# United States Patent [19]

**Coleman**

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[54] **BAR QUENCH FIXTURE**


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[52] **U.S. Cl.** ..... **266/6 S,** 134/122, 134/199

[51] **Int. Cl.** ..... **C21d 1/62**

[58] **Field of Search** ..... 266/4 S, 6 S, 8; 164/283, 282, 281, 82, 83, 89; 134/64, 122, 199



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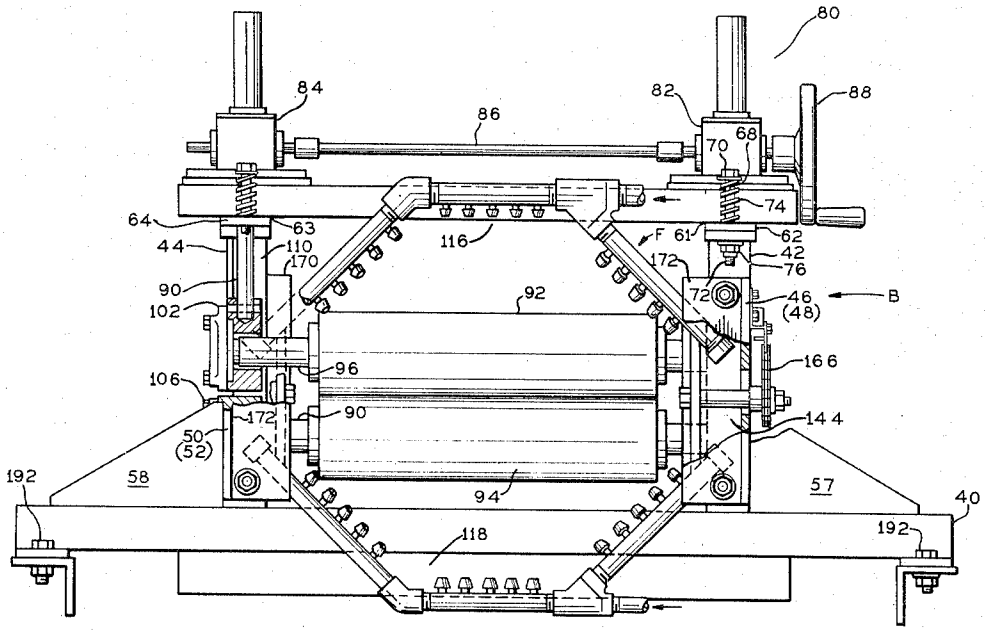
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[57] **ABSTRACT**

A quenching apparatus for quenching elongated bar-type workpieces wherein a plurality of interchangeable roll stands comprised of generally horizontal and vertical roll pairs define an elongated workpiece pass. At least one of the rolls of each roll pair is moveable towards and away from its associated roll normal to the workpiece pass in order to accommodate workpieces of various dimensions. Each horizontal roll pair includes a quenching fluid manifold on each side of the roll pair which transversely surrounds the pass and includes a plurality of fluid outlet nozzles directed inwardly towards the pass area. Each manifold is interconnected with the moveable horizontal roll so as to be moved one half the distance of movement of the moveable horizontal roll to facilitate a symmetrical quenching fluid spray pattern to the workpiece pass irrespective of workpiece dimensions.


**15 Claims, 5 Drawing Figures**



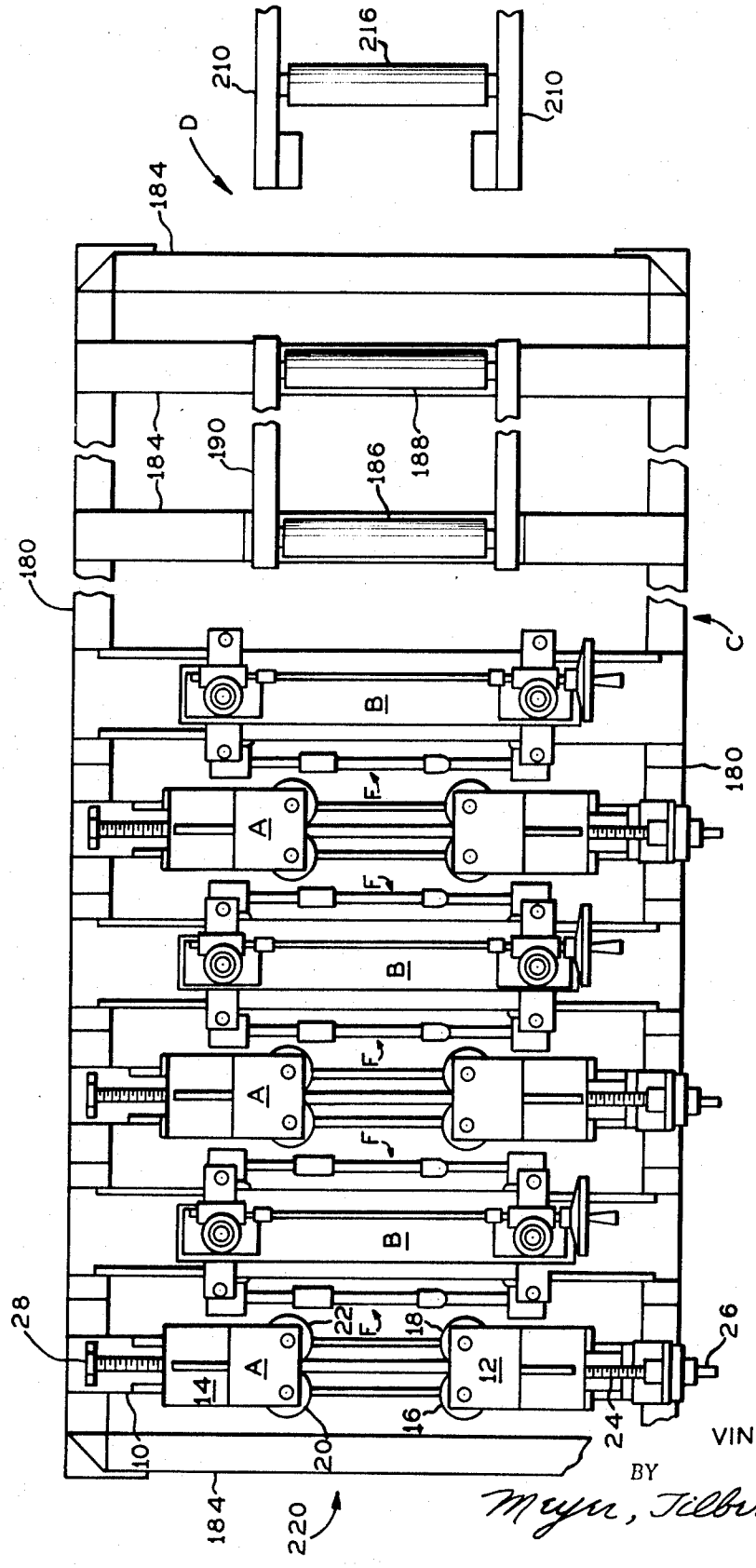



Fig. 1.

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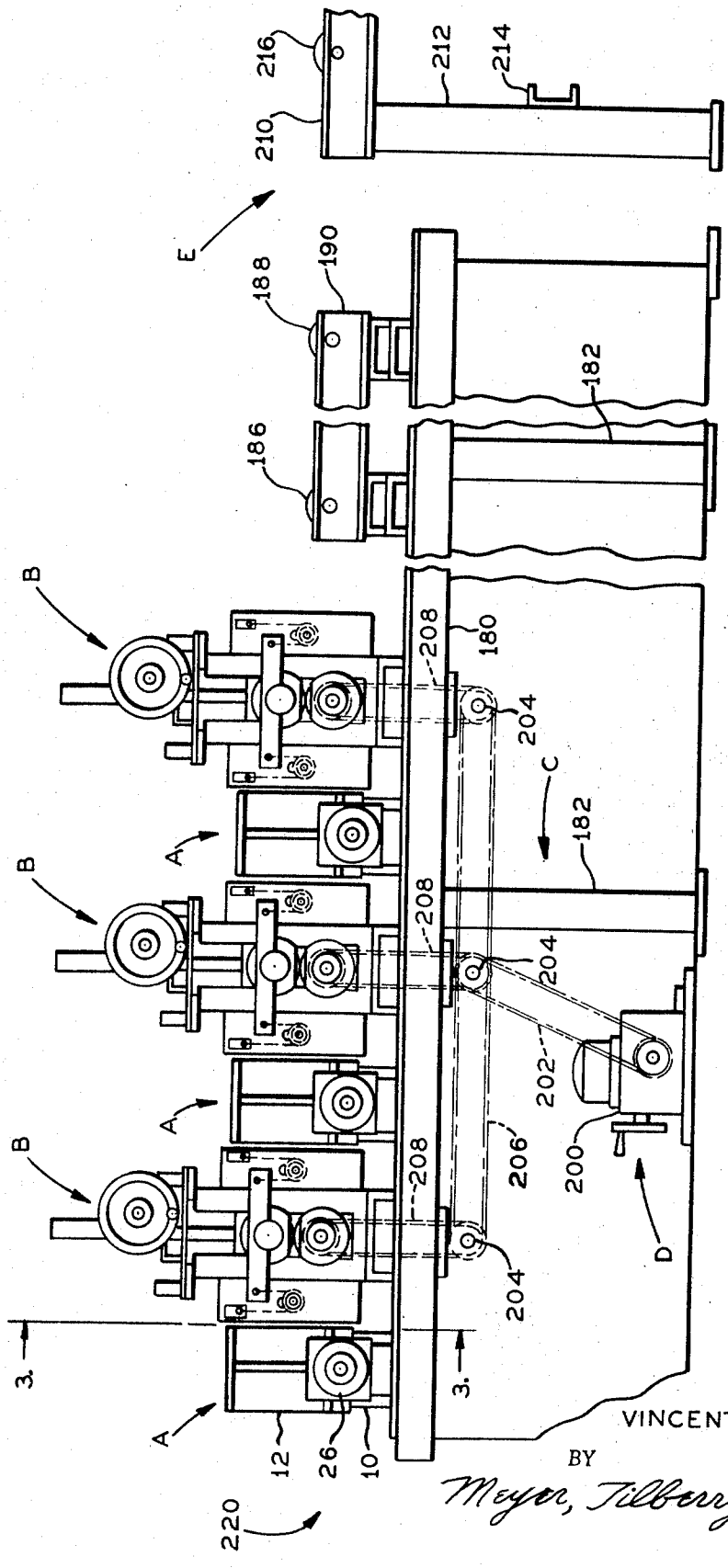



Fig. 2.

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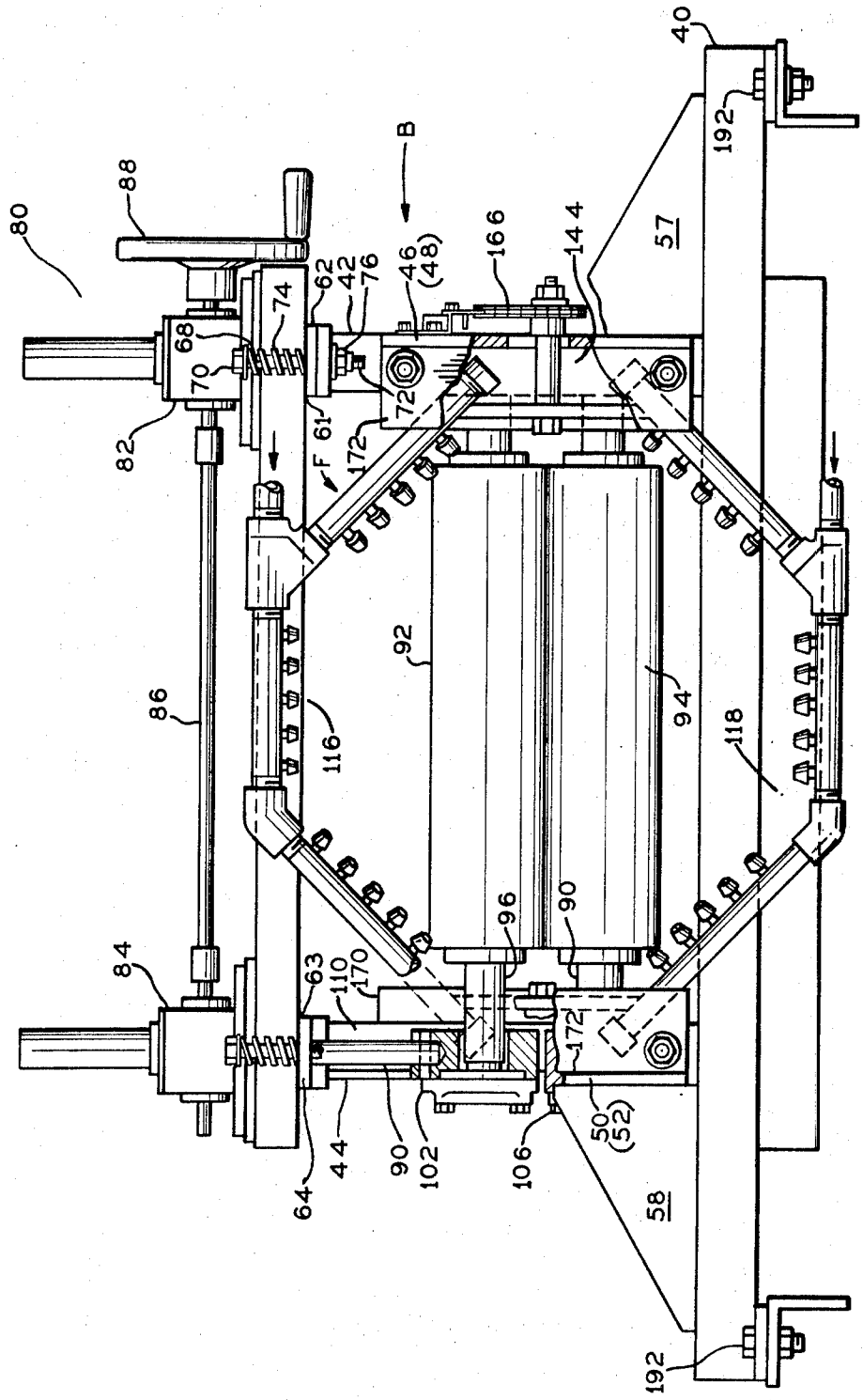



FIG. 3.

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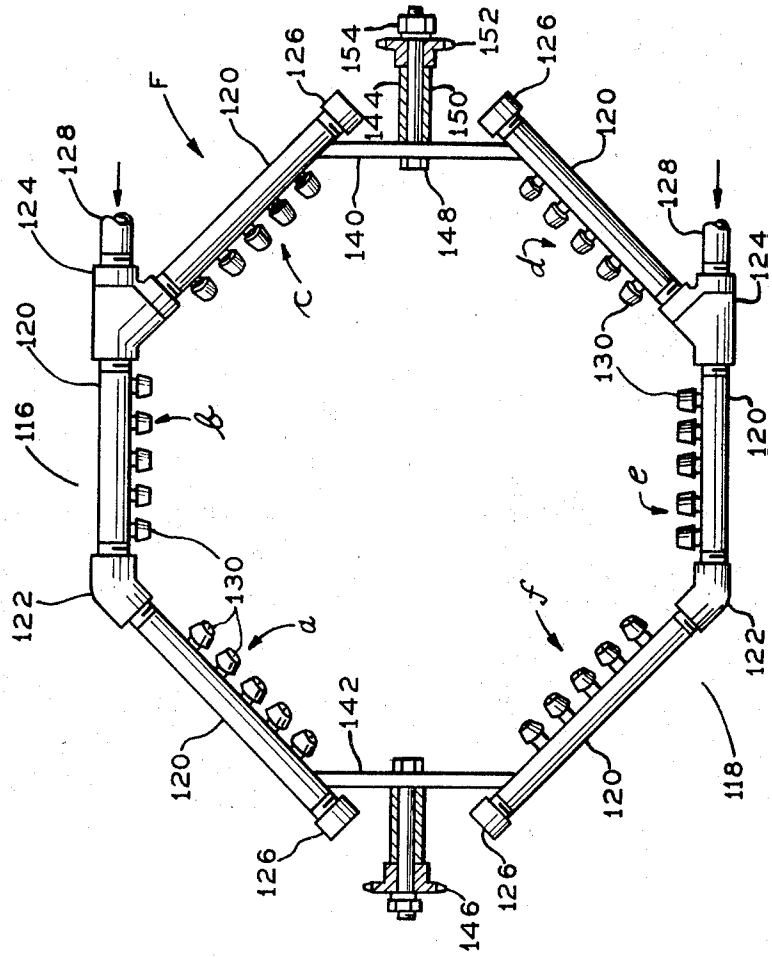



FIG. 5.

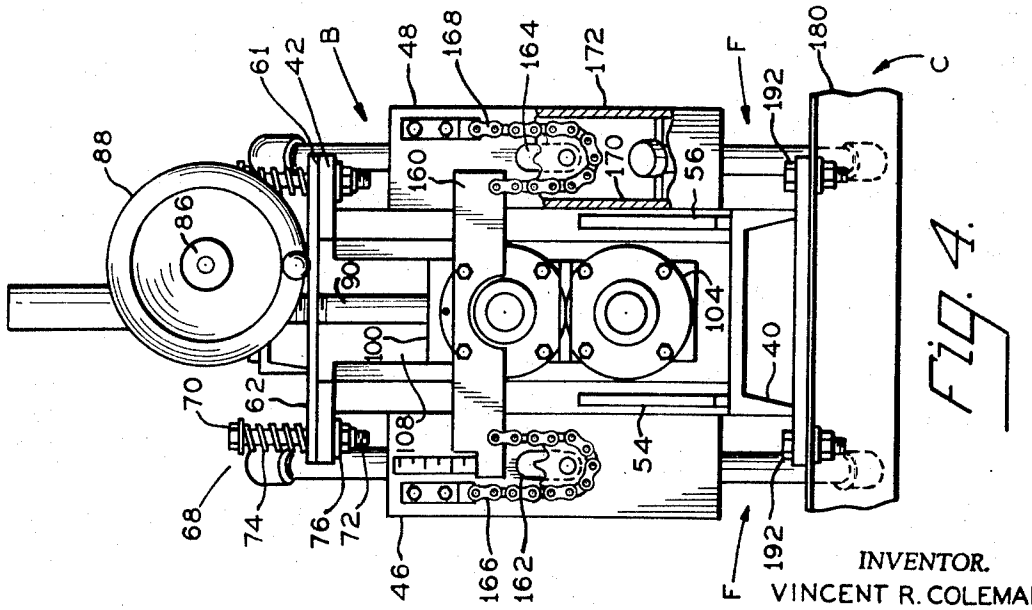



FIG. 4.

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# BAR QUENCH FIXTURE

This application pertains to the art of heat treating apparatus and more particularly to an apparatus for progressively quenching moving elongated heated workpieces.

The invention is particularly applicable to progressively quenching elongated bar-type workpieces as they emerge from a rolling mill or furnace and will be described with particular reference thereto; however, it will be appreciated by those skilled in the art that the invention has broader applications and may be used in any environment where it is desired to quench moving heated workpieces.

Prior apparatus for quenching elongated bar-type workpieces comprised means for spraying a quenching fluid, such as water or gas, onto the workpiece as it passed from one processing area to another. This sudden application of a quenching fluid, with no particular predetermined flow patterns, caused undesirable workpiece warpage as well as varying physical characteristics in the workpieces themselves. The warpage problem necessitated additional process steps in order to straighten the workpieces so that they could be placed in commercial use, while the varying physical characteristics caused difficulty in assuring that bars having particular desired properties could consistently be manufactured.

Attempts to overcome these problems gave rise to apparatus which included a plurality of roll pairs immediately adjacent the quenching fluid source in an attempt to prevent the processed workpieces from warping. The actual quenching fluid supply means were also improved so that the fluid was supplied to at least two sides of the elongated workpieces. However, the improved apparatus also had inherent deficiencies which also prevented efficient workpiece quenching. First of all, the apparatus comprised a single large machine with the component parts all being stationarily mounted relative to each other. This did not provide for a flexible quenching operation in that the workpieces were all received in the quenching unit and quenched in the same manner without any possibility for a sequence variation. In quenching elongated bar-type workpieces, it is often desirous to apply specific predetermined quench spray patterns and roll forces to obtain desired physical properties therein. In an effort to accomplish this with prior apparatus, it was necessary to have a plurality of quenching units, each preset for the desired quenching patterns.

Further, and although the previous type of flood quenching fluid supply manifolds have proved fairly satisfactory for thin strip or sheet workpieces, i.e., where workpiece thickness is substantially less than workpiece width, they have not proven particularly successful for use with elongated bar-type workpieces where the workpiece width and thickness are more generally of similar dimensions. In bar quenching, these prior quenching fluid supply means merely flooded two sides of the bar, while the other two sides only received the overflow quenching fluid or were left to be air-quenched. This, of course, again presented the problem of causing varying physical characteristics when quenching elongated bars. Some prior apparatus did include means to permit automatic adjustment of the quenching fluid supply manifold relative to two opposed sides of the workpiece, but not all sides. This too has not proved satisfactory for bar quenching.



The present invention contemplates a new and improved bar quenching apparatus which overcomes the above referred problems and others and provides a new apparatus for quenching elongated bar-type workpieces or the like which is flexible to permit variation of quenching patterns and which provides symmetrical quenching fluid spray patterns around the workpiece as it is directed through the apparatus.

In accordance with the present invention, there is provided a quenching apparatus for quenching elongated bar-type workpieces which includes a plurality of sets of horizontally and vertically disposed elongated rotatable rolls whereby a workpiece pass is defined transverse to and between the rolls of each set. Each roll of each set extends generally parallel to the other rolls in its associated set and transverse to the workpiece pass. At least one roll in each set is adapted to move towards and away from its associated roll in order to alter the cross-sectional dimensions of the workpiece pass for accommodating workpieces of various dimensions. Quenching fluid supply manifolds disposed so as to surround the workpiece pass are interconnected with the moveable roll of each horizontal roll pair such that the manifolds are moved in the same direction as and proportioned to the moveable rolls as a workpiece is directed through the pass.

In accordance with another aspect of the present invention, each roll set comprises a separate unit which may be moved from its association with the other roll sets in order to permit alteration of the workpiece pass configuration.

In accordance with another aspect of the present invention, there is provided an improved quenching fluid supply manifold wherein quenching fluid is symmetrically applied to the surface of a workpiece as it is directed through a quenching apparatus. The manifold includes fluid outlet nozzles which supply fluid to an area generally transversely circumscribing the workpiece pass and further include means for mounting the manifold to the quenching apparatus whereby it will be self-adjusting to always be in a symmetrical supply position when a workpiece is fed through the quenching apparatus.

In accordance with a more limited aspect of the present invention, there is provided an improved quenching fluid supply manifold which circumscribes the workpiece pass and provides separate spray zones focused so as to not interfere with each other.

The principal object of the present invention is the provision of a new quenching apparatus for elongated bar-type workpieces.

Another object of the present invention is the provision of a quenching apparatus for quenching elongated bar-type workpieces which permits variance of quenching patterns to obtain predetermined desired physical properties in the workpieces.

Another object of the present invention is the provision of an improved quenching fluid manifold which is self-adjusting so that during the quenching period a symmetrical spray pattern of quenching fluid is supplied to the workpiece surfaces.

Yet another object of the present invention is the provision of a quenching apparatus for quenching elongated workpieces which is equally adaptable for quenching both strip-type and bar-type workpieces.

The invention may take physical form in certain parts and arrangements of parts, a preferred embodiment of

which will be described in detail in this specification and illustrated in the accompanying drawings which form a part hereof and wherein:

FIG. 1 is a plan view of an apparatus utilizing the subject invention;

FIG. 2 is a side elevation view of FIG. 1;

FIG. 3 is a sectional view taken along lines 3—3 in FIG. 2 showing one of the sets of horizontal rolls and a quenching manifold mounting;

FIG. 4 is a side elevation view of FIG. 3; and,

FIG. 5 is a view of the manifold used in the subject invention.

Referring now to the drawings wherein the showings are for the purposes of illustrating the preferred embodiment of the invention only and not for purposes of limiting same, the FIGURES show a bar quench fixture comprised of a plurality of vertical roll pairs A, a plurality of horizontal roll pairs B, a roll support frame C, a drive unit D, a run-out table E and a plurality of quenching manifolds F.

More specifically, and with particular reference to FIGS. 1 and 2, a description for one vertical roll pair A will be given, it being understood that the others are identical thereto unless otherwise noted. Each vertical roll pair A comprises a roll frame support member **10** extending across roll support frame C and has mounted thereon roll frames **12,14.** Mounted by conventional means in roll frame **12** are vertically extending rolls **16,18** and mounted by similar means in roll frame **14** are rolls **20,22.** These rolls may be of the type generally associated with roller quench units and do not form a part of the present invention. Threadably received in roll frames **12,14** and extending therebetween is threaded adjusting shaft **24.** Hand wheel adjuster **26** is mounted at one end of the shaft and a stop **28** is mounted at the other end. By rotating hand wheel **26** in one direction or the other, the relative distance between roll frame **12,14** may be altered. This, of course, is to provide means whereby various dimensioned bars may be accommodated for quenching.

Each horizontal roll pair B includes a roll frame support member **40** extending across roll support frame C as best shown in FIGS. **1, 3** and **4.** A description of only one horizontal roll pair B will be given, it being understood that the others are identical thereto unless otherwise noted. Disposed in a permanent relationship to support member **40** are roll frames **42,44.** Extending from roll frame **42** are side portions **46,48** and extending from roll frame **44** are side portions **50,52.** These side portions merely accommodate mounting of the quenching fluid manifolds as hereinafter more fully described. Disposed between support member **40** and roll frames **42,44** are generally triangular shaped roll frame supports **54,56** and **58** and **60** respectively. Disposed on the top surface **61** of roll frame **42** is an adjusting means mounting plate **62** and disposed on the upper surface **63** of roll frame **44** is adjusting means mounting plate **64.** Extending across plates **62,64** is adjusting means support channel **66,** which, in the preferred embodiment, comprises a U-shaped channel member.

Plates **62,64** are located relative to surfaces **61,63** so as to permit relative vertical movement therebetween. One of these mountings will now be described in detail, it being understood that the other mountings are identical therewith unless otherwise specifically noted. An elongated bolt **68** is fitted to clearance holes (not shown) passing through plate **62** and surface **61.** Elongated bolt **68** includes the standard head portion **70** and threaded body portion **72.** A coil spring **74** is received on the elongated bolt between head **70** and plate **62.** A nut **76,** adapted to be received on threaded body portion **72,** retains the bolt in position. It will be seen, therefore, that with this structure, plates **62,64** with channel **66** mounted thereon, may be forcefully moved vertically away from surfaces **61,63.** Once this moving force is removed, however, coil spring **74** will bias plates **62,64** back into mating contact with surfaces **61,63.**

As best shown in FIGS. **3** and **4,** the adjustment apparatus generally designated **80** is mounted on channel **66.** The adjusting apparatus is known in the art and generally comprises two spaced apart gear boxes **82,84** interconnected by a driving and synchronizing shaft **86** which may be operated by hand wheel **88.** As the hand wheel is turned, driving and synchronizing shaft **86** operates the gears within the gear boxes so as to effect simultaneous raising or lowering of the roll chock support shafts **90.** Most often, shaft **90** will include a helical threaded portion or worm which is engaged and vertically moved by a worm wheel inside gear boxes **82,84.** This type of adjustment is known in the art and does not form a part of the present invention. Each horizontal roll pair B includes an upper roll **92** and a lower roll **94** which are mounted on roll shafts **96,98** respectively and may be of the type generally associated with rolling or quenching apparatus. Roll shaft **96** is received in conventional roll chocks **100,102** and roll shaft **98** is similarly received in roll chocks **104,106.** Lower roll chocks **104,106** are stationarily mounted in roll frames **42,44.** Roll chocks **100,102,** however, are mounted to roll chock mounting shafts **90** by any convenient means to provide vertical movement for roll **92** relative roll **94.** That is, as adjustment wheel **88** is turned to effect movement of the gears in gear boxes **82,84** the worm wheel therein will effect a synchronous raising or lowering of roll **92.** Roll **92** is maintained in its relative vertical relationship with roll **94** by roll chock guide areas **108,110** in roll frames **42,44** respectively. Areas **108,110** merely represent slots in the frame members of sufficient dimensional size to accommodate a sliding relationship with the upper roll chocks.

As best shown in FIGS. **3** and **5,** quenching manifold F comprises two manifold portions **116,118.** Each portion is comprised of a plurality of hollow cylindrical segments **120,** pipe connections **122,** pipe "T"s **124** and pipe caps **126.** In the preferred embodiment of the invention, these parts are made from standard black pipe. Quenchant supply inlets **128** are interconnected with the manifold portions at the pipe "T"s. The quenchant supply lines lead to a quenchant supply located remote from the apparatus and in the preferred embodiment comprises a water supply source. A plurality of nozzles **130** are included in each pipe segment **120.** These nozzles are longitudinally aligned along their respective segments and may comprise nozzles of any known type suitable for adaptation to providing a quenching spray. It would also be possible to merely pierce holes in the pipe segments in order to receive the desired nozzling effect.

Manifold portions **116,118** are mounted relative each other by means of side frame plates **140,142** so as to form a generally closed loop of generally octagonal configuration. Extending outwardly from plates

140,142 are mounting members generally designated 144,146 respectively. These mounting members are coplanar with the manifold and extend so as to provide a symmetrical mounting means therefor. With particular reference to FIG. 5, mounting member 144 will be particularly described, it being understood that the other mounting members are identical thereto except where noted. The mounting member comprises an elongated bolt 148 extending through frame plate 140 and retained in position by the bolt head. Spaced coaxially over the bolt body and adjacent the outside portion of frame plate 140 is a spacer 150. Adjacent spacer 150 is a sprocket wheel 152 which may be of any known type. The sprocket is mounted in a conventional manner so as to permit rotation relative to the elongated bolt. Maintaining the spacer and sprocket in position is a nut 154 threadably received on the bolt body.

The nozzles of each segment establish a plurality of quenching spray zones generally shown in FIG. 5 as *a*, *b*, *c*, *d*, and *f*. It has been found that it is most advantageous in order to effect efficient quenching to have the nozzles of zones *b* and e focused directly across from each other; to have zones *a* and *f* focused slightly away from the plane of the manifold outwardly in the view of FIG. 5; and, to have the nozzles of zones *c* and *d* focused slightly away from the plane of the manifold inwardly in the view of FIG. 5. In other words, each quench zone *a–f* is focused generally in one of three different directions. This type of focusing permits each zone to effectively quench a portion of the bar as it traverses the workpiece pass without interference with one another.

Mounting of a quenching manifold F is best described with reference to FIGS. 3 and 4 and reference will be made to the mounting of one end of a manifold only, it being understood that the other end and other manifolds are mounted identical thereto. A yoke 160 is mounted to roll chock 100 to extend in a generally horizontal direction. Side portions 46,48 each include a vertically extending elongated slot 162,164 respectively therethrough. The bottom of each slot is positioned such that when rolls 92,94 are in a peripherally contacting position, quenching manifold F is symmetrically disposed therearound. The length of the slots is not of particular importance to the invention, it merely being necessary that they be of sufficient length to accommodate the width of bar members to be processed therethrough which will hereinafter be more fully described. The width of each slot merely must be sufficient to provide a sliding relationship relative to spacers 150. Mounted at generally the end areas of yoke 160 are lengths of link chain 166,168 having a pitch dimension equal to the pitch dimension of sprockets 152. Chains 166,168 extend about the sprockets as best shown in FIG. 4 and are affixed by any convenient means to side portions 46,48 respectively. These chains provide a harness arrangement so as to support quenching manifolds F within elongated slots 162,164. The relationship between the sprockets and the link chain provide a simple pulley arrangement whereby when upper roll 92 is moved upwardly away from lower roll 94, quenching manifolds F correspondingly move one half of that distance. The benefits derived from this type of movement are more fully hereinafter described. Side frame plates 140,142 are of such a width dimension so as to be slideably retained between manifold guide plates 170,174 as best shown in FIGS. 3 and 4 for side portions 46,48. This sliding arrangement retains the quenching manifolds F in a generally vertically disposed position in order that the quenching action will be consistent.

Roll support frame C is comprised of a plurality of horizontal beams 180, vertical legs 182 and cross members 184 sufficient to maintain vertical roll pairs A and horizontal roll pairs B in the desired positions. The exact configuration of this frame is not important to the invention and it is to be understood that many specific frame structures could be adapted for use. At the rear end portion of roll support frame C are two workpiece support rolls 186,188 mounted by conventional means to roll frame 190.

Drive unit D comprises a standard electric drive motor 200 of the type commonly used in industrial applications. It includes the necessary adjustments and drive sprockets, a drive chain 202 extending between one of a plurality of jackshafts 204, a drive chain 206 interconnecting the jackshafts and individual drive chains 208 interconnecting the jackshafts and the lower roll of each horizontal roll pair B.

In the preferred embodiment shown in FIGS. 1 and 2, it will be seen that the apparatus is comprised of alternating vertical roll pairs A and horizontal roll pairs B. Pairs A and B are affixed to horizontal beams 180 by threaded connectors 192 as shown in FIGS. 3 and 4. By removing the threaded connectors, the various roll pairs may be moved and so positioned so as to yield other quenching apparatus configurations to provide varying physical characteristics in the bar-type workpieces being quenched. Merely by way of example, and using the roll pair units of the subject invention, it would be possible to have the quenching unit comprised of a first horizontal roll pair, several vertical roll pairs, a second horizontal roll pair and finally several additional vertical roll pairs. The specific roll configuration used would, again, depend on a particular physical characteristics desired in the finished bars. Adjacent the rear end of the apparatus is run-out table E comprised of horizontal beams 210, vertical legs 212, cross members 214 and rolls 216. The run-out table does not form a part of the present invention and may be of the type and design already utilized in quenching operations.

For operation, the subject quenching apparatus is positioned such that entrance area 220, shown in FIGS. 1 and 2, is immediately adjacent the exit end of a heat treating furnace or rolling facility such that the quenching apparatus itself extends longitudinally therewith. The distance between opposing rolls 16,18 and 20,22 in each vertical roll pair A is adjusted by hand wheel 26 so that the elongated bar-type workpiece will be guided through the apparatus.

Similarly, each horizontal roll pair B is adjusted through adjustment apparatus 80 such that rolls 92,94 are sufficiently spaced apart to be able to receive an elongated bar-type workpiece transversely therebetween. The transverse distance between the rolls, however, is adjusted to remain slightly less than the thickness of the bar so that during quenching the bar will receive a pressured rolling action between the horizontal rolls in order to prevent warpage as more fully explained below.

The longitudinally extending area between the rolls of the consecutive roll pairs define a workpiece pass. As a workpiece exits from the furnace area, and with

reference to FIGS. 1 and 2, it passes between the opposed vertical rolls in the first roll pair A and then between the opposed horizontal rolls in the first horizontal roll pair B. This passage continues between the alternating roll pairs A and B until the workpiece passes along rollers **186,188** and onto run-out table E for removal therefrom.

As hereinabove noted, it is most desirous for a bar-type workpiece having a thickness dimension and a width dimension substantially similar to receive uniform quenching therearound. As the workpiece passes between horizontal rolls **92,94,** roll **92** is forced in an upward direction from its initial adjusted position to allow the workpiece to pass therebetween. The force of the workpiece passing between the rolls has the effect of raising the entire adjusting mechanism **80** from contact with surfaces **61,63** of roll frames **42,44** respectively. This, of course, compresses springs **68,** so that in addition to the weight of the roll assembly itself applying pressure to the workpiece, the coil springs apply additional pressure. As can best be seen in FIG. **4,** as roll **92** is forced upward, yokes **160** are also directed upwardly so that link chains **166,168** have the effect of raising quenching manifold F along slots **162,164.** As is known, the pulley arrangement adapted for use in the subject quenching apparatus vertically raises quenching manifolds F one half the distance of the vertical movement of upper roll **92.** In this way, and as best shown in FIG. **3** when the rolls are in a peripherally contacting position, the quenching manifolds may be retained in a symmetrical relationship relative to the workpiece pass. Again, the directional focusing of spray zones *a–f* assure that as the workpiece is passed longitudinally therethrough, the quenching effect of the sprays will not be impaired by interference from the oppositely disposed zones.

The invention has been described with reference to the preferred embodiment. Obviously, modifications and alterations will occur to others upon the reading and understanding of this specification. It is my intention to include all such modifications and alterations in so far as they come within the scope of the appended claims or the equivalence thereof.

Having thus described my invention, I now claim:

**1.** A quenching apparatus for quenching a generally elongated workpiece, said apparatus comprising:

means for establishing a longitudinally extending workpiece pass comprising a plurality of interchangeable rotatable roll sets disposed adjacent to each other, each roll of each said set extending generally parallel to the other rolls of each said set and generally transverse to said pass formed thereby; one roll of selected said roll sets being independently movable toward and away from its associated roll; and,

means associated with said selected roll sets generally surrounding said pass for symmetrically dispensing a quenching fluid around said pass onto all sides of said workpiece, said dispensing means being operatively connected to said selected roll sets for movement relative to said pass proportional to and in the same direction as movement of said one rolls of said selected roll sets to said associated rolls.

**2.** The apparatus as defined in claim **1** wherein said roll sets comprise a plurality of first and second roll means for defining said workpiece pass, each said first roll means comprising a generally horizontally disposed roll pair and each said second roll means comprising a generally vertically disposed roll pair, said first and second roll means being selectively positionable adjacent each other in any desired pre-determined pattern, whereby said pass is established between the rolls in each of said roll pairs of said first and second roll means.

**3.** The apparatus as defined in claim **2** wherein said selected roll sets comprise roll means and said first roll means include first force means for selectively forcing said one rolls from a first normal position to a second rolling position wherein said rolls are spaced apart from said first position and second force means for selectively forcing said one rolls from said second position back to said first position.

**4.** The apparatus as defined in claim **3** wherein said first force means comprises said workpiece as it is directed along said pass and said second means comprises biasing means.

**5.** The apparatus as defined in claim **3** wherein at least one said dispensing means is disposed in an operative relationship with each said first roll means, each said dispensing means comprising a quenching fluid manifold generally transversely surrounding said pass, each said manifold further including a plurality of fluid outlet nozzles focused generally inwardly toward said pass to establish a plurality of quenching spray zones.

**6.** The apparatus as defined in claim **5** including means for moving said manifold in the same direction as said one roll a distance proportional to the distance traversed between said first and second positions.

**7.** The apparatus as defined in claim **6** wherein each of said first roll means includes one of said dispensing means on each side thereof.

**8.** In a bar quenching apparatus for an elongated workpiece of the type having a plurality of horizontal and vertical roll pairs which define a longitudinally extending workpiece pass between the rolls of each pair and wherein at least one roll of each horizontal roll pair is disposed so as to move toward and away from its associated roll to accommodate said workpiece and means for quenching associated with selected ones of said roll pairs to provide quenching fluid to said workpiece, the improvement comprising:

means associated with selected of said horizontal roll pairs for supplying said quenching fluid symmetrically about said workpiece pass irrespective of the cross-sectional dimensions of said workpiece, each said supply means including a manifold portion having fluid outlet nozzles therein, means for mounting said manifold portion in an operative relationship with said at least one roll of the associated horizontal roll pair and means for maintaining said manifold portion in a symmetrical position relative to said pass as said at least one roll moves toward and away from its associated roll, said maintaining means comprising an automatic adjustment linkage operably connected to said manifold portion and to said at least one roll wherein said manifold moves in the same direction as said at least one roll as said at least one roll is moved toward and away from its associated roll, the distance of movement of said manifold being approximately one half that of said at least one roll in order to maintain said manifold in said symmetrical position.

**9.** The improvement as defined in claim **8** wherein said manifold portion comprises a loop defining a

quenching plane, said loop including a plurality of said fluid outlet nozzles disposed therearound and focused generally inwardly towards said quenching plane.

**10.** The improvement as defined in claim **9** wherein said loop includes an upper portion, a lower portion and side portions interconnecting said upper and lower portions and means for supplying a quenching fluid to at least said upper and lower portions.

**11.** The improvement as defined in claim **10** wherein the oppositely disposed nozzles in said upper and lower portions are focused away from each other towards said pass to prevent interference with each other.

**12.** In a bar quenching apparatus for an elongated workpiece the type having a plurality of horizontal and vertical pairs which define a longitudinally extending workpiece pass between the rolls of each pair and wherein at least one roll of each horizontal roll pair is disposed so as to move toward and away from its associated roll to accommodate said workpiece and means for quenching associated with selected ones of said roll pairs to provide quenching fluid to said workpiece, the improvement comprising:

means associated with selected of said horizontal roll pairs for supplying said quenching fluid symmetrically to said workpiece pass irrespective of the cross-sectional dimensions of said workpiece, each said supply means including a manifold portion having a fluid outlet nozzles therein, means for mounting said manifold portion in an operative relationship with said at least one roll of the associated roll pair and means for maintaining said manifold portion in a symmetrical position relative to said pass as said at least one roll moves toward and away from its associated roll, said maintaining means comprising at least one generally U-shaped sling operably mounted to the associated of said selected horizontal roll pairs for engaging said mounting means, one leg of said U-shaped sling being stationarily mounted to said quenching apparatus with the other leg of said U-shaped sling being affixed to and movable co-extensive with said at least one roll of the associated of said selected horizontal roll pairs, movement of said at least one roll causing corresponding proportional movement of said manifold about said pass through said U-shaped sling.

**13.** The improvement as defined in claim **12** wherein said mounting means comprises at least one mounting pin extending outwardly from at least one side of and coplanar with said manifold.

**14.** The improvement as defined in claim **13** wherein said at least one sling comprises two said slings spaced apart on opposite sides of said apparatus comprised of link chain and said at least one mounting pin comprises two said mounting pins extending outwardly from opposite sides of and coplanar with said manifold, said mounting pins each further including a sprocket rotatably received thereon, whereby said sprockets are matingly received in said spaced apart slings to support said manifold and to effect movement of said manifold coextensive with said at least one roll a distance equal to one half the distance of movement of said at least one roll.

**15.** The improvement as defined in claim **14** wherein said mounting pins are received in guides in said apparatus to guide said manifold in said movement.

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