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METHOD OF SURFACE HARDENING

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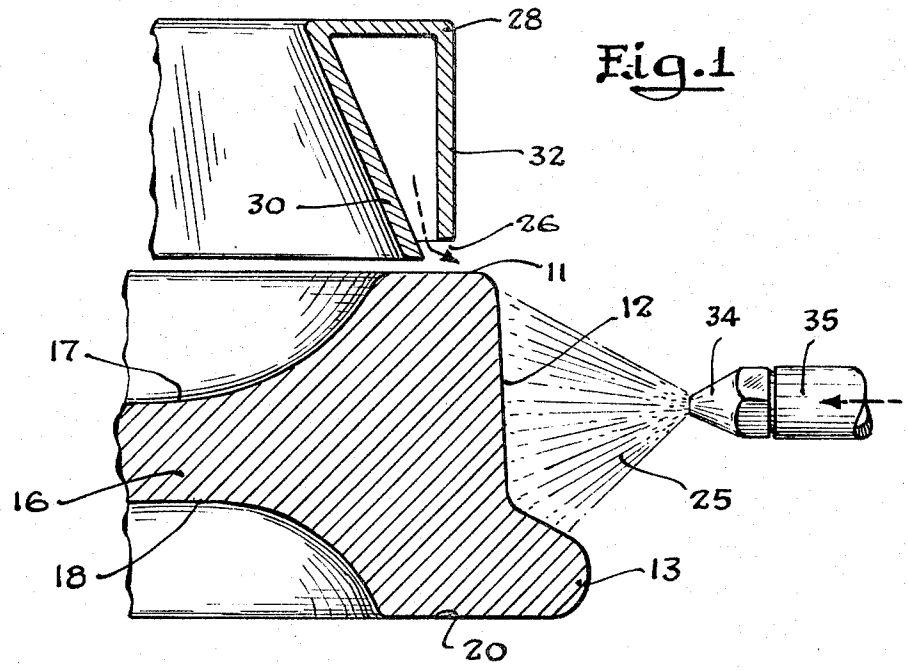
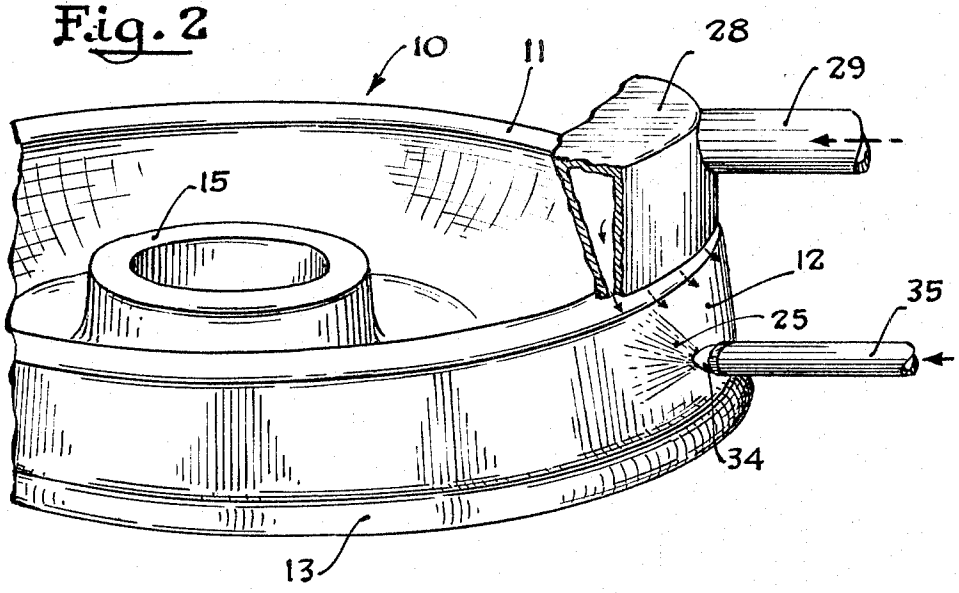


Fig. 1

Fig. 2



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METHOD OF SURFACE HARDENING

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This invention relates to a method of surface hardening selected portions of metal objects.

The invention is particularly useful in the heat treatment and the attendant quenching of selected areas of large metal objects such as gears, rollers, wheels or the like. In many applications, heat treatment and quenching must be conducted with extreme care, in order to assure that the proper mechanical properties, from a metallurgical standpoint, are presented only over selected areas of an object. For instance, the tread and plate areas of a railroad car wheel have different requirements; and in a railroad car wheel this restricts the quenching medium to the tread so that at least the plate of the car wheel is free of a quench. Accordingly, the primary object of the present invention is to enable selective portions of a metal object to be surface hardened by a facile technique easily employed in commercial practice.

According to a more specific object of the invention, a quenching medium is applied to the area to be hardened and a barrier stream of air or the like is directed across another area and toward the quenching medium to prevent movement of the quenching medium onto the other area. Another object of the invention is a method of selectively quenching the flange, tread and front rim face of a railroad car wheel by a technique which eliminates the requirement for mechanical shields in order to prevent quenching of the plate of the railroad car wheel by a quenching fluid.

Under a more specific object of the invention, a first quenching fluid is directed against the tread and flange of the railroad car wheel while a second quenching fluid is directed across the horizontally positioned front rim face and toward the tread to act as a barrier layer against movement of the first quenching fluid across the front plate surface.

A further object of the invention is a new improved production method of selectively quenching only the flange, tread, and front rim face of a railroad car wheel by directing a water stream against a selected portion of the tread and flange while an overhead air stream is directed across the front rim face to quench the front rim face and to afford a barrier layer to prevent the quenching water stream from moving upwardly over the front rim face and onto the plate portion of the car wheel.

Other and further objects of the present invention will be apparent from the following description and claims and are illustrated in the accompanying drawing which, by way of illustration, shows a preferred embodiment of the present invention and the principles thereof and what is now considered to be the best mode contemplated for applying these principles. Other embodiments of the invention embodying the same or equivalent principles may be used and structural changes may be made as desired by those skilled in the art without departing from the present invention and the purview of the appended claims.

In the drawings:

FIG. 1 is a sectional view showing separate fluid streams directed on the tread and front rim face, according to the preferred embodiment of the invention; and

FIG. 2 is a perspective view of a railroad car wheel having a portion thereof being quenched by two fluid streams according to the preferred embodiment of the invention.

Referring now to the drawings, and more particularly to FIG. 2, for purposes of illustration of the present invention, there is shown a conventional cast steel railroad car wheel **10** having a front rim face **11**, a tread **12** and a flange **13**. The front rim face **11**, tread **12** and flange **13** are the selected surfaces which are to be surface hardened to withstand wear. Conversely, it is not desirable to quench that portion of the car wheel interconnecting the rim of the car wheel and a hub **15**, this portion of the car wheel being commonly termed a plate portion of the car wheel.

As best seen in FIG. 1, a plate portion **16** of the car wheel **10** has an upper or front plate surface **17** extending from the hub **15** to the front rim face **11**, and has a lower or back plate surface **18** extending from the hub **15** to a back rim face **20** adjacent to the flange **13** of the car wheel. It is undesirable from a metallurgical standpoint to permit the quenching fluid to reach either the front plate surface **17** or the back plate surface **18**, since such quenching could cause, among other things, cracks in the plate section, undesirable stress patterns in the plate section, and undesirable hardened areas, which can cause trouble in service.

Preferably, although not limited thereto, the car wheel **10** is mounted horizontally with the flange **13** being down as seen in FIGS. 1 and 2. This position of the car wheel is preferred because of the handling equipment, likely to be employed, works best with the car wheel in this position. A stream of first quenching fluid **25**, preferably a water spray, is directed against the tread **12** and a portion of the flange **13**, so that the water flows down the tread and over the surface of the flange **13** to give the tread and flange sufficient quenching. The present method also employs a second stream or barrier stream **26** directed against the front rim face **11** so as to sweep thereacross and to serve as a barrier layer against the quenching fluid **25** moving up and across the front rim face **11** toward the front plate surface **17**.

In the preferred embodiment of the invention, the second stream **26** is also a quenching fluid stream, preferably an air stream, directed from an arcuate air duct **28**. That is, the second stream **26** may be a stream whose important function is to afford a barrier layer and which may only incidentally afford a second quenching medium. The air duct **28** receives air from an inlet pipe **29** and has a longer rearward wall **30** extending obliquely downward and forward towards the tread **12** so as to direct the air stream toward the water stream **25** attempting to move onto the front rim face **11** and plate surface **17**. The air duct **28** also has a generally vertical front wall **32** which extends downwardly to a lesser degree than the obliquely extending wall **30** so that the air stream **26** is directed under the wall **32** and across the rim surface **11** towards the water stream **25**, which is issuing from a water nozzle **34** secured to a water pipe **35**. In actual practice, a water stream **25** of 80 p.s.i. and an air stream issuing from a blower rated at 10 ounces of pressure have given satisfactory results. The wheel **10** is at a relatively high temperature compared to ambient air temperature so that the quenching fluids rapidly cool the portions of the car wheel **10** being quenched to cause a metallurgical change in properties of the quenched portions, particularly the forming of a harder surface on the quench areas as compared to the non-quenched areas. The railroad wheel **10** is in actual practice quenched in its "as cast" condition, that is, without having been machined prior to quenching.

While the water stream **25** and air stream **26** are shown as quenching only a relatively small portion of the wheel, it is within the purview of the present invention that the air stream **26** and water stream **25** be directed against the entire periphery surface of the rim face **11**, tread **12** and

flange **13** merely by providing annular air ducts **28** and water nozzles **34** to quench the entire front rim **11**.

Also, it is contemplated that the stream of second quenching fluid may be a liquid, for example, water, rather than an air stream. The water stream **26** would be directed, as the air stream **26** is directed, to provide a barrier against the quenching fluid **25** from moving toward the plate surface **17**.

From the foregoing, it will be seen that the present method of surface hardening selected areas of an object eliminates the necessity of mechanical shields or other devices, and advantageously employs two different streams of quenching fluid directed in a specific manner against the object so as to prevent either of the quenching fluids from reaching other portions of the object and causing undesirable stresses or hardness in these other portions. Thus, while a railroad car wheel is shown and described as having its tread and rim selectively hardened, it is to be understood that the invention is not limited to selective hardening of railroad car wheels but can be employed advantageously in the hardening of selected surfaces of gears, rollers or other objects.

Hence, while preferred embodiments of the invention have been described and illustrated, it is to be understood that they are capable of variation and modification, and I therefore do not wish to be limited to the precise details set forth, but desire to avail myself of such changes and alterations as fall within the purview of the following claims.

I claim:

1. The method of selectively quenching a tread and a portion of the front rim face and flange of a preheated railroad car wheel, said method comprising: the steps of positioning the preheated railroad car wheel in a horizontal position with the flange thereof positioned downwardly, applying a liquid quenching medium to the tread of the car wheel, said quenching medium moving across the flange of the car wheel and moving across the front rim face of the car wheel, and directing a gaseous stream across the front rim face of the car wheel to form a barrier to prevent the liquid quenching medium from flowing onto the plate of the car wheel.

2. The method of claim **1** including the step of simultaneously directing said stream of gas in an annular configuration about the annular front rim face.

3. The method of claim **1** wherein said liquid quenching medium is water applied at about 70 p.s.i. against the tread of the wheel and wherein said gas is air applied at about 10 ounces of pressure.

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