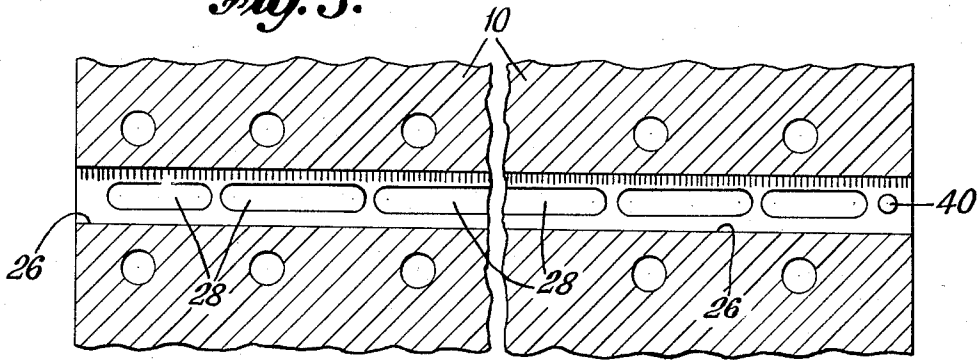
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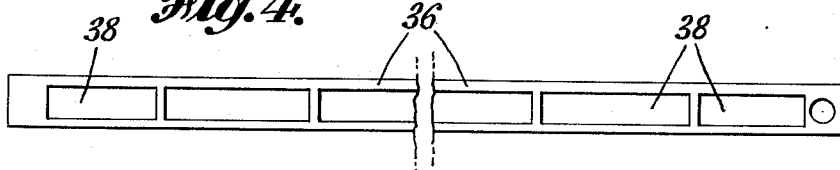
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2 Sheets-Sheet 2

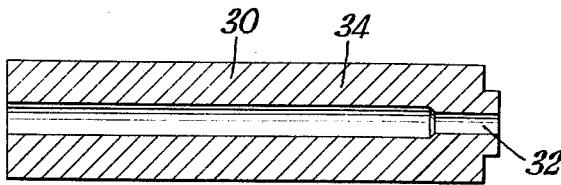
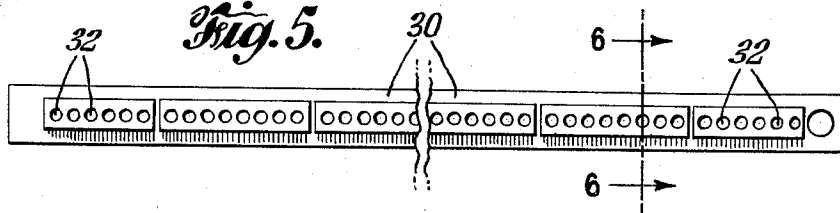
*Fig. 3.*



*Fig. 4.*



*Fig. 5.*



*Fig. 6.*

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**THERMOCHEMICAL DESURFACING HEAD**

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Application October 17, 1957, Serial No. 690,856

4 Claims. (Cl. 158—27.4)

This invention relates to thermochemical desurfacing heads, and constitutes an improvement upon the structure disclosed in the copending application of Allmang et al. Serial No. 357,496 filed May 26, 1953, now Patent No. 2,838,431 which issued June 10, 1958.

A most serious problem connected with scarfing machines is the maintenance of the scarfing units. During the scarfing operation, a considerable quantity of molten metal is present in the scarfing or reaction zone. During normal operation, it is virtually impossible to prevent at least a portion of this molten slag from being blown back accidentally through the continuous-slot of the scarfing unit into the oxygen metering orifices located in the head of the scarfing unit. Unless this accumulation of slag is removed, the resulting plugging of the oxygen orifices causes insufficient and uneven distribution of the cutting oxygen across the width of the scarfing unit. The result of this uneven distribution is unevenly scarfed slabs with undesirable ridges or missed areas in the scarfed surface.

The necessary frequency of removal of the accumulated slag depends to a large extent on the skill and care exercised by the machine operator and maintenance personnel; careful operation greatly minimizes plugging. The periods of plug-free operation may range from as little as 2 or 3 minutes, with only a few feet of steel slab scarfed, to several months, with 100,000 tons of steel processed. In order to keep the down-time of the scarfing machine at a minimum, the general practice in the mills is to replace the plugged scarfing units in the machine with reserve units; otherwise it would be necessary to discontinue operation of the machine while the accumulated slag is removed from the oxygen ports in the head.

In order to remove accumulated slag from the oxygen metering ports, it is necessary to disassemble the continuous slot scarfing unit from the machine and remove the shoe and preheat block sandwich from the head. When the plugged holes are thus made accessible, it is then necessary to chip out the slag with a drill or an electrical disintegrator such as an electro-arc metal disintegrator; this is a long and tedious job. The head contains components of different metals, as well as soldered joints, making submersion of the head in an acid solution to remove the hardened slag impractical. In those instances where it proves impossible to chip out the hardened slag, the plugged head is considered permanently damaged and must be scrapped, at considerable expense.

The main objects of the present invention are therefore to avoid the above cleaning difficulties or the loss of the plugged head, and to provide a removable orifice plate for supplying oxidizing gas to the wide continuous slot of desurfacing heads, which is expendable, readily removable and inexpensively replaceable.

According to the present invention a readily-removable orifice plate is mounted in the desurfacing head in back of the wide continuous cutting oxygen slot and is pro-

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vided with transversely spaced passages for distributing oxygen to said cutting oxygen slot.

In the drawings:

Figure 1 is an exploded perspective view of a desurfacing head according to the present invention;

Figure 2 is an assembly elevation of the structure shown in Fig. 1;

Figure 3 is a section taken along the line 3—3 of Fig. 2;

Figure 4 is an elevation of the gasket;

Figure 5 is a front elevation of the removable orifice plate; and

Figure 6 is a section taken along the line 6—6 of Fig. 5.

Referring more particularly to the drawings, the desurfacing head according to said copending Patent No. 2,838,431 comprises a nozzle base block 10, a skid block 12, and upper lip plate 14 and a lower lip plate 15. The lip plates are bolted to the front face of the nozzle block 10. This face is about 60° to the horizontal, so that the lip plates are at about 30°.

The lip plates 14 and 15 are spaced apart by end walls 18 and parallel partitions 16 to form the cutting slot 20 for the oxidizing gas. The upper lip plate 14 extends forwardly as at 21 about a third of its length beyond the lower lip plate 15, to confine the stream of oxidizing gas close to the reaction zone.

The upper lip plate 14 is provided with a row of closely spaced bores 22 for projecting jets of fuel gas down toward the reaction zone. The lower lip block 15 is provided with a row of closely spaced bores 24 for preheat gas, similar to the bores 22 in the upper lip block.

According to the present invention the nozzle block 10 is provided with a deep transverse groove 26 extending back therefrom in line with the cutting oxygen slot 20. Oxygen passages 28 shown in Fig. 3 extend from the bottom of the groove 26 further back into the block 10 to receive oxygen from the supply system fully illustrated and described in said copending Patent No. 2,838,431.

Removably fitted in the groove 26 is an oxygen orifice plate 30 shown in Figs. 5 and 6, having a plurality of transversely spaced counterbores 34 drilled in the front thereof, and smaller orifices 32 extending back to register with the oxygen passages 28 in the block 10. If desired, one single diameter drilling could be used instead of the stepped drilling. A gasket 36 is interposed between the back end of the plate 30 and the bottom of the groove 26, and suitably apertured as at 38 for communication from the passages 28 into the orifices 32. The gasket is constructed of suitable compressible and heat resistant material such as neoprene.

A pin 40 locates and holds the orifice plate 30 and gasket 36 from moving sidewise in the groove 26 in the block 10. When the parts shown in Fig. 1 are assembled as shown in Fig. 2 the upper and lower preheat blocks 14 and 15 hold the orifice plate 30 secure in the head and apply pressure to the gasket 36 to effect gas sealing.

The use of the removable oxygen orifice plate to replace the integrally drilled oxygen metering orifices in the head of the continuous slot scarfing unit provides the following advantages:

Of paramount importance, the relative ease of keeping scarfing units equipped with orifice drillings which are free of obstructions facilitates good scarfing performance; operators are better able and thus more prone to keep units in good condition. By providing a removable, low cost throw-away orifice insert, costly salvage work to clean accumulations of slag from drillings directly in the head can be eliminated. The scrapping of expensive heads, with unsalvageably plugged orifices can be eliminated. Previously, scarfing unit head material has been stainless steel, because of the vulnerability of the drilled orifices to molten metal dripping from the

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scarfed product. It is now feasible to use brass or bronze for the head, which is considerably easier to machine and therefore much less costly in initial manufacture.

Instead of a user having to stock a large number of the costly reserve head blocks for replacement of plugged units, only the much less expensive reserve removable orifice plates need be stocked. If permanent damage, due to inability to remove the accumulated slag occurs, only the oxygen orifice plate need be scrapped instead of the more costly head block. This is a considerable advantage since the cost of the head block is more than 20 times that of the oxygen orifice plate. When the oxygen ports become plugged, the removable orifice plate is more easily handled for cleaning out the accumulated slag from the ports, regardless of the method of removal used, than is the head block having the integrally drilled metering orifices.

What is claimed is:

1. In apparatus for thermochemically scarfing metal bodies, a surface conditioning head having upper and lower surfaces therein defining therebetween a wide continuous slot adapted to discharge a sheet-like stream of oxidizing gas in a zone extending across a metal body, said slot being adapted to be disposed at an acute angle of impingement to the work surface of said metal body, said head having a recess in back of said slot of greater thickness than said slot, and an individual throw-away metering orifice plate of greater thickness than said slot removably mounted in said recess in back of said slot and having transversely distributed orifices for passages aligned with said slot and extending the full depth of said plate for supplying oxidizing gas to the rear of said wide continuous slot, the portion of said head forming said upper surface having an abutment engaging the front of said orifice plate to hold it in said recess, and being removable for access to said orifice plate.

2. In apparatus for thermochemically scarfing metal bodies, a desurfacing head comprising a nozzle block having a front face and a transverse groove extending from said front face back into said block, upper and lower lip plates secured to the front of said nozzle block

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in spaced apart relation, side walls closing the space between said lip plates and forming a cutting oxygen slot, and a removable individual throw-away metering orifice plate in said nozzle block groove for supplying oxidizing gas to said cutting oxygen slot, one of said lip plates having an abutment engaging the front of said orifice plate to hold it in said recess, and being removable for access to said orifice plate.

3. In apparatus for thermochemically scarfing metal bodies, a desurfacing head comprising a nozzle block, upper and lower lip plates secured to the front of said nozzle block in spaced apart relation, at least one of said lip plates having a row of preheat orifices drilled in the front portion thereof, side walls closing the space between said lip plates and forming a cutting oxygen slot, and a removable individual throw-away metering orifice plate in said nozzle block in back of said cutting oxygen slot and having a row of transversely spaced orifices therein for supplying oxygen to said cutting oxygen slot, one of said lip plates having an abutment engaging the front of said orifice plate for holding it in back of said oxygen slot and removable for access to said orifice plate.

4. For use in a desurfacing head comprising a nozzle block with upper and lower lip plates secured to the front of said nozzle block in spaced apart relation and at least one of said upper plates having a row of preheat orifices drilled in the front portion thereof and side walls closing the space between said lip plates and forming a cutting oxygen slot, the improvement which comprises a removable individual throw-away metering orifice plate for insertion in said nozzle block in back of said cutting oxygen slot and having a row of transversely spaced orifices therein for supplying oxygen to said cutting oxygen slot and one of said lip plates being let down below the top of said orifice plate to engage the front thereof to hold it in back of said cutting oxygen slot and being removable for access to said orifice plate.

References Cited in the file of this patent

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