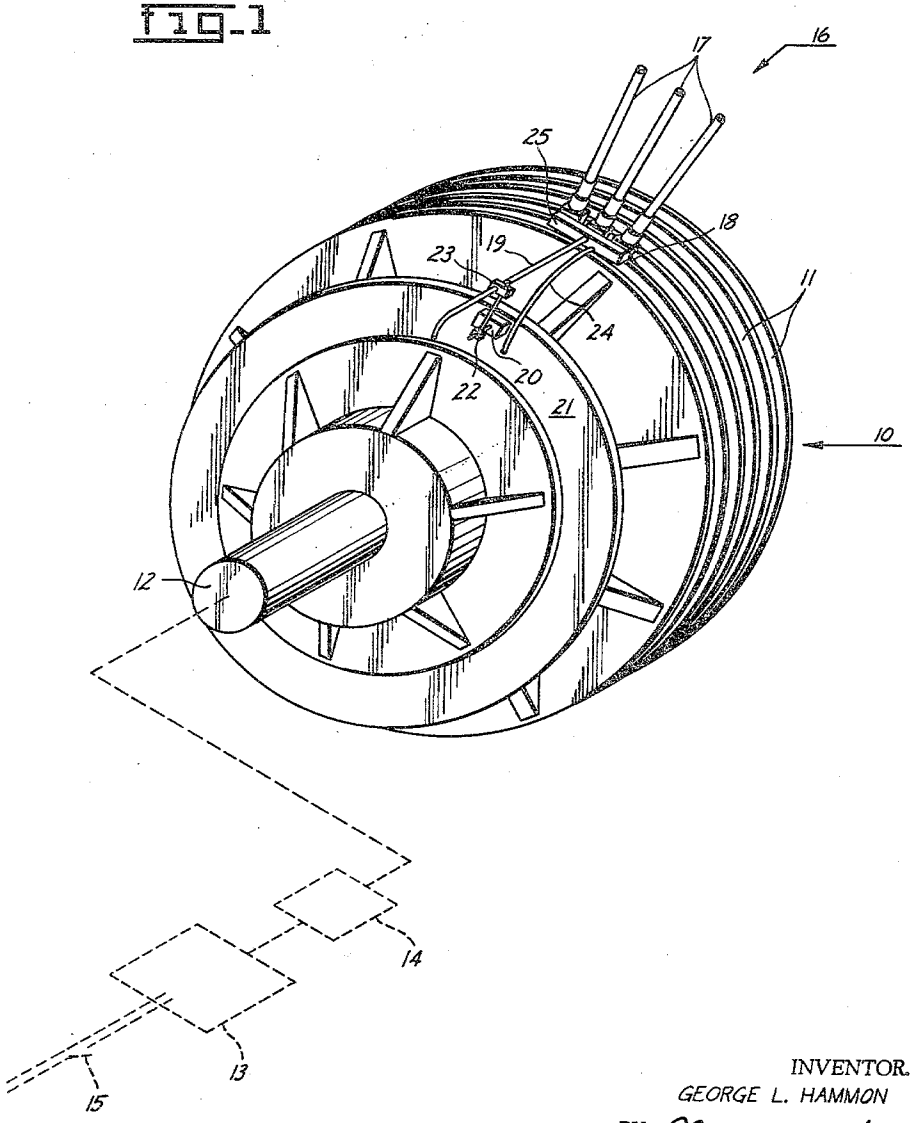
July 6, 1965 G. L. HAMMON 3,193,269

FLAME HARDENING MECHANISM

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Fig. 1



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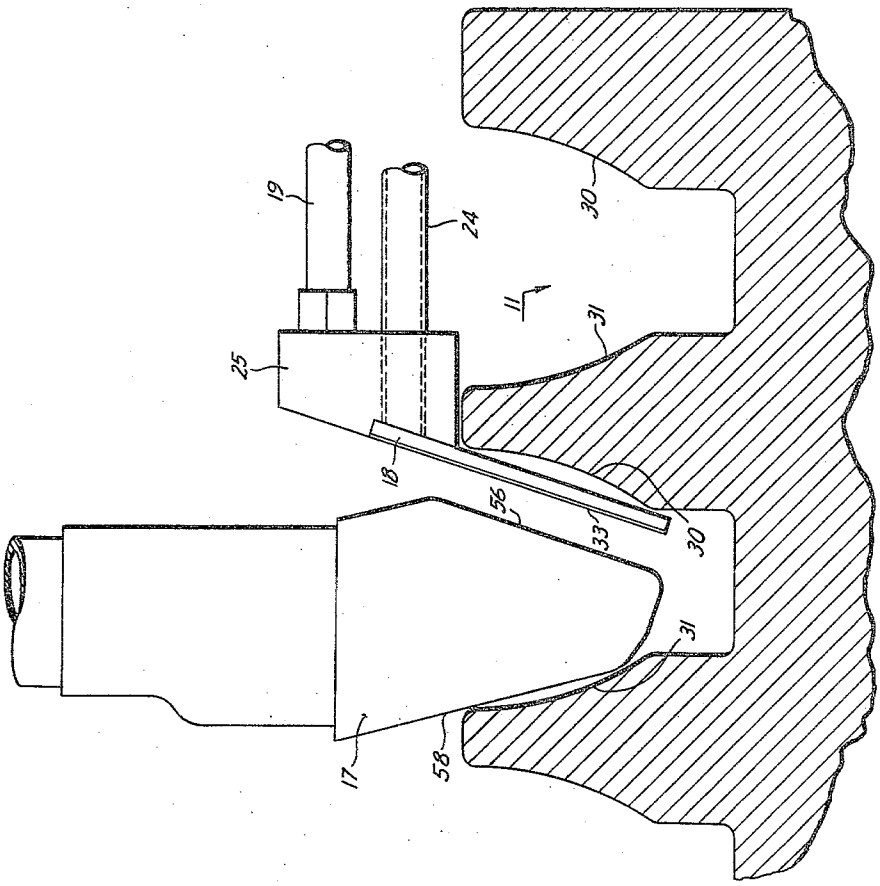


Fig. 2

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FLAME HARDENING MECHANISM

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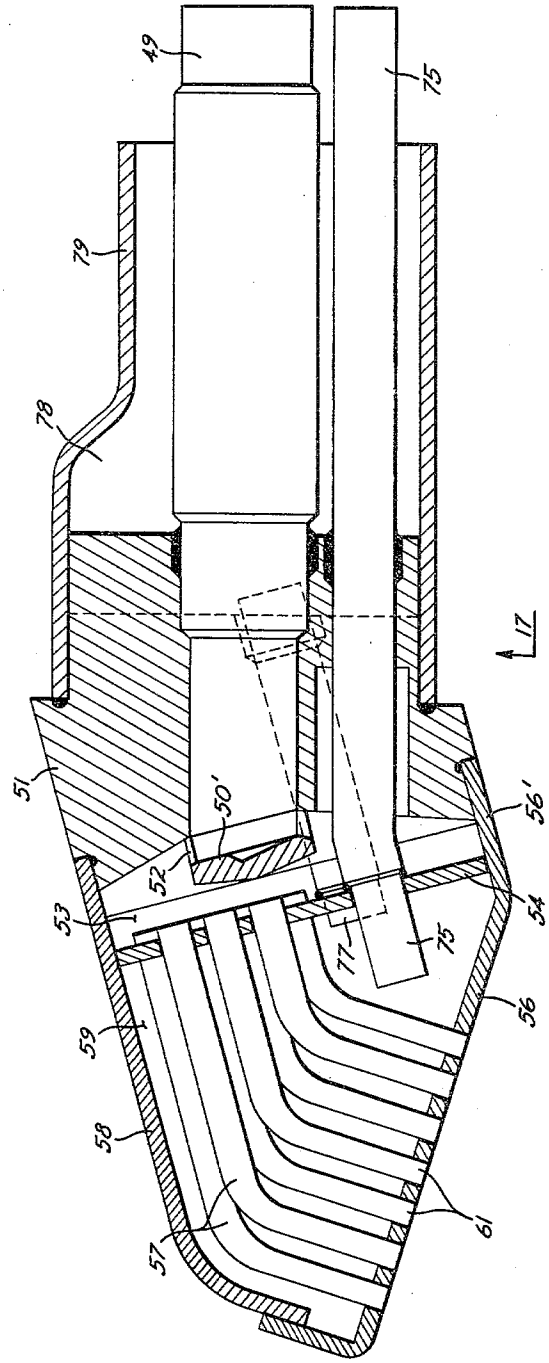


FIG. 3

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FLAME HARDENING MECHANISM

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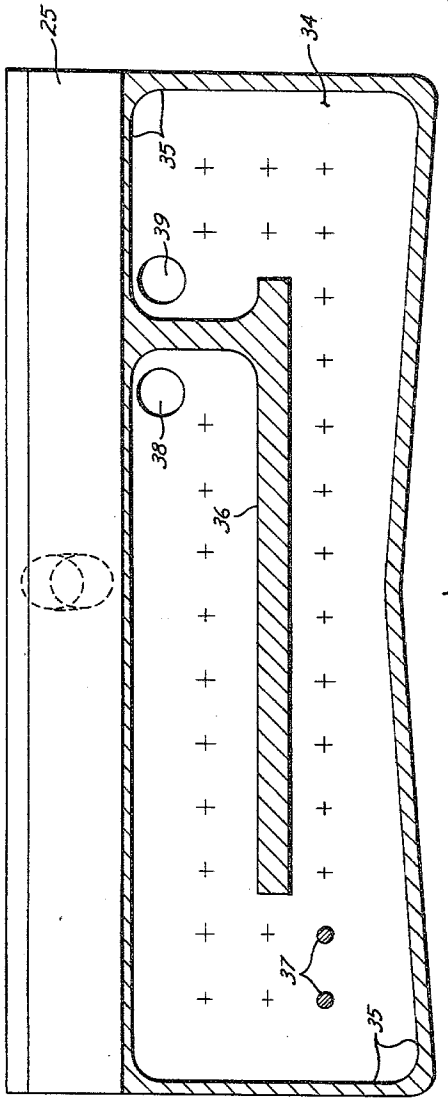


FIG. 4

United States Patent Office 3,193,269 Patented July 6, 1965

3,193,269

FLAME HARDENING MECHANISM

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Filed Nov. 9, 1962, Ser. No. 236,569
4 Claims. (Cl. 266—5)

The invention relates to means for flame hardening surfaces of metallic objects such as the rims of wheels, the working surfaces of sheaves or the like. More particularly the invention concerns means for shielding the object during the ignition and adjustment of the source of flame, and for preventing the flame from coming into contact with an area of wheel, sheave or the like which has already been hardened.

The application of flames to metal for the purpose of rapidly hardening the surface thereof to a selected depth without unduly changing the characteristics of the remainder of the metal has long been understood. One method of attempting to harden a rim on a wheel such as a railway car wheel has been to subject the entire rim of a stationary wheel to a source of flames defined by a plurality of torches surrounding the wheel; however, this method suffers first from the inability to provide all of the surrounding torches with an identical working heat, and also renders the method expensive as well as difficult to control due to the requirement of a great number of torches and attendant supporting equipment such as valves, pressure regulators and sources of combustible gases. Furthermore, practical application of the principle of flame hardening has suffered from the lack of a torch capable of creating sufficient heat to harden the metal to the desired depths; however, with the advent of the water cooled torch such as disclosed in my patent application Serial No. 154,952, filed Nov. 27, 1961 and now abandoned, extreme heat is available over a wide range of temperatures, not previously attainable. Due to the cost of this torch, however, it is desirable to use but a minimum of such torches, mounted in a bank, and to rotate the rim of the wheel, or the walls of a sheave relative to the torches. One problem which arises is the protection of the object to be hardened during the ignition and adjustment of the torch or torches to a desired constant temperature. Another problem is to prevent overlapping the application of heat at the beginning and end of the heated areas since the re-heating of such areas causes pitting, flaking and other deterioration of the heated surface.

Therefore, a main object of the invention is to provide an improved flame hardening mechanism.

Another object is to provide a unitary shelding means for protecting the object to be hardened during the ignition and adjustment of the torch and also for preventing the re-heating of any portion of an object which is rotated relative to a heating torch.

Another object is to provide a shielding means of the character described in which a coolant is circulated therethrough.

Still another object is to separately flame harden the two respective surfaces defining the working walls of a sheave.

Other objects and advantages of the invention will be apparent from the following description, given by way of example only, when read with reference to the drawing in which:

FIGURE 1 is a projection of a wheel having a plurality of sheaves with a flame hardening torch and a shield shown in the initial position of the flame hardening process;

FIGURE 2 is a view, showing a portion of the sheaves

in cross section, with the torch and the shield shown in the same position as shown in FIGURE 1;

FIGURE 3 is a view, in section, of one of the torches used in the flame hardening process; and FIGURE 4 is a view, partially in section, of the heat shield.

A sheave is generally indicated at **10** in FIGURE 1 having a plurality of grooves **11** and an axle having two projecting spindle ends **12**, only one of which is shown. The opposite ends **12** are supported in conventional manner, not shown and the sheave is driven by a motor **13** through reduced gearing **14**. A switch **15** is connected to a source of current and may be closed to drive the sheave one full revolution after which the switch is opened.

Also shown in FIGURE 1 is an assembly **16** comprising three identical torches **17** (FIGURES 2 and 3) which are suitably supported and fixed relative to the sheave in the position shown in FIGURES 1 and 2. A heat shield **18** (FIGURES 1, 2 and 4) is fixed to a tube 19 which is supported by means including a block **20** (FIGURE 1) of magnetizable material removably mounted on a steel flange **21** integral with the sheave. Clamps **22** and **23** are provided for adjusting the position of the shield **18** relative to the magnetic block **20** and sheave **10**.

A source of liquid coolant such as water, under pressure, is connected to the tube **19** by means of a flexible hose. A second tube **24**, connected at one end to the main body portion **25** of the heat shield, is also made of flexible hose, preferebaly of metal, and carries away the water after it is circulated through the heat shield **18**.

In the embodiment shown the heat shield is connected to the sheave by the magnetic block **20**. This arrangement provides for rapid readjustment of the shield relative to the sheave; however, it will be apparent that other devices such as mechanical clamping devices could be used to connect the heat shield to the flange **21** or other suitable areas of the sheave.

The torch assembly **16** comprises three torches **17**. The number of torches used may be varied in accordance with the size of the object to be heat treated, as long as the torches do not extend beyond the heat shield. Since the three torches are identical, the torch assembly is referred to hereinafter as the torch.

Referring to FIGURE 3, the torch **17** is similar to a torch **10** disclosed in my patent application Serial Number 154,952, filed November 17, 1961 and now abandoned, to which reference may be had for a more complete description of the complete torch. In the following description of the torch, reference numerals are used which are identical to those used in the above-mentioned application and, although the configuration of the torch heads is somewhat different in the two applications, the function of the torches in providing great ranges of controlled heat is otherwise identical. FIGURE 3 shows a portion of the main body **79** connected to a second body portion **51**. A tube **49** supplies a mixture of combustible gases, under the control of valves and manometers, not shown, to the torch head. The gases flow through apertures **52** in a cap **50'** and into a chamber **53**. The chamber is formed by a plate **54**, a plate **58**, a bent extension **56'** of a face plate **56**, and opposite side walls **59**, only one of which is shown. From the chamber **53** the gases flow through a plurality of rows of tubes **57** which are arranged in rectangular array and the gases are emitted at the exterior surface of the face plate **56**. In the present embodiment, the ends **61** of the tubes are arranged parallel to each other to provide an even flame over a predetermined area of an object placed opposite the flame.

Since the flame which is produced is capable of melting the metal of which the torch head is made, the following arrangement is provided to protect the torch. Water,

under pressure, is pumped through a tube **75** and into a chamber bounded by the plates **56**, **58** and **59**, which chamber surrounds the tubes **57**. Water circulates around the tubes and against the walls of the chamber at a rate of flow sufficient to prevent the deterioration of the torch head otherwise due to over-heating of the same. A tube 77 is provided to discharge water from the chamber described into a chamber **78** formed within body portion **79** to thereby cool the latter. Suitable means, not shown, are provided to carry the water away from the chamber **78**, reference being had to the previously mentioned application for a complete description of the torch.

The grooves **11** (FIGURE 1) each comprise a pair of opposite side walls **30** and **31** (FIGURE 2) only one of which is flame hardened at a time.

In the position of the parts shown in FIGURE 2, the face plate **56** of torch **17** faces wall **30**, with the shield **18** interposed therebetween, and the opposite plate **58** of the torch lies closely adjacent the wall **31**. In this manner the torch may apply heat only to the one wall **30** since the back side of the torch effectively blocks flames from wall **31**, the flames escaping upwardly and outwardly from between the torch and the wall **30**, or over the heat shield **18** when the shield is in the position shown in FIGURE 2.

The heat shield (FIGURE 2) includes the body portion **25** and a shielding portion **18**. The latter comprises a front plate **33**, normally welded to a water jacket **34**, but which plate **33** has been removed as shown in FIGURE 4.

The water jacket is made from a solid piece of heat conducting metal such as aluminum with the interior portion milled away to produce four continuous side walls **35** and an interior baffle **36**. Spacer stops **37**, connected between the jacket **34** and the front plate **33**, are located at intervals within the water jacket and are provided to prevent collapse or buckling of the shield **18** when exposed to the extremely high temperature heat of the torch. Water, under pressure is pumped through the tube **19** (FIGURE 2) and into the main body portion **25** which is hollow. From there the water flows through an inlet hole **38** (FIGURE 4) in the water jacket and flows in a general counterclockwise direction around the baffle **36** to an outlet hole which is in direct communication with the outlet pipe **24** (FIGURE 2). For this purpose the pipe **24** passes completely through the body portion **25** to connect with the outlet hole **39**. Thus, a path of flow is provided for the water, or other coolant which is pumped continuously through the heat shield.

In the initial position of the parts shown in FIGURES 1 and 2, the trailing edge of the shield, which is the rightmost end as seen in FIGURE 1, is located on an index point, scribed, or otherwise marked on the sheave **11**. With the coolant being pumped through the heat shield, the torch **16** is ignited and adjusted to a predetermined operating temperature. During this adjustment of the torch, the shield **18** protects the wall **30** and prevents the heating and pitting of the wall which occurs when no heat shield is present. The switch **15** is then closed to cause the motor to drive the spindle **12** and the sheave **10**, the arrangement being that the motor drives the sheave in a counterclockwise direction. The sheave and the shield, attached thereto, are rotated relative to the torch, the flexible tubing connected to the shield permitting movement of the shield while coolant is continuously pumped therethrough. The motor drives the sheave at a constant rate and the torch flame hardens the wall of the sheave opposite the torch as the sheave rotates.

When the sheave has rotated to a position where the shield is past the flame of the torch, the shield is removed from the sheave. The flame hardening process continues, the shield being laid aside until the index point on the sheave is rotated approximately 300° from the starting

position. The shield is then replaced on the sheave, while the flame hardening process continues, with the leading edge of the shield (the leftmost end as seen in FIGURE 1) being located on the index point of the sheave. Such relocation of the shield permits the portion of the wall previously covered to be flame hardened, while preventing the re-heating or hardening of the wall which has already been hardened. After such hardening is completed, the shield is again located opposite the torch, whereupon the torch is extinguished and the motor switch is opened.

It will be observed that the length of the shield is not critical, the main requirement being that it be of sufficient length to protect the sheave during the ignition and adjustment of the torch. With this requirement in mind, the shield is usually made longer than the length of the torch, and in those cases where a torch of lesser length is used, the same shield may be used.

I claim:

1. A machine for flame hardening the continuous periphery of a circular metallic object comprising, in combination with means for rotatably mounting said object,

(a) a torch,

(b) means for holding the torch in a fixed position,

(c) means for rotating said object relative to the torch to flame harden a continuous peripheral surface area of the object,

(d) a shield to prevent a torch flame from contacting said object, and

(e) means for detachably fixing said shield in a first and a second position on said object for rotation therewith,

said shield being operable in the first fixed position to prevent said torch flame from contacting a first selected area of the object and being operable in the second fixed position to prevent said torch flame from contacting a previously flame treated area of the object.

2. A flame hardening machine as defined in claim **1** including means for rotating the object at a constant rate relative to the torch.

3. Means for flame hardening a selected one of a pair of side walls of a sheave or the like comprising;

(a) means for rotating the sheave about its axis,

(b) a flame hardening torch having a heating head of such configuration that a plurality of flames are directed at only one side wall of the sheave,

(c) means for holding the torch head in a selected fixed position relative to the sheave throughout 360° of rotation of the sheave,

(d) a shield which is detachably secured to the sheave prior to igniting the torch and which shield is located between the torch and said selected wall of the sheave to deflect flames from said sheave,

(1) said shield having a leading edge and a trailing edge as defined by the direction of movement of the shield and sheave relative to the torch,

(2) and said trailing edge being aligned with an index point on said sheave,

(3) said shield moving with the sheave out from beneath the ignited torch to permit flame hardening of the selected wall during rotation of the sheave and

(4) said shield being capable of being detached from said sheave during the hardening process and being re-attached with the leading edge of the shield coinciding with said index point prior to completion of 360° of movement of the sheave to thereby prevent re-hardening of any portion of said wall, but permitting hardening of the entire wall.

4. A flame hardening means as defined in claim **3** in which the torch head is so shaped that the side of the head opposite the flame emitting side is contoured to lie closely

adjacent the sheave wall which is not being hardened and to thereby protect said latter wall from flames.

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