Nov. 22, 1955 T H SPENCER 2,724,394

QUENCHING DEVICE FOR HEAT TREATING AND QUENCHING SYSTEMS

Filed July 23, 1953 3 Sheets-Sheet 1

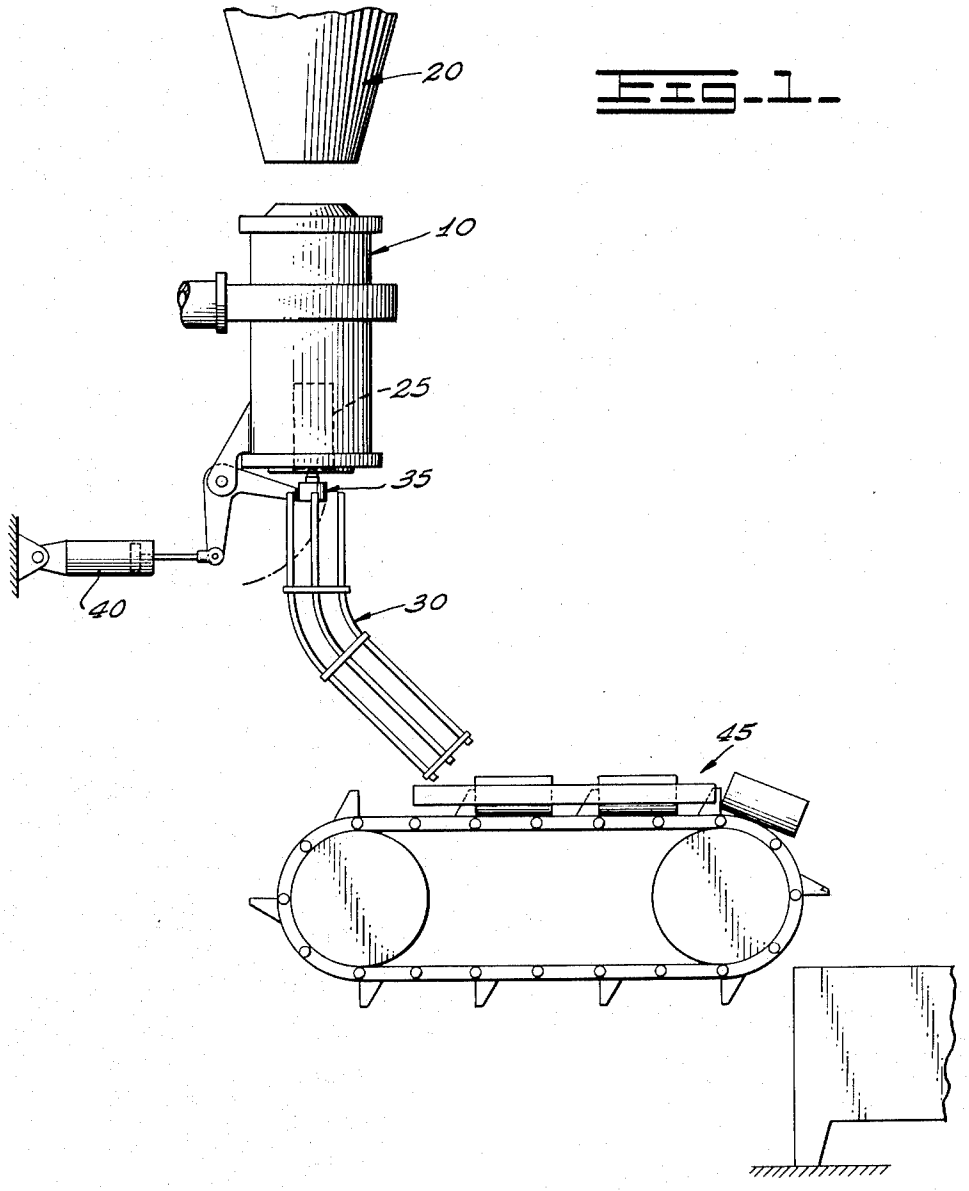


FIG. 1

INVENTOR.
T H Spencer
BY
Charles M. Fryer
Attorney

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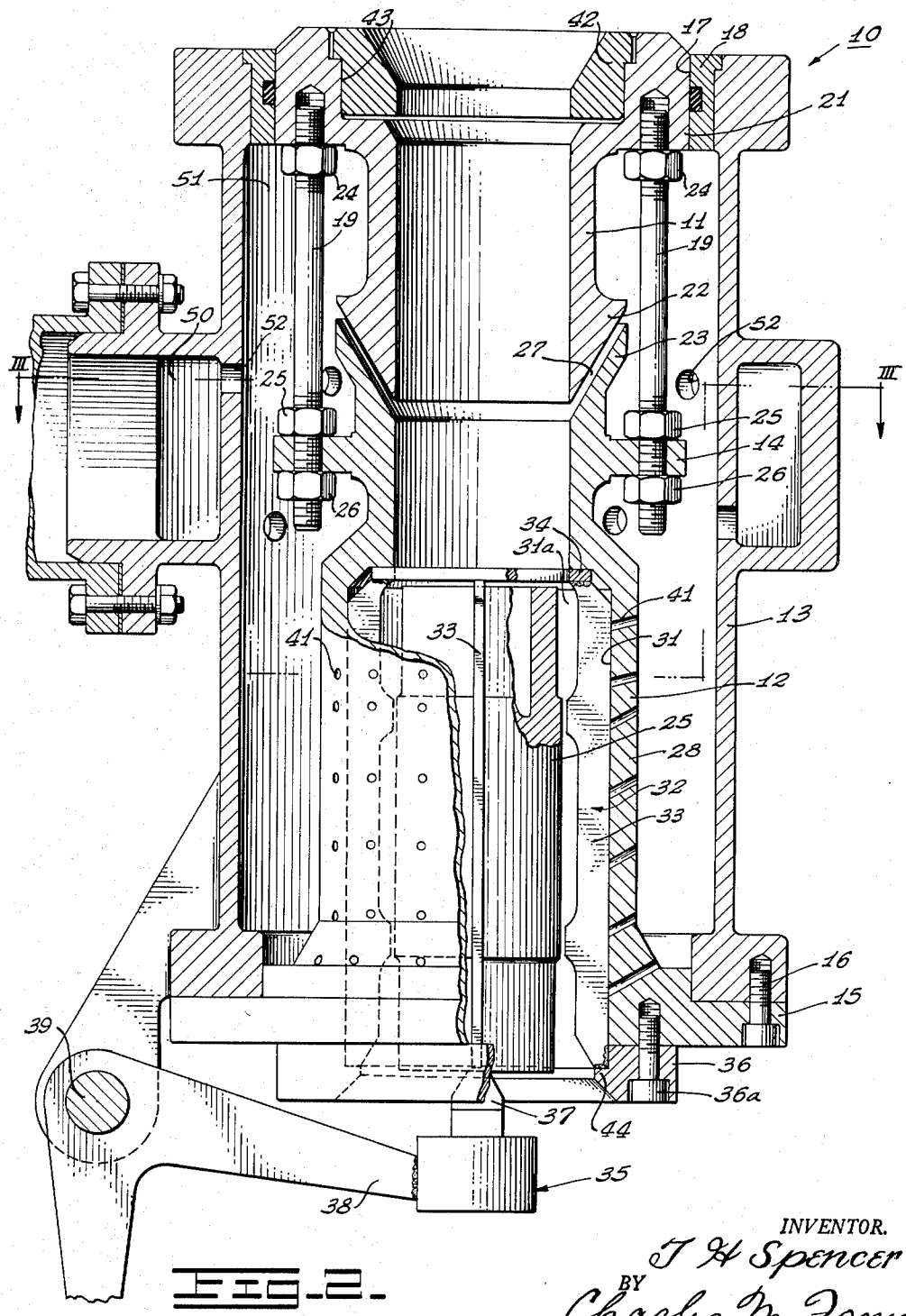


FIG. 2.

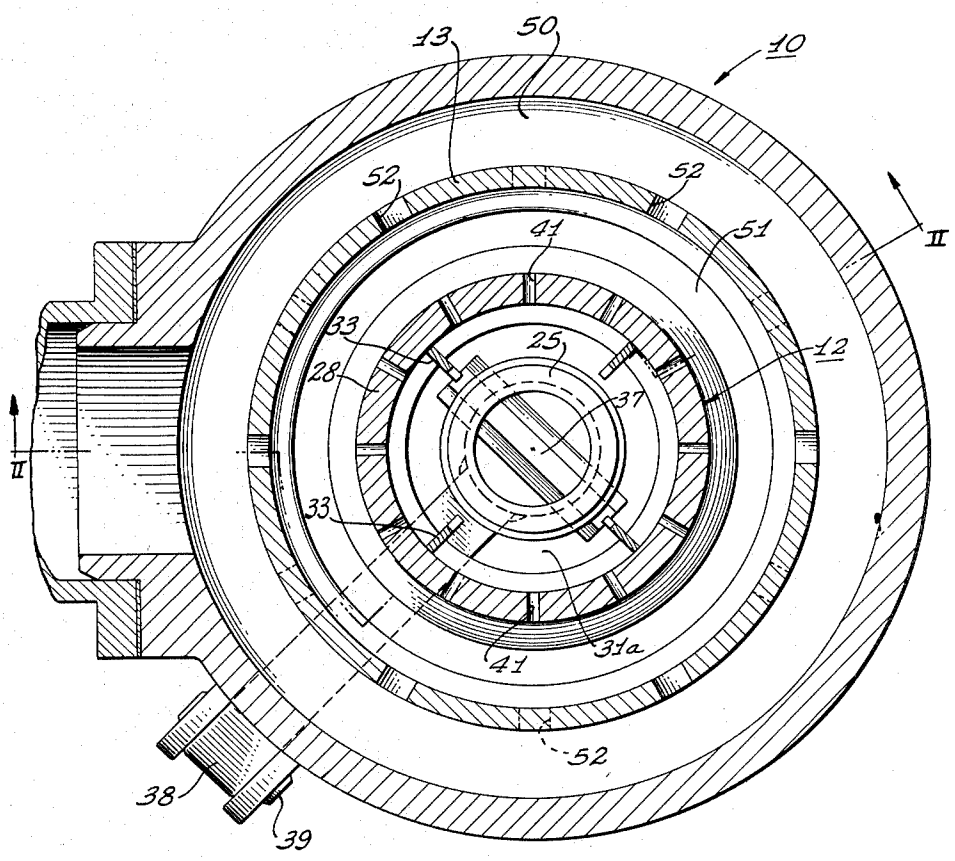
INVENTOR.
T. H. Spencer
BY
Charles M. Fryer
Attorney

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QUENCHING DEVICE FOR HEAT TREATING AND QUENCHING SYSTEMS

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FIG-3-



INVENTOR.
T H Spencer
BY
Charles M. Fryer
Attorney

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QUENCHING DEVICE FOR HEAT TREATING AND QUENCHING SYSTEMS

T H Spencer, Peoria, Ill., assignor to Caterpillar Tractor Co., Peoria, Ill., a corporation of California

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3 Claims. (Cl. 134—105)

This invention relates generally to an improved system for heat treating and quenching cylindrical members such as bushings for track rollers of track type tractors, and more specifically to a new and improved quench tube for use in such heat treating and quenching arrangements.

In quenching arrangements in common use the quench tube is usually positioned below the discharge opening of a conventional heating element to receive the heated cylindrical member and the quench tube is usually furnished with an upstanding spray nozzle provided with locating fins, to center said cylindrical member within said quench tube. Water or other suitable quench fluid is injected into said quench tube through a passage in the bottom closure plate of a water jacket surrounding said quench tube and is caused to flood the internal and external areas of the cylinder by a vertical upward flow of quench fluid thereby. Suitable orifices are provided in the quench tube wall to provide free passage of quench fluid therethrough. Upon completion of the quenching cycle the cylindrical member is ejected through the top opening of said quenching tube and means is usually provided for deflecting the quenched bushing into a suitable hopper or bin positioned to one side of said arrangement.

The principal disadvantage of the above arrangement is that stagnant areas are created in the quench tube thereby causing a variation in the final hardness of the heat treated member.

It is therefore, a principal object of this invention to provide a heating and quenching arrangement comprising a quenching element that receives the heated member through the top portion thereof; means for detaining the heated member in the quench chamber during the quenching cycle thereof; and means for ejecting said quenched member through the bottom portion of the quench tube after the quench cycle is completed; and wherein the quench water is directed downwardly upon all surfaces of said heated member, and a controlled discharge port is provided for permitting a desired flow therethrough; thereby maintaining a desired level of quench fluid within the quench chamber and allowing a steady flow of quenching fluid past the heated member and eliminating any collection of stagnant quench.

Another object of this invention is the provision of a deflecting, grated trough which directs the quenched bushing member outwardly of the falling quenching fluid upon completion of such quenching cycle to retain a controlled degree of residual heat within said bushing to permit a desired stress relief condition. Further and more specific objects and advantages and the manner in which these objects are accomplished will appear in the following specification wherein reference is made to the accompanying drawings.

In the drawings:

Fig. 1 is a schematic view of a heat treating and quenching installation embodying the invention and showing the arrangement of the various components thereof;

Fig. 2 is a longitudinal section taken substantially along the lines II—II of Fig. 3 with parts broken away to show the details of the new quench tube; and

Fig. 3 is a horizontal section taken through the quench tube substantially along the lines III—III of Fig. 2.

With reference to Fig. 1 the new quench tube generally indicated at **10** is disclosed as being positioned below the discharge opening of a heating element of any of the well known types generally indicated at **20**. A curved, grated trough **30** is arranged to receive heat treated members such as cylindrical bushings upon completion of the quenching cycle. Upon completion of a heating cycle in the element **20** a heated member such as a bushing **25** will drop into said quench tube **10** and be held therein by a movable stop assembly **35** during the quenching cycle thereof. After a controlled time cycle, a pneumatic piston **40** will be actuated to swing said stop assembly **35** in a clockwise direction to permit the quenched bushing to drop into grated trough **30** which directs said bushing away from the path of the falling quench water to retain a desired amount of residual heat in the bushing for stress relieving as the bushing is directed onto a conveying means **45** or into suitable storage receptacles.

In Fig. 2 the quenching element **10** is disclosed as comprising a receiving tube **11** and a quenching tube **12**, in axial alignment, disposed within a housing **13**. An enlarged flange portion **15** of quench tube **12** underlies the lower end of housing **13** and is secured thereto as by capscrews **16**. A flange **21** of receiving tube **11** is adapted for sliding engagement with a bore **17** of a bushing **18** carried in the upper end of housing **13**. A conically shaped lower end portion **22** of receiving tube **11** is retained in spaced relationship with a matching conically shaped female top portion **23** of quench tube **12** as by a plurality of studs **19** adapted for threaded engagement with the lower side of flange **21** and extending through bores provided in a flange **14** integral with quench tube **12**. A plurality of nuts **24**, **25** and **26** are provided whereby it is possible to make fixed adjustments to the spaced relationship between tube **11** and tube **12** which will be effective to vary the size of conical shaped orifice **27** formed between said tubes.

Quenching tube **12** is shown as comprising an enlarged cylindrical portion **28** having a bore **31** defining a quench chamber **31*a*** adapted to receive a guide assembly generally indicated at **32**; the purpose of which will subsequently be described. Said guide assembly comprises a plurality of upstanding, radially disposed vanes **33** integrated into a single insertable member as by an upper ring **34** and a lower ring **36** both welded to the vanes. Capscrews **36*a*** are utilized to secure said guide assembly to the lower face of quench tube **12**.

A multiplicity of radially disposed orifices **41** are formed in the wall of cylindrical portion **28** of quench tube **12** for purposes to be described.

Stop member **35** is disclosed as comprising a stop bar **37** carried on one arm of a bellcrank **38** pivotally secured intermediate its ends, to housing **13** as indicated at **39**. Upon the extension of piston **40** bellcrank **38** will rock in a counter-clockwise direction about pivot **39** and position stop bar **37** beneath chamber **31*a*** to support the bushing to be quenched.

Quenching fluid under pressure is constantly supplied to quenching element **10** from an external source, not shown. It enters an annular chamber **50** embracing housing **13**, and flows through ports **52** to a reservoir **51** formed between the housing **13** and tubes **11** and **12**. Fluid from reservoir **51** is directed downwardly toward the central portion of chamber **31*a*** through the conical orifice **27** and radially toward the center of chamber **31*a*** through orifices **41**. The fluid is discharged through the

lower end of the quench chamber through a bore defined by a flange **44** of ring **36**.

In operation a heated bushing **25** is dropped from heating element **20** upon completion of the heating cycle thereof through a conical opening in a director ring **42** retained within a recess **43** of receiving tube **11**. This guides the bushing through the receiving tube into the quench where stop bar **37** holds it in the quench chamber as best disclosed in Fig. 2. When a bushing is in contact with stop bar **37** a controlled discharged opening is defined by the outer diameter of bushing **25** and the inner diameter of flange **44** of ring **36** to retard the flow of discharged quench fluid from the area surrounding the bushing. Stop bar **37** also restricts the discharge of quench fluid from the inside diameter of the bushing during the quenching cycle. The dimensional characteristics of flange **44** and stop bar **37** present sufficient restriction to the discharging fluid to maintain a level of turbulent quench fluid that will immerse the entire inner and outer surfaces of the heated bushing during the quenching cycle.

By controlling the vertical adjustment between conically shaped male portion **22** and conically shaped female portion **23** of tubes **11** and **12** respectively, the quantity of quench directed toward the inside of the bushing can be adjusted as desired and the resulting cone shaped flow of quench water converging centrally of the bushing will insure a steady flow of quench fluid along the entire inner surface of the bushing.

The orifices **41** are shown as being inclined inwardly and downwardly at the uppermost portion of the quenching chamber and more steeply inclined toward the bottom of the chamber as shown in Fig. 2. This varied inclination provides a desired flow of quench water to the outer surface of the bushing. Quench water introduced through the upper orifices **41** will absorb more heat than that introduced through the lower ones because it travels farther before being expelled at the bottom of the quench tube. Thus the steeper inclination of the lower orifices will tend to speed up the flow of warmed quench fluid and maintain a relatively constant temperature of quench in contact with the bushing throughout its entire length to insure uniformity of hardness on the finished part.

Upon completion of the quenching cycle, piston **40** is actuated to release the bushing into the grated trough **30** upon which it moves by gravity from beneath the quench area as previously described.

In the system disclosed, all quench fluid flows in a downward path over all the surfaces of the heated bushing and the discharge of the quench fluid is controlled to such a point that all surfaces of said bushing will be contacted by a supply of cool quench. Furthermore, due to the constantly moving supply of fluid, air pockets are eliminated; thereby developing an even degree of hardness throughout the entire surface of both the internal and external walls of said heat treated bushing.

I claim:

1. In a quench fixture for quenching heat-treated bushings or the like, a substantially continuous tubular member, comprising a receiving portion and a relatively enlarged quench chamber, a plurality of radially positioned downwardly disposed ports in the wall of said quench chamber, means to direct jets of cool quench through said ports about the outer surface of a bushing when it is retained in said quench chamber, a conically shaped orifice formed between adjacent ends of said receiving portion and quench chamber for directing a quench spray into the inside of said retained bushing, and a stop member interposed in the discharge opening of said quench chamber forming at least a partial restriction to the discharge flow of quench and maintaining a bath of quench water made turbulent by said jets of quench.

2. In a quench fixture for quenching heat-treated bushings or the like, a substantially continuous tubular member, comprising a receiving portion and a relatively enlarged quench chamber, a plurality of radially positioned downwardly disposed ports in the wall of said quench chamber, means to direct jets of cool quench through said ports about the outer surface of a bushing when it is retained in said quench chamber, some of said ports being in the upper portion of the quench chamber and inclined at a slight downward angle and some in the lower portion of the chamber being inclined at a steeper angle to increase the rate of discharge flow of the quench fluid from the upper portion of said quench chamber, and a stop member interposed in the discharge opening of said quench chamber forming at least a partial restriction to the discharge flow of quench and maintaining a bath of quench water made turbulent by said jets of quench, said stop member also acting to retain said bushing within the quench bath and means to move the stop member periodically to permit discharge of the bushing and release of the quench bath.

3. In a quench fixture for quenching heat-treated bushings or the like, a substantially continuous tubular member, comprising a receiving portion and a relatively enlarged quench chamber, a plurality of radially positioned downwardly disposed ports in the wall of said quench chamber, means to direct jets of cool quench through said ports about the outer surface of a bushing when it is retained in said quench chamber, some of said ports being in the upper portion of the quench chamber and inclined at a slight downward angle and some in the lower portion of the chamber being inclined at a steeper angle to increase the rate of discharge flow of the quench fluid from the upper portion of said quench chamber.

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