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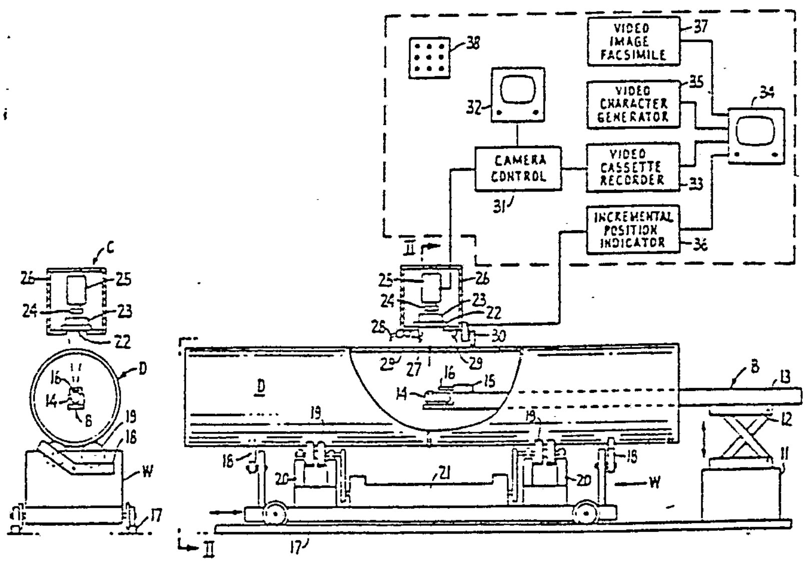
(54) Title: FLUOROSCOPIC EXAMINATION OF PIPE GIRTH WELDS

(57) Abstract

A device for radiographically inspecting the girth weld seam on a double-jointed pipe (D) includes a cart (W) on which the pipe is mounted, for transporting the pipe longitudinally to a location where it surrounds a radiation source (14) mounted on one end of a cantilevered boom (B). A radiation detection unit (C) that produces a visible image of radiation penetrating through the pipe is disposed on the outside of the pipe in alignment with the radiation source. When the girth weld on the pipe is brought into registry with the radiation source by the cart, rollers (19) on the cart are actuated to rotate the pipe about its longitudinal axis, thereby enabling the entire periphery of the girth weld to be inspected. The video image of the girth weld can be observed on a video monitor (32), and recorded by means of a video cassette recorder (33) and a facsimile unit (37). Appropriate instructions relating to repairs to be performed on the pipe can also be included in the recordings. A spray marker (27) located adjacent the radiation detection unit enables an operator to precisely mark the locatiion of detected flaws on the pipe, to facilitate subsequent repairs in accordance with the instructions on the recorded medium.



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FLUOROSCOPIC EXAMINATION OF PIPE GIRTH WELDS

Technical Field

The present invention relates to the examination of pipes, and in particular to the X-ray fluoroscopic inspection of the circumferential weld between two sections of a double-jointed steel pipe, as well as other pipe characteristics.

Background Art

Steel pipes that are intended for use in installations such as oil pipelines and the like are typically manufactured in forty foot (12.192 meter) lengths, for ease of transportation. When the pipe sections are to be transported by a relatively large capacity transport vehicle, such as railroad car or a ship, a much longer section of pipe can be easily accommodated. Therefore, two forty foot (12.192 meter) lengths of pipe are typically welded together at the manufacturing site to form an eighty foot (24.384 meter) length of pipe that is commonly referred to as a "double-jointed" steel pipe.

Prior to release of the double-jointed steel pipe from the manufacturing facility, it is desirable, and sometimes mandatory, to inspect the quality of the weld between the two pipe sections. For example, it is desirable to determine that there are no voids in the weld which could result in leakage from the pipe, and to insure that there is no foreign material in the area of the weld that could weaken the structural integrity of the pipe.

The most commonly used method for inspecting the girth weld on a pipe is radiographic, which utilizes a form of ionizing radiation that penetrates the material on the pipe and produces a reaction on an image receiving device. In the past, a radiographic film was typically used as the image receiving device. The radiation source was placed inside the pipe and a strip of radiographic film surrounded the outside of the pipe on the girth weld. The film was irradiated by X-rays passing through the pipe, and then removed from the outside of the pipe and developed in a processing laboratory. Once the film was developed, the quality of the weld could be determined from the quantity of X-rays that impinged on the film.

There are a number of disadvantages associated with the use of radiographic film for the inspection of girth welds on pipe, particularly in a production line environment. Since the film does not provide an immediate indication of the quality of the inspected weld, but rather requires developing prior to providing a picture, a substantial amount of time is consumed before the pipes can be determined to be satisfactory or passed on to an appropriate station for any necessary repairs. Consequently, the inspected pipes must be stored during the time in which the film is developed. Furthermore, the costs associated with the use of film are substantial. For example, piping intended for use in an oil field environment typically has diameters in the range of 30 to 48 inches (76.2 to 121.92 cm). Consequently, a strip of film that is 95 to 150 inches (241.30 to 381 cm) in length must be used for each weld to be inspected. The chemicals that are used to develop the film require disposal facilities that add to their real cost, since they undergo a change in composition during the developing process and form a solution that is harmful to the environment if not disposed of properly. Finally, a significant amount of time and manpower is required to place the film around the pipe each time a weld is inspected.

One alternative to the use of radiographic film for the inspection of girth welds on pipes is disclosed in U.S. Patent No. 3,835,324. The apparatus disclosed in the patent includes a movable source of gamma radiation that is disposed within the pipe, and an elastomeric belt that forms a track and that is attached around the pipe adjacent a weld to be inspected. A cart carrying a photomultiplier tube and a crystal detector is placed on the track formed by the belt and moved around the entire circumference of the pipe to detect the gamma radiation passing through the pipe at the location of the weld.

Although the above noted patent provides an alternative to the use of radiographic film, it is primarily directed to the inspection of pipe at remote locations, and it posesses a number of features which render it less than ideal for use in a production line type of environment. For example, the use of the elastomeric belt that must be placed around the pipe for each inspection still requires a significant amount of manpower and time. In addition, as specifically noted in the patent, it is important that the belt be placed a precisely determined distance from the weld so that the photomultiplier tube and detector are correctly suspended the same distance from the weld about the entire circumference of the pipe. Any variation in the spacing of the detector from the pipe can lead to a degradation of the results of the inspection.

In the system disclosed in the above noted patent, the results detected by the radiation detector are fed to a chart recorder that produces a record medium of the results. While these results are provided to an operator much faster than those obtained with radiographic film, they are not instantaneous, in that the operator is not apprised of a fault in the weld seam and able to note it as soon as it is detected by the radiation detection apparatus. Rather, in the operation of the system, the entire circumference of the pipe weld is first recorded on the chart, and thereafter the operator must determine the location of any detected faults by correlating a fault noted on the printed chart with a distance from a starting point at which the detection apparatus began the inspection of the weld. In a production environment, it is preferable to have the operator note the location of any detected flaws directly on the pipe as the flaw is being scanned by the radiation detector, to thereby avoid the extra step of having to correlate the printed results with a distance around the circumference of the pipe, and thereby eliminate the time consumed in such a step.

Disclosure Of Invention

Accordingly, it is a general object of the present invention to provide a novel method and system for the radiographic inspection of girth welds on double-jointed steel pipe that do not require the use of radiographic film.

It is another object of the present invention to provide a novel method and apparatus for the radiographic inspection of double-jointed steel pipe that reduces the manpower costs associated with inspection by eliminating the need to manually place any structure around the circumference of the pipe at the location of each weld.

It is a further object of the present invention to provide a novel radiographic pipe weld inspection method and apparatus that substantially reduces the time required for inspection over prior art methods, and thereby renders the inspection method suitable for use in a production line situation.

It is yet another object of the present invention to provide a novel radiographic pipe weld inspection apparatus that provides an operator with a visual image of the radiographic detection results and enables the location of any flaws to be instantaneously marked as they are observed.

A system for accomplishing these objectives in accordance with the present invention includes a source of radiation mounted on an adjustable cantilevered boom. A pipe whose girth weld is to be examined is placed on a cart that is movable longitudinally of the boom. The cart is moved to cause the boom to be located within the pipe, with the girth weld in registry with the radiation source. A fluoroscope located outside of the pipe in alignment with the radiation source produces a visible image of radiation penetrating through the pipe. The cart has rollers for rotating the pipe about its longitudinal axis, so as to produce an image of the entire weld.

The image of the weld can be observed on a video monitor and recorded on a video cassette recorder and a facsimile unit. Appropriate instructions relating to repairs to be performed on the pipe can be included in the recordings. A spray marker located adjacent the fluoroscope enables an operator to mark detected flaws on the pipe, for subsequent repairs.

Further details of the manner in which the present invention achieves the foregoing objects, and their attendant advantages, will become apparent to one of ordinary skill in the art from a perusal of the following detailed description of a preferred embodiment of the invention, when taken in conjunction with the accompanying drawings.

Brief Description Of The Drawings

Fig. 1 is a side elevation, partly in section, showing a double-jointed pipe section mounted on a conveying cart wherein the radiation source at the end of the cantilevered boom extending within the pipe section is in registry with a camera for recording the character of the weld seam and adjacent wall area, and wherein the region adjacent the weld seam is broken away and shown in section; and

Fig 2 is an end view of the pipe when mounted on the cart shown partly in section and taken along the line II-II of Fig. 1.

Best Mode For Carrying Out The Invention

Referring to Figs. 1 and 2, the principal elements of the embodiment of the invention illustrated therein comprise a conveyor cart W, a cantilevered boom B, and a camera unit C that are used to inspect the weld between the two sections of a steel pipe D. The pipe D is a so-called "double-jointed" steel pipe that consists of two separate sections of pipe that are welded together at their abutting ends to form a longer, single piece of pipe. The weld which joins the two sections extends around the entire periphery of their abutting surfaces and is called a girth weld. The term "double-jointed" steel pipe as used in the context of the present invention is intended to refer to pipe of this type; i.e. any type of pipe which for various reasons is formed from two or more individual sections of pipe that are welded together.

The cantilevered boom B includes a base 11 upon which is mounted a vertically adjustable support platform 12 to which a boom element 13 is affixed and extends in the horizontal direction a distance equal to at least the length of one of the pipe sections of the double-jointed pipe unit D. The support platform to which the boom element 13 is affixed is adjustable in height to raise and lower the boom an appropriate distance to enable it to be inserted into various diameters of pipe section approximately along the central axis thereof.

An X-ray tube 14 is mounted on the end of the boom element 13 that is remote from the platform unit 12. The tube 14 is disposed so as to emit X-rays in a substantially vertically upward direction from its output port when it is energized. A shutter mechanism 15 is affixed on the boom element 13 adjacent the output port of the X-ray tube 14, and includes a shutter element 16 that is adapted for reciprocal movement to selectively interrupt or pass the X-rays eminating from the source 14 by advancing or retracting the element as desired.

The pipe D is moved longitudinally by means of the cart W to the position illustrated in Fig. 1, wherein it surrounds the X-ray source 14. The cart is mounted on a set of tracks 17 that guide it in its movement between the location illustrated in Fig. 1 and a remote location where it is in position to receive assembled double-jointed pipes at an appropriate point in a production line. A pair of oscillatable transfer rails 18 are disposed on the cart W and engage the pipe to move it onto and from the cart at the remote location. The cart is also equipped with two sets of rollers 19 that rotate about axes extending in the longitudinal direction of the cart. These rollers are mounted on hydraulic cylinders 20 that enable them to be raised and lowered into and out of contact with a pipe supported on the cart. The movement of the cart along the rails 17, the actuation of the transfer rails 18, and the raising and lowering of the rollers 19 are provided by a suitable power unit 21 mounted on the cart W and controlled from a remote operator's station.

The camera unit C is disposed on the exterior of the pipe D to be inspected in alignment with the output port of the X-ray tube 14. The unit includes an imaging fluorescent screen 22, an image amplifier 23, a set of focusing lenses 24 and a video camera 25 for viewing a fluorescent image on the screen 22. All of these components are mounted on a platform 26 that can be raised and lowered by suitable means (not shown) to accommodate pipes of different diameters while maintaining the alignment of the unit C and the source 14. Two remotely operated spray markers 27 and 28 are mounted on the camera platform 26 in a position to be adjacent a pipe when it is moved into the location illustrated in Fig. 1 by the cart W. These two spray markers are preferably filled with different colors of ink or paint, such as yellow and white, for example. Also located on the camera platform are two photocells 29 for detecting when a pipe has been moved into position to be inspected, such that it surrounds the X-ray source 14. These photocells provide a signal that is used to control the actuation of the shutter mechanism 15 to open the shutter and allow X-rays to strike the inside of a pipe when it is in a position overlying the X-ray source 14. An incremental position detector 30 is mounted on the platform unit 26 and adapted to engage the pipe being inspected and provide an indication of the rotational position of the pipe.

The video camera 25 is connected to a conventional camera control circuit 31 that provides suitable control signals in response to the output signal of the camera to produce a video image on a viewing monitor 32. The camera control circuit 31 is also connected to a video cassette recorder 33 that records the video image, which is simultaneously displayed on a recording monitor 34. In addition to receiving the video signal from the camera control circuit 31, the recording monitor 34 also receives input information from an alpha-numeric video character generator 35 and an incremental position indicator 36 that is responsive to the position detector 30. The information from these two input sources is also recorded by the video cassette recorder 33. A video image facsimile unit 37 is connected to the recording monitor 34 to enable a hard copy record of the video image to be obtained by an operator.

In the operation of the device illustrated in Figs. 1 and 2, the support platform 12 and the camera platform 26 are appropriately positioned in height to accommodate the particular diameter of pipe that is to be inspected. The boom 13 is preferably positioned so that it lies approximately along the central axis of the pipe, and the camera assembly platform is positioned just slightly above the top surface of the pipe.

After a double-jointed pipe has been welded, it procedes on the production line to the location of the inspection device. The cart W is moved to a position in the production line just ahead of the pipe. As the pipe arrives at the cart, the operator actuates the transfer rails 18 so that the pipe is moved onto the cart. The hydraulic cylinders 20 are then actuated to raise the pipe rotating rollers 19 and thereby elevate the pipe a few inches above the transfer rails 18, to the position illustrated in Fig. 2, so that the pipe becomes cradled on the rollers. The cart is then driven from the production line towards the location of the inspecting apparatus.

As the cart approaches the boom, the pipe passes over the cantilevered portion of the boom and surrounds the X-ray source 14. As soon as the X-ray source is enclosed by the end of the pipe, the photocells 29 provide a signal that energizes the shutter mechanism 15 to open the X-ray tube output port. At this time, radiation from the X-ray tube will penetrate the wall of the pipe and cause an image to be produced on the fluorescent screen 22.

The image that is produced on the fluorescent screen 22 is received by the video camera 25 and displayed on both the viewing monitor 32 and the recording monitor 34. As the pipe continues to move over the boom 13, an image of the girth weld will eventually appear on the monitors. At this point the operator can actuate a control panel 38 to interrupt the movement of the cart W, so that the girth weld remains in registry between the X-ray source 14 and the imaging screen 22.

When the pipe is so positioned, the operator can enter any appropriate pipe identification information onto the recording monitor 34 through a keyboard on the video character generator 35. After the incremental position indicator 36 is reset to zero, the pipe rotating rollers 19 are actuated to begin rotating the pipe about its longitudinal axis. The image of the girth weld that appears on both of the monitors shows the weld in motion as the pipe rotates at a rate of speed determined by suitable pipe production specifications. This speed can be adjusted under the control of the operator through the control panel 38.

If no discontinuities, or other such flaws, are observed in the weld image, the operator can stop the rotation of the pipe when it has completed one revolution, as indicated by the incremental position indicator 36. The cart W can be then actuated to move back towards the production line. As the rear end of the pipe approaches the location of the camera platform 26, the operator can actuate one of the spray markers, for example the white marker 28, to provide an indication on the pipe that the weld meets quality specifications. The cart can then continue on towards the production line, where the operator can lower the rollers 19 and actuate the transfer rails 18 to move the pipe towards the next facility in the line. When the photocells 29 detect that the pipe is leaving the vicinity of the X-ray source, the shutter mechanism 15 is actuated to close the output port of the X-ray tube 14, to thereby prevent X-rays from being emitted while there is no protective covering, such as a pipe, around the source.

If, during the visual inspection of the pipe, the operator observes a discontinuity or other such flaw that is sufficient to impair the quality of the weld, he can stop the rotation of the pipe at the point where the observed discontinuity appears on the recording monitor, by means of the control panel 38. Appropriate repair instructions relating to the discontinuity can be entered into the recording monitor by means of the video character generator 35, so that the discontinuity and related repair instructions are recorded by the video cassette recorder 33. The video image facsimile unit 37 can also be actuated to provide a hard copy duplicate of the video image on a piece of paper, for use by the individuals who will be repairing the observed weld. The operator can also energize the other spray marker 27 to place a spot of ink or paint directly onto, or adjacent, the weld at the location of the observed discontinuity. The repair instructions that are generated by the video character generator 35 can then be erased and the rollers 19 reactuated to again rotate the pipe about its axis and enable the remainder of the weld to be inspected. If additional discontinuities are observed, the foregoing steps ean be repeated until the entire weld has been examined. Once the inspection of the weld is complete, the operator can control the cart to move it to a designated repair area and unload the pipe from the cart, where it will be repaired in accordance with the instructions printed out on the hard copies produced by the video image facsimile unit 37.

From the foregoing, it will be appreciated that the present invention provides a novel system for inspecting girth welds on double-jointed steel pipe that is particularly well suited for production line use. The fixed alignment of the X-ray source and detector, and the remotely controlled delivery of a pipe into registry with them, protects the operator from any harmful exposure to X-rays and eliminates errors that are caused by manual affixation of the source or detector to the pipe. The rotation of the pipe about its longitudinal axis relative to the source and detector eliminates the need for a detector that circumscribes the entire periphery of the weld, and any associated manpower required to fit the detector in place. The video image of the inspected area of the girth weld provides an operator with the ability to instantaneously interrupt the rotation of the pipe, mark the location of a detected flaw, and record appropriate information relating to repairs.

In addition, the apparatus provides a measure of flexibility that enables it to be successfully employed in measurement or inspection operations in addition to girth weld examination. For example, the individual sections of a double-jointed steel pipe are commonly formed by rolling a flat sheet of steel into a tube shape and welding the abutting edges of the sheet along the length of the pipe. It is often desirable to inspect the quality of the weld along the longitudinal seam of the pipe sections. Such examination can be easily accomplished with the apparatus of the present invention. The cantilevered boom, having a length equal to or greater than that of one pipe section, permits the entire longitudinal seam of a section to be viewed by the operator as the cart brings the girth weld into registry with the source and detector. The only extra step that is required is to rotate the pipe immediately after the shutter 15 is opened to bring the longitudinal seam into registry with the source and detector, to thereby enable it to be viewed as the cart moves toward the final position of inspection illustrated in Figure 1.

After the girth weld examination is completed, it may be desirable to turn the pipe around on the cart, or turn the cart around on a turntable, for example, to similarly inspect the longitudinal seam of the other section of the pipe. However, since most defects in longitudinal welds occur within about six inches (15.24 cm) of the girth weld, it may be most advantageous to provide a long enough boom 13 that enables the cart to be moved an additional 6-10 inches (15.24-25.40 cm) to the right, as viewed in Figure 1. Such a feature will permit the portion of the longitudinal weld adjacent the girth weld to be examined without the need to reposition the pipe or turn the cart.

Another characteristic of double-jointed pipes that must be measured relates to the circumferential spacing between the respective longitudinal seams of the two pipe sections. The specifications relating to such pipes require that a minimum spacing be present between the two seams around the periphery of the pipe, primarily for stress control purposes. Such spacing can be easily measured with the apparatus of the present invention, preferably at the beginning of the girth weld examination. The examination can be initiated at a point where one of the longitudinal seams intersects the girth weld, which is easily provided for when the apparatus is used to examine the longitudinal seam, as described above. As the pipe is rotating during the girth weld examination, the image of the other longitudinal seam will appear on the video monitors 32 and 34. At this point, the operator can observe the reading of the incremental position indicator 36 and determine whether the spacing between the two seams meets the specifications for the pipe. If it does, the girth weld examination can continue in the normal manner. If the spacing is less than the required minimum, the operator can halt the examination operation as soon as the spacing is determined, since there is no need to continue when the pipe does not meet all specifications. Thus, the use of the apparatus in this manner can save time by reducing the time required to examine the girth welds of pipes that are defective in terms of longitudinal seam spacing.

Body defects, such as gouges or scratches, can also be radiographically examined with the apparatus of the present invention. The ability to both rotate a pipe and move it longitudinally with the cart enables the operator to position any portion of the pipe section between the source and the detector for radiographic examination. Gouges are typically removed by grinding the surrounding surface area of the pipe so that a smooth contour is presented. After such an operation, the inspection apparatus of the present invention facilitates inspection of the ground area to ascertain whether the thickness of the pipe wall has been reduced to a value that is less than that required by the specifications.

The present invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. For example, the detector could be located on the side of the pipe, rather than above it, and the X-rays could be directed in a horizontal direction from the source. It is also possible to have the cantilevered boom longitudinally movable, as well as vertically adjustable. However, in such a case, provision should be made for adjusting the camera unit laterally as well, since it is important that the camera and X-ray source be in alignment with one another during the examination of a pipe.

The presently disclosed embodiments are therefore considered in all respects as illustrative and not restrictive. The scope of the invention is indicated by the appended claims, rather than the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

Claims

1. A method for examining the girth weld seam of a double-jointed steel pipe by detecting radiation passing through the pipe, characterized by the steps of:

moving the pipe longitudinally to a position where the girth weld seam surrounds a stationary source of radiation;

actuating the source of radiation to cause radiation to pass through a portion of the girth weld seam;

detecting the radiation passing through the portion of the girth weld seam with a stationary detector positioned in alignment with the radiation emitted from said source;

rotating the pipe about its longitudinal axis to enable the entire girth weld seam to be positioned adjacent the detector; and

producing a video image of the detected radiation passing through the girth weld seam as the pipe is rotating.

2. The method of Claim 1 further characterized by the steps of interrupting the rotation of the pipe when a flaw is observed in the video image, and producing a permanent record of the observed portion of the pipe appearing in the video image.

3. The method of Claim 2 further characterized by the step of providing a marking on the pipe at the location of the observed flaw while rotation of the pipe is interrupted.

4. The method of Claim 1 characterized in that the radiation source is actuated as soon as the end of the pipe surrounds the source during the pipe's longitudinal movement, and further characterized by the steps of rotating the pipe to position a longitudinal seam on the pipe between the source and the detector, and producing a video image of radiation passing through the longitudinal seam as the pipe is moving longitudinally.

5. The method of Claim 1 further characterized by the step of providing an indication of the rotational position of the pipe on the video image as the pipe is rotating.

6. The method of Claim 5 further characterized by the step of measuring the spacing between two longitudinal seams on the pipe as it is rotating.

7. Apparatus for examination of the girth weld seam area of a section of double-jointed steel pipe by detecting radiation passing through the pipe in the area of the girth weld, characterized by:

a conveying cart including means for loading and discharging a double-jointed pipe section;

means mounted on an adjustable cantilevered boom providing a source of radiation when energized and adapted for insertion into said pipe section;

means for moving said cart and said pipe section longitudinally toward and away from said cantilevered boom whereby said girth weld seam area may be placed in a position of registry with said radiation source mounted on said cantilevered boom;

radiation sensitive detection means adjustably mounted adjacent said pipe section at said position of registry; and

means mounted on said conveyor cart for rotating said pipe section about its longitudinal axis while said seam area is in said position of registry whereby said radiation sensitive detection means is able to detect radiation passing through said girth weld seam area when said radiation source is energized.

8. The apparatus of Claim 7 characterized in that said radiation sensitive detection means includes fluoroscope means for producing a visible image of radiation passing through said girth weld seam area, and a video camera for receiving said visible image.

9. The apparatus of Claim 8 further characterized by a televsion monitor connected to said video camera.

10. The apparatus of Claim 7 further characterized by means mounted adjacent the radiation sensitive detection means for providing a marking on a pipe as it is being examined.

11. The apparatus of Claim 8 further characterized by means for producing a permanent record of said visible image.

12. The apparatus of Claim 11 characterized in that said record producing means includes a video cassette recorder.

13. The apparatus of Claim 11 or 12 characterized in that said record producing means includes a video image facsimile recorder.

14. The apparatus of Claim 9 further characterized by means for generating alpha-numeric information on said television monitor.

15. The apparatus of Claim 7 characterized in that said radiation sensitive detection means is movable along the path of radiation emitted by said radiation source to accommodate pipes of different diameters.

16. The apparatus of Claim 7 characterized in that said pipe rotating means includes pairs of rollers having rotational axes that are parallel to the longitudinal axis of the pipe, said rollers being adjustable in the vertical direction.

17. The apparatus of Claim 7 further characterized by means for indicating the rotational position of a pipe mounted on said cart.

18. The apparatus of Claim 7 characterized in that said moving means and said rotating means are controllable from an operator's station located remote from said radiation source.

19. The apparatus of Claim 7 further characterized by means for detecting the presence of a pipe and means for enabling radiation from said source to impinge upon the pipe in response to detection thereof.

20. A method for examining a portion of a pipe by measuring radiation passing through the pipe, characterized by the steps of:

moving the pipe longitudinally to a position where the pipe surrounds a stationary source of radiation;

actuating the source of radiation to cause radiation to pass through the pipe;

detecting the radiation passing through the pipe with a stationary detector positioned in alignment with the radiation emitted from said source;

producing a video display of the detected radiation passing through the pipe; and

rotating the pipe so that the portion of the pipe to be examined is positioned between said source and said detector to thereby provide an image of said portion on said video display.

21. The method of Claim 20 characterized in that the portion of the pipe to be examined is a longitudinal seam, and the pipe is continued to be moved longitudinally after the pipe is rotated to position the seam between the source and the detector and while said video image is being produced.

22. The method of Claim 20 or 21 characterized in that the portion of the pipe to be examined includes a girth weld seam, and said pipe continues to be rotated while said video image is being produced to thereby provide an image of the entire girth weld on said display.

23. The method of Claim 20 characterized in that the portion of the pipe is examined to determine the thickness of its wall.

24. Apparatus for radiographically examining a characteristic feature of a pipe characterized by:

a source of radiation mounted on one end of a cantilevered boom;

means positioned in alignment with said source for detecting radiation emitted therefrom and producing a video image of the detected radiation;

a cart for receiving a pipe to be inspected and moving the pipe longitudinally to a position where the pipe surrounds said source of radiation and its wall is disposed between said source and said detecting means; and

means mounted on said cart for rotating the pipe about its longitudinal axis to position the characteristic feature of the pipe to be examined between said source and said detecting means.

25. The apparatus of Claim 24 characterized in that said source and said detecting means are movable towards and away from each other along the path of radiation emitted by said source.

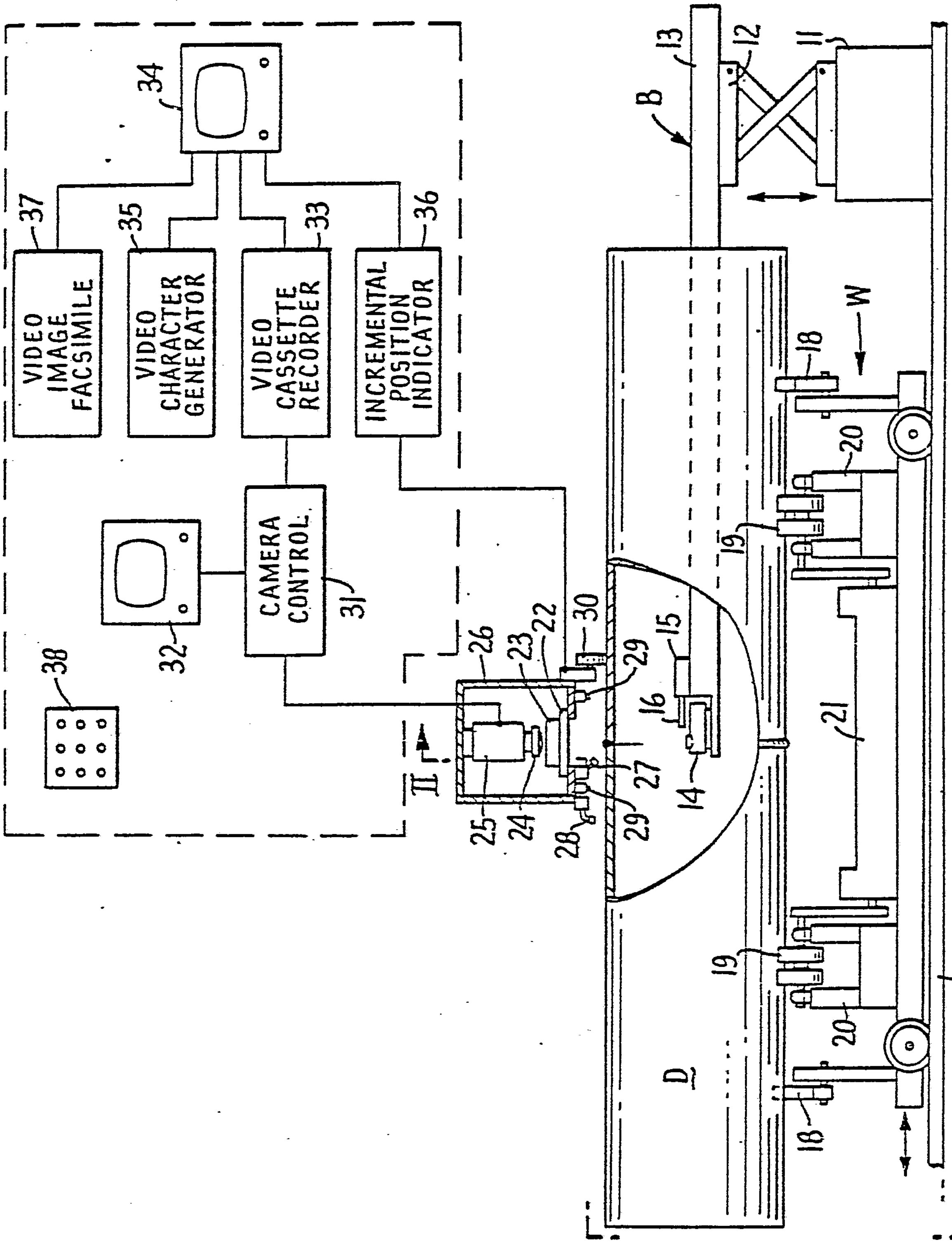
VIDEO IMAGE FACSIMILE
VIDEO CHARACTER GENERATOR
VIDEO CASSETTE RECORDER
INCREMENTAL POSITION INDICATOR
CAMERA CONTROL

FIG. 1

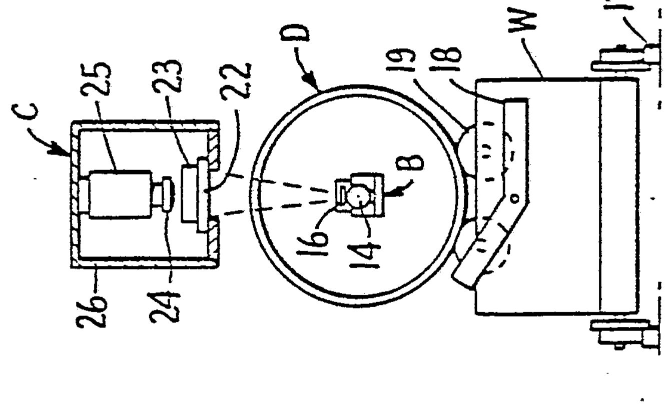

FIG. 2

INTERNATIONAL SEARCH REPORT

International Application No PCT/US82/01382

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [3]

According to International Patent Classification (IPC) or to both National Classification and IPC

INT. CL.[3] G01N 23/00
U.S. CL. 378/59

II. FIELDS SEARCHED

Minimum Documentation Searched [4]

Classification System	Classification Symbols
U.S.	378/59 250/460.1

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [5]

III. DOCUMENTS CONSIDERED TO BE RELEVANT [14]

Category *	Citation of Document, [16] with indication, where appropriate, of the relevant passages [17]	Relevant to Claim No. [18]
X	US, A, 4,078,180 Published 07 March 1978, GREEN	1-25
X	US, A, 3,835,324 Published 10 September 1974, WEIGLE	1-25
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IV. CERTIFICATION

Date of the Actual Completion of the International Search [2]	Date of Mailing of this International Search Report [2]
20 JANUARY 1982	25 JAN 1983
International Searching Authority [1]	**Signature of Authorized Officer** [20]
ISA/US	Davis L. Willis