Oct. 4, 1949. I. P. THOMPSON ET AL 2,483,483

SHOE FOR THERMOCHEMICAL DESURFACING MACHINES

Filed Sept. 27, 1945

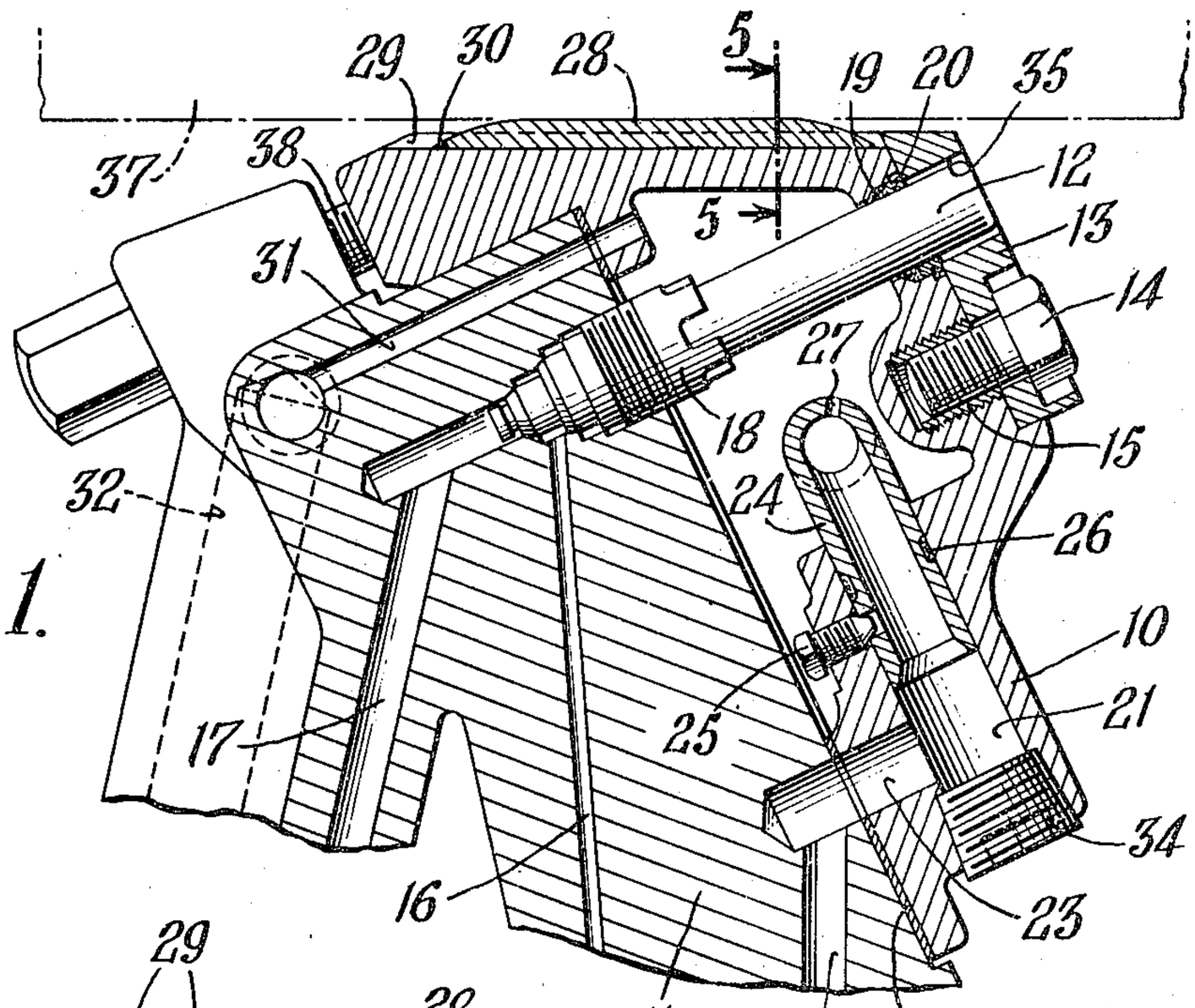

Fig. 1.

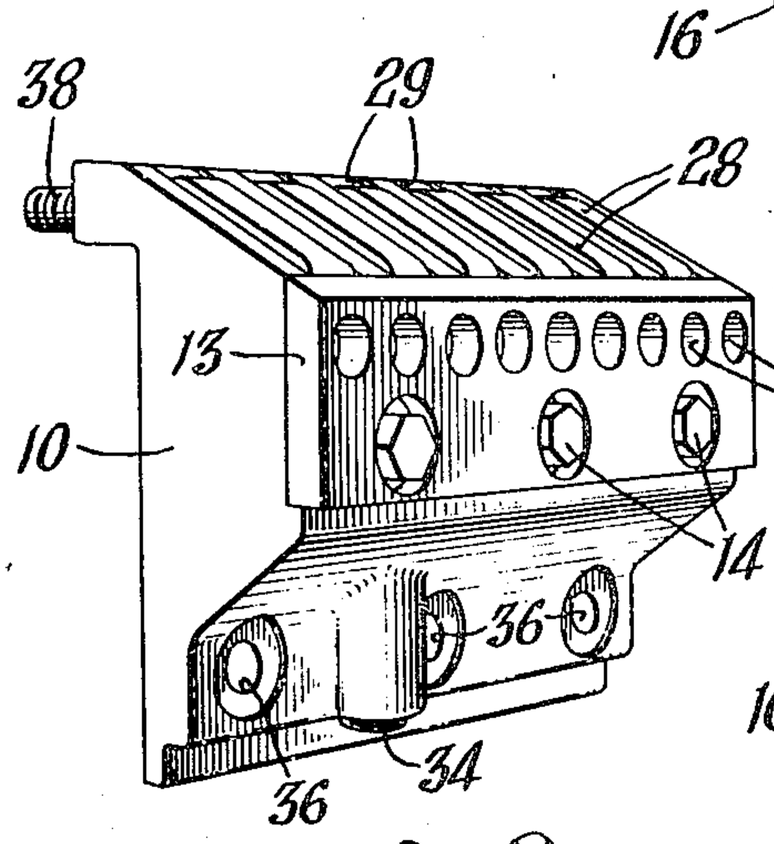

Fig. 2.

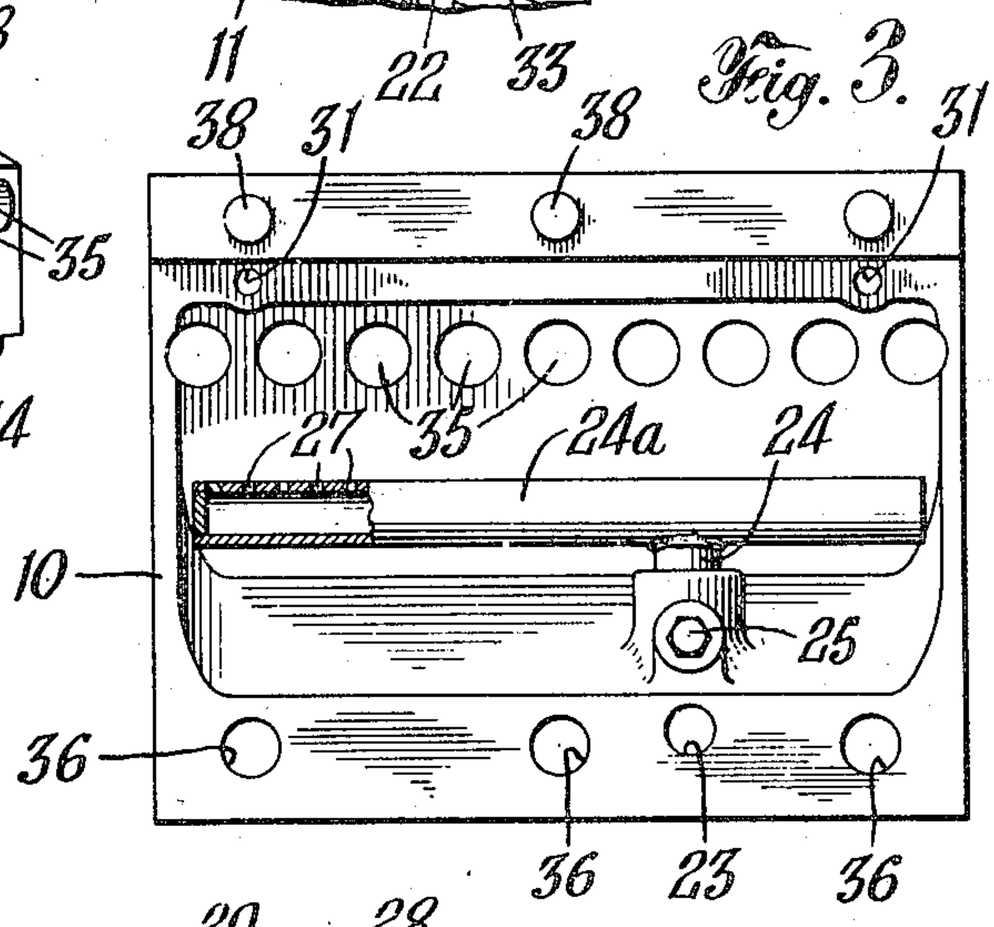

Fig. 3.

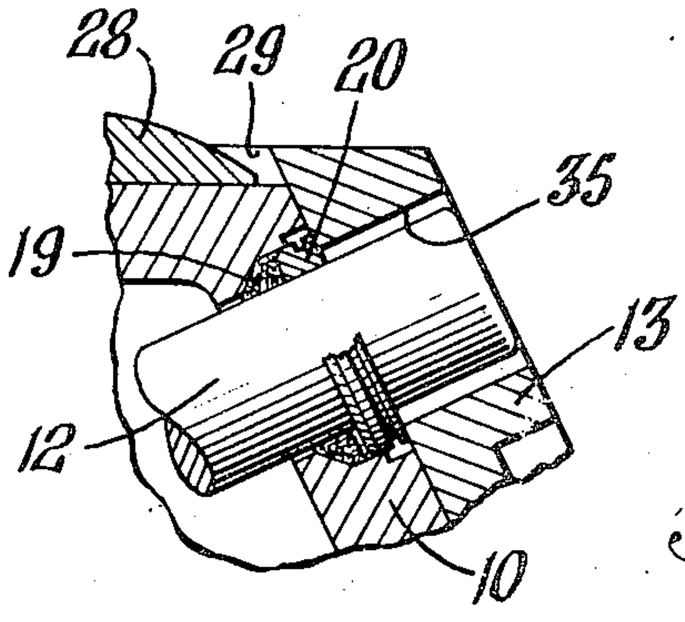

Fig. 4.

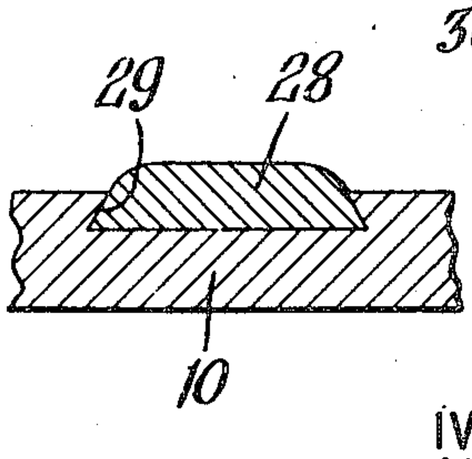

Fig. 5.

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Patented Oct. 4, 1949 2,483,483

UNITED STATES PATENT OFFICE

2,483,483

SHOE FOR THERMOCHEMICAL DESURFACING MACHINES

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Application September 27, 1945, Serial No. 618,852

13 Claims. (Cl. 266—23)

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This invention relates to the mounting and protection of scarfing nozzles to protect them against heat incident to the thermochemical desurfacing of metal, and has for an object to provide an improved mounting for the outer end portion of such nozzles. Another object is to provide a construction whereby the packing within a cooling shoe and around a scarfing nozzle may be renewed without removal of the shoe. A further object has been to enhance the removal of heat from the shoe. Yet another object is to provide a removable face-plate secured to the shoe and capable of transmitting heat to the shoe while surrounding the outer end portion of the nozzle as well as compressing packing around the nozzle.

It has been the practice to provide a protective shoe around the scarfing nozzle and have such shoe supplied inside with cooling water to carry away heat from the high temperature work with which the shoe contacts, such, for example, as is shown in Figs. 4 and 5 of the patent to J. H. Bucknam, No. 2,362,536, November 14, 1944, for "Apparatus for conditioning the surfaces of metal bodies." A variety of materials have been tried for the shoe, but none was found so satisfactory as to eliminate the need for a wear-resistant reinforcement where the shoe contacts the work. The previous shoes have been provided with packing around the scarfing nozzle for the purpose of preventing cooling water within the shoe leaking out on to the hot work. To remove or replace the packing it has heretofore been necessary to remove the shoe from its supporting head or block. There has been erosion of the portion of the shoe around the nozzle which made it necessary to go to the expense of replacing the shoe when such deterioration became excessive. The causes of this wear are perhaps legion and the relative importance of the various effects not known.

According to this invention it is no longer necessary to replace the entire shoe due to erosion from slag, but only a plate needs to be replaced, such plate being located around the fore part of the nozzles and the shoe where erosion has been found to be greatest. Time also has been saved in having to replace the packing in the shoe and around the nozzle by eliminating the necessity for taking off the shoe. Now it is possible to replace this packing from outside the shoe by removal of only a bolted face-plate that takes far less time and effort for removal than does the shoe.

Referring to the drawings,

Fig. 1 is a view of a transverse section through a shoe embodying the present invention;

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Fig. 2 is a perspective view from the front and one side of the shoe;

Fig. 3 is a rear view of the shoe;

Fig. 4 is an enlarged detail view of the packing around the nozzle, held in place by the face-plate;

Fig. 5 is a sectional view on the line 5—5 of Fig. 1.

The shoe 10 is held in position contiguous the supporting block in the usual manner so that the customary desurfacing nozzles 12 may project forwardly from their support in the block 11 through the front wall of the shoe. A face-plate 13 is secured to the shoe by bolts 14. Since both the shoe and face-plate are preferably made of copper for high heat conductivity, in order to provide better wear for the threads of the steel bolts 14 than would be obtained were the cooperating threads in the shoe of soft metal, a sleeve 15 of Monel metal or other hard material is preferably threaded into the copper to contain the internal threads with which the bolts 14 cooperate. The supporting block 11 contains the passage 16 for fuel gas and the customary passage 17 for oxygen leading to the nozzles 12 and their mounting 18 in the block.

As may be seen from Fig. 4, the recess for the packing 19 around the nozzle 12 is preferably shaped as illustrated so that when pressure is applied to the ring 20 by the face-plate 13, the packing will be deformed by the slanting surface illustrated and wedged tightly around the nozzle.

To supply cooling water to the nozzle of the shoe a bore 21 is supplied by passages 22 and 23 so that cooling liquid passes up the tube 24 where it is distributed along header 24*a* and out a row of perforations 27 in the wall of the header. A set screw 25 holds the tube in the desired elevated position, and the header 24*a* in the desired angular position in which it is preferably parallel with the front wall of the shoe. Packing 26 may be provided around the tube 24, although such is not necessary since the interior of the shoe is usually flooded with the cooling water. On the side of the shoe contiguous the work are located the usual wear-resisting metal pads 28 which, as shown in Fig. 5, have a sliding fit within the dovetail grooves 29. To assist in holding these wear-resisting plates 28 in position, welds 30 are placed on their lagging end in cooperation with such plates and the shoe. A plurality of water outlets 31 are provided through the shoe and block to carry off the cooling liquid from the shoe to an outlet passage 32 in the block. The usual gasket 33 is placed between the shoe and block. A screw plug 34 closes the outer end of the bore 21 against

leakage of cooling water. A plurality of perforations 35 are provided in the face-plate 13 for the nozzles 12, but such perforations may be more nearly the size of the nozzle than is shown in the drawing. Such perforations must be small enough so that the face-plate engages the packing ring 20 and these perforations need only be large enough to permit easy removal of the face-plate from the nozzle ends under all temperature conditions. Bolts extend through several perforations 36 in the shoe, as shown in Fig. 2 for securing the shoe to the block. The broken lines 37 in Fig. 1 outline the work to illustrate how the work surface cooperates with the shoe, and that the face-plate 13 need not touch the work. An additional threaded stem or bolt 38 is provided for the end of the shoe adjacent the work.

Among the advantages of this invention may be mentioned the addition of a protective and easily removable face-plate to the front portion of the shoe around the nozzles. It is much cheaper to replace only the face-plate after it has become eroded than to replace the shoe. Packing 19 may be removed and replaced without taking off the shoe. The necessity for a spring 48, as shown in Fig. 4 of Bucknam No. 2,362,536, has been eliminated with the location of the packing in its new position. The Monel metal sleeve 15 saves wear that might otherwise occur if the threads of the bolt 14 directly engaged the soft copper of the shoe. The coldest water is directed from the perforations onto the hottest portion of the shoe.

We claim:

1. In apparatus comprising a scarfing nozzle for a desurfacing head, a shoe protecting the forward portion of the nozzle from the heat of a scarfing operation on work, said shoe having means for supplying cooling liquid around the nozzle, and packing around the nozzle to prevent egress of cooling liquid onto the work; the combination therewith of the improvement which comprises a detachable face-plate surrounding the outer end portion of the nozzle contiguous to the shoe and holding the packing in place around the nozzle, whereby renewal of said packing may be made by removal of said face plate without removal of said shoe.

2. The combination with a scarfing nozzle for a desurfacing head, of a protective shoe surrounding a portion of the nozzle having a wall through which the nozzle extends, a removable face-plate secured to the outer side of said wall of the shoe and around the outer end portion of the nozzle covering at least a portion of the shoe outer wall which is in danger of erosion and which lies between said nozzle and a position adjacent said work, both said shoe and face-plate being of heat-conductive metal such as copper; a wear-resisting metal on the shoe for cooperation with the work, and passages for circulating cooling liquid within said shoe to carry off heat.

3. A thermochemical desurfacing apparatus comprising a nozzle, passages for supplying fuel and oxidizing gases thereto, a shoe engaging the work and surrounding said nozzle, passages for supplying and withdrawing cooling liquid to and from said nozzle, said shoe having an outer wall through which the nozzle extends, packing in said wall around said nozzle to prevent cooling liquid getting onto the work, and a removable face-plate compressing said packing and held against said shoe outer wall.

4. A thermochemical desurfacing apparatus comprising a nozzle, passages for supplying fuel and oxidizing gases thereto, a shoe engaging the work and surrounding said nozzle, passages for supplying and withdrawing cooling liquid to and from said nozzle, said shoe having an outer wall through which the nozzle extends, packing in said wall around said nozzle to prevent cooling liquid getting onto the work, and a removable face-plate compressing said packing and held against said shoe outer wall, a metal ring between said face-plate and packing, the outer wall of said shoe having a recess in which said packing is held and the inner wall of said recess being inclined to clamp the packing around the nozzle on the application of pressure longitudinally of said nozzle.

5. In apparatus comprising a scarfing nozzle for a desurfacing head, a protective shoe around a portion of the nozzle having a front wall through which the nozzle extends, and means for supplying cooling liquid to the inside of the shoe; the combination therewith of the improvement whereby packing around the nozzle may be replaced without removal of the shoe, said improvement comprising a recess in the front wall of said shoe around said nozzle for packing accessible from the outside of said shoe, packing in said recess, and a face-plate bolted to said front wall of the shoe for compressing said packing, said face-plate surrounding the outer end portion of said nozzle and extending over the front wall to a point adjacent the work for shielding the portion of a front wall of said shoe adjacent the work from erosion and other wear.

6. In desurfacing apparatus including a protective shoe for a plurality of scarfing nozzles, means for circulating cooling liquid within said shoe, and a wear-resisting surface on the shoe for cooperation with the work, the combination therewith of the improvement comprising a face-plate removably secured to the shoe and enclosing the outer end portions of said nozzles, except the gas discharge orifices thereof, packing around each nozzle accessible from the front for replacement without removal of the shoe and held in place by said face-plate, both the face-plate and shoe being of metal having heat conductivity at least as high as that of nickel.

7. In an apparatus for thermochemical desurfacing metal work, the combination with a protective shoe, of a scarfing nozzle passing therethrough, means for cooling the inside of said shoe, and a face plate removably secured to said shoe covering at least the portions of said shoe outer surface which are subject to erosion around said nozzle, at least one of said shoe and face-plate being of heat-conductive metal, a bolt securing said shoe and face-plate together, wear-resisting metal on an outer surface of the shoe for engaging the work, said bolt being of harder and more wear-resisting metal than said heat-conductive metal, and a wear-resisting bushing within the heat-conductive metal threaded to cooperate with threads on said bolt.

8. In an apparatus for thermo-chemically desurfacing metal work having a nozzle, a block supporting said nozzle and through which gases are supplied to the nozzle, a shoe supporting the outer end portion of said nozzle and secured to forward portion of said block, passages for supplying and withdrawing cooling fluid to and from said shoe, and packing between said shoe and nozzle adjacent the forward part of the nozzle, the combination therewith of the improvement whereby said packing may be replaced without removing said shoe, which improvement includes a forward wall of said shoe having a packing

recess open at the front, a removable compressor for said packing secured to the front of said forward wall, and engaging said packing on the forward side, the packing being compressed between said compressor and by the rear or bottom wall of said packing recess, said removable compressor extending for a substantial area over said forward wall of said shoe and around said nozzle to protect the same against erosion..

9. In an apparatus comprising a plurality of thermochemical desurfacing nozzles, a block in which said nozzles are supported, passages from said block for conveying fuel and oxidizing gas to said nozzles, a liquid cooled shoe secured to said block and enclosing the forward portions of said nozzles, cooling liquid passages in the block for supplying cooling liquid to said shoe and removing such liquid therefrom, packing between the shoe and said nozzles, and a wear resisting pad on said shoe for cooperation with the work, the combination therewith of the improvement for reducing erosive wear of the shoe around and adjacent said nozzles which improvement comprises a removable face plate of heat conductive metal on the portion of the shoe extending from adjacent the work around the nozzles and beyond them in a direction away from the work, and fastening means for said face plate engaging said shoe.

10. In an apparatus for thermochemical desurfacing and removal of metal including a blowpipe nozzle, a water cooled shoe around the portion of the nozzle adjacent the flame end thereof, and packing around said nozzle, and the combination therewith of the improvement for prolonging the life of the shoe by reducing erosion thereof around said nozzle and at the same time rendering said packing accessible for replacement without removal of said shoe, said improvement comprising a wall of the shoe having a recess in an outer face of the shoe around said nozzle for receiving said packing with the packing accessible from the outside of the shoe, and a metal plate around said nozzle having heat conductivity at least substantially that of copper, holding the packing in said recess and clamped against the shoe wall in heat conductive relation therewith.

11. An apparatus according to claim 10 in which the outer surface of said plate is substantially flush with the flame end of said nozzle.

12. Apparatus according to claim 10 in which at least the major portion of the shoe which is in heat conductive relation with the plate being also of at least as good heat conductive material as said plate.

13. The combination with a scarfing nozzle for a desurfacing head, of a protective shoe surrounding a portion of the nozzle having a wall through which the nozzle extends, a removable face-plate secured to the outer side of said wall of the shoe and around the outer end portion of the nozzle, both the face-plate and at least some of the wall of said shoe which is contiguous thereto being of metal, a wear resisting pad on the shoe for cooperation with the work, and supply and outlet passages for circulating cooling liquid within said shoe to carry off heat, said removable face-plate covering that portion of the shoe outer wall which is in danger of erosion and which lies between said nozzle and the side of said shoe next to the work.

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