Feb. 16, 1937. S. O. HANNA 2,071,034

DEVICE TO PREVENT BUCKLING OF SHEET METAL DURING GRINDING OR POLISHING

Filed Aug. 15, 1936

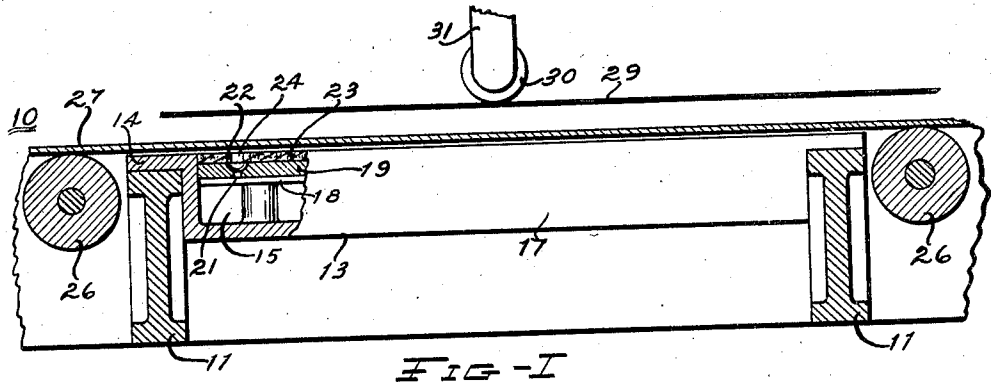


FIG-1

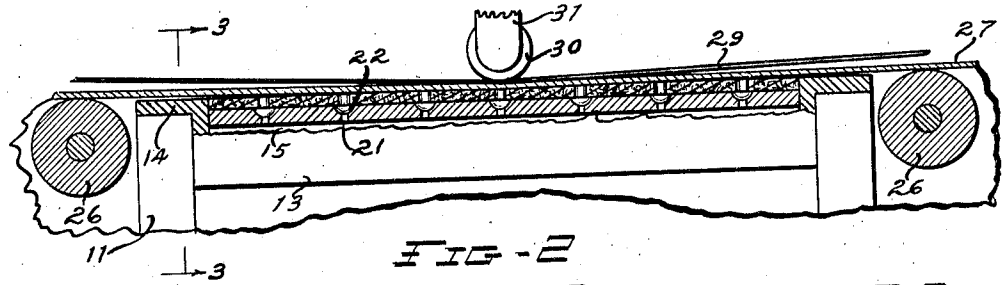


FIG-2

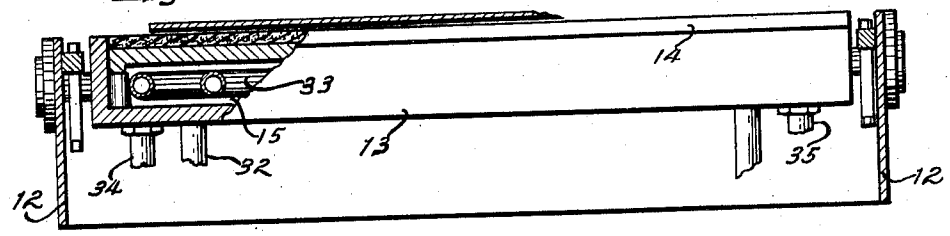


FIG-3

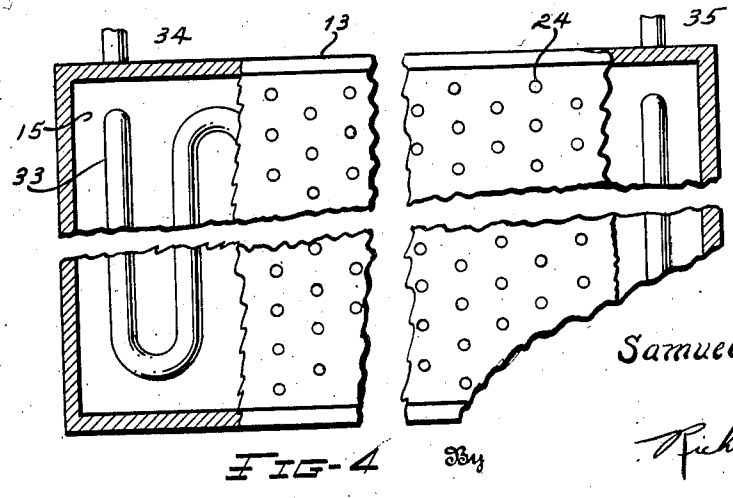


FIG-4

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DEVICE TO PREVENT BUCKLING OF SHEET METAL DURING GRINDING OR POLISHING

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7 Claims. (Cl. 51—240)

This invention relates to a structure for preventing warping or buckling of sheet metal during the process of grinding or polishing the surface thereof.

It is well known that sheet metal, as it is received from the rolling mill, has imperfections or pitted spots in the surfaces. Before the metal can be used for most manufacturing purposes it is necessary that these imperfections or spots be ground or polished out. Various abrading machines have been developed and used for the purpose of eliminating surface imperfections in metal sheets. It has, however, been almost impossible to prevent warping or buckling taking place during the process of clearing a metal sheet of surface imperfections. This is due to the fact that during the process of removing an imperfection, that portion of the surface, in contact with whatever abrasive means is employed, becomes quite hot. The under surface of the metal directly beneath that portion of the sheet being worked upon is considerably cooler and, as a result of this uneven temperature, the sheet tends to buckle or warp.

It is the purpose of the present invention to overcome this undesirable condition in one of two ways. First, to heat that portion of the under surface of the sheet, directly beneath the portion being worked upon, to a temperature approximately the same as the upper surface so that little or no difference in the rate of expansion and contraction of both upper and lower surfaces at a given spot will take place. Second, to cool that portion of the under surface of the sheet, directly beneath the spot that is being polished, to such an extent that heat generated on the upper surface will be rapidly dissipated and the upper surface will, therefore, remain at a temperature approximately that of the under surface and thus warping or buckling is prevented.

In its preferred embodiment the present invention is directed to the provision of a structure adaptable for any abrading machine which may be utilized to spot out imperfections in the surface of metal sheets and consists in fitting the central portion of an abrading machine bed with a liquid filled tank. A perforated cover is located and suitably supported on top of the tank and serves as a work surface for the machine. A suitable moisture absorbent and slightly compressible material forms the upper surface of the cover. Both material and cover are perforated and the liquid in the tank is maintained at a level slightly beneath the upper surface of the material. Any suitable means is provided on the machine for normally holding the metal sheet slightly above and out of contact with the material. When the abrading means is applied to the upper surface of the sheet, said sheet is depressed to contact and in turn compress the material on the cover of the tank to such an extent that the under surface of the sheet is in direct contact with the liquid. Inasmuch as certain metals may more readily be prevented buckling or warping, during the process of spotting out imperfections, by dissipating heat as it is generated, rather than raising the temperature of the under surface to that of the abraded surface, the tank may be provided with both cooling and heating coils, the former being connected with a refrigerating unit, and the latter with a heat generating unit.

The principal object of the invention lies in the provision of means for preventing warping or buckling of a metal sheet during the process of grinding or polishing the surface thereof.

Another object of the invention lies in the provision of means for heating or cooling a given portion of a metal sheet for the purpose of preventing warping or buckling during the process of grinding or polishing a given portion of the surface thereof.

Other and further objects and advantages of the invention will be more fully understood from a consideration of the following specification taken in conjunction with the accompanying drawing and in which

Fig. 1 is a fragmentary side elevational view of an abrading machine bed fitted with one modification of the invention and showing a metal sheet positioned thereabove prior to applying an abrasive to the upper surface of the sheet;

Fig. 2 is a view similar to Figure 1 showing an abrasive surface in contact with the surface of a metal sheet, and the metal sheet in turn depressed to contact the structure of the invention;

Fig. 3 is a vertical sectional view showing the invention in place in an abrading machine bed; and

Fig. 4 is a plan view of the invention, partly in section, showing the unit for cooling or heating the liquid contained therein.

Referring to the drawing and more particularly to Figures 1 and 2 thereof, one modification of the invention is shown applied to a sheet metal abrading machine generally indicated by the reference numeral 10. The machine, only a portion of which is shown, comprises spaced apart uprights 11. Conventional rails 12 extend longitudinally of the machine and are secured to or

mounted on uprights 11 in any conventional manner.

Between the uprights 11 is located a tank 13 which in one form may be provided with horizontal rim flanges 14 that are adapted to rest upon the transverse uprights 11. The present form of the invention shows the tank 13 to have a liquid receiving compartment 15, along the side walls 17 of which are formed overhanging ledges 18. Mounted on these ledges is a suitable cover 19 which fits the contour of the liquid compartment 15 and is slightly below the upper face of flanges 14. The cover 19 is perforated to permit the level of the liquid to be above the upper surface thereof. One form of perforation is shown in the drawing and consists of a plurality of openings 21 connected with enlarged openings 22 in the under face of the cover. Mounted on the cover 19 is a suitable moisture absorbent and compressible material 23. The material is formed with perforations 24 which may optionally coincide with the openings 21 of the cover 19. The upper edge of the material may be flush with the upper face of flanges 14 of the tank 13.

Suitable transverse rollers 26 are mounted between rails 12 adjacent the tank ends and are adapted to support a metal sheet 27. The rollers 26 are arranged to project slightly above the upper surface of the material 23 and, consequently, sheet 27 is normally out of contact with said material. Located above the sheet 27 is an abrading belt 29. This belt is mounted in any conventional manner and may be depressed into spot contact with the sheet 27 by actuating a roller 30 through a structure 31, shown only in part. It will be understood that neither the type of belt 29 nor the roller 30 by which the belt is depressed constitutes a part of the invention inasmuch as any suitably mounted means may be substituted for the roller for this purpose.

The chamber 15 has a liquid inlet port 32 and any conventional overflow means by which to maintain said liquid at a desired level. This chamber is also fitted with tubing 33 which is continuous within the tank between ports 34 and 35. If the metal sheet 27 is such that it is preferable to heat the under surface thereof during the process of spotting out imperfections through use of belt 29, ports 34 and 35 may be connected with any suitable heat generating unit. On the other hand, if it is preferable to cool the under surface of the metal sheet 27, ports 34 and 35 may be connected to a refrigerating unit.

Inasmuch as the invention is utilized in the same manner whether the liquid in the chamber 15 is heated or cooled, only one of these forms of operation will be described. It may be assumed that ports 34 and 35 of the tubing 32 are connected with a steam line and the liquid in the tank is being maintained at a level just beneath the upper surface of material 23. The liquid is heated to approximately 180 degrees. The operator of the abrading machine moves sheet 27 along rollers 26 until an imperfection or pitted spot in the surface of the sheet is positioned over the tank 13. Belt 29, it will be understood, travels continuously in one direction and the operator moves a lever (not shown) for the purpose of lowering roller 30 to depress the belt into contact with the spot to be ground or polished out. Inasmuch as a certain amount of pressure of the abrading surface of the belt on the metal is necessary to properly remove the imperfection, the roller 30 causes the metal sheet 27 to be slightly bowed into contact with material 23 and to in turn compress said material sufficiently so that the under surface of the sheet, directly beneath the roller, is instantly heated to a temperature approximating that of the upper surface of the sheet at this point where heat is generated by contact with the abrasive belt 29. Immediately the operator raises roller 30, sheet 27 raises out of contact with the material 23 and belt 29 raises from the position of Figure 2 to that of Figure 1 of the drawing.

Although applicant has shown and described only one modification of means for heating or cooling a given portion of a metal sheet directly beneath a portion being ground or polished for the purpose of preventing warping or buckling of the sheet during this process, it will be understood by those skilled in the art that other modifications or adaptations of the disclosed structure may be made without departing from the spirit and scope of the invention as defined in the hereunto annexed claims.

Having thus set forth my invention what I claim as new and for which I desire protection by Letters Patent is:—

1. A structure for effecting a temperature change in a metal sheet during application of an abrasive to the surface thereof, comprising a body member, a cover on said member, means normally supporting a metal sheet out of contact with said cover, said body member and said cover together forming a compartment, and further means in said compartment for producing a desired temperature in said cover.

2. A structure for effecting a temperature change in a metal sheet during application of an abrasive to the surface thereof, comprising a liquid contained tank, a cover on said tank, means normally supporting a metal sheet out of contact with said cover, and means for producing a desired temperature of the liquid in said tank and said cover.

3. A structure for effecting a temperature change in a metal sheet during application of an abrasive to the surface thereof, comprising a liquid contained tank, a cover on said tank, rollers adjacent said cover, said rollers being adapted to normally support a metal sheet out of contact with said cover, and means adapted to produce a desired temperature of said liquid and said cover.

4. A structure for effecting a temperature change in a metal sheet during application of an abrasive to the surface thereof, comprising a liquid contained tank, a top on said tank, said top being perforated to permit passage of liquid therethrough, rollers adjacent opposite sides of said top, said rollers being adapted to normally support a metal sheet out of contact with said top and means adapted to produce a desired temperature of said liquid, said liquid being contacted by the metal sheet when an abrasive is applied to the upper surface thereof.

5. A structure for effecting a temperature change in a metal sheet during application of an abrasive to the surface thereof, comprising a rectangular tank, a top or cover set into said tank, moisture absorbent material on said top, the upper surface of said material being substantially flush with the upper edges of said tank, said top and said material being perforated, said tank being filled with liquid to a point slightly beneath the upper surface of said material whereby when said material is depressed by contact with a metal sheet, the under surface of said sheet

will be in direct contact with the liquid of said tank.

6. A structure for effecting a temperature change in a metal sheet during application of an abrasive to the surface thereof, comprising a tank, a top on said tank, moisture absorbent material on said top, said top and said material being perforated, said tank being filled with liquid to a point slightly beneath the upper surface of said material, and means adapted to produce a desired temperature of said liquid, said material, when contacted by a metal sheet, being compressed whereby to dip the under surface of said sheet into the liquid.

7. A structure for effecting a temperature change in a metal sheet during application of an abrasive to the surface thereof, comprising a liquid contained tank, a top on said tank, moisture absorbent material on said top, said top and said material being perforated, means adjacent said tank normally supporting a metal sheet out of contact with said material, the level of said liquid being slightly beneath the upper surface of said material, and means for producing a desired temperature of said liquid, said material, when contacted by a metal sheet during an abrasive operation, being compressed to cause the under surface of said sheet, at the place of abrasive contact, to be dipped into said liquid.

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