

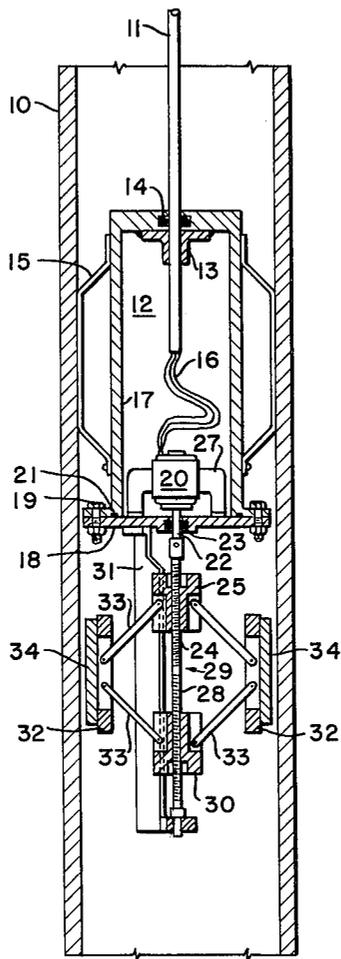
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DEVICE FOR OBTAINING IMPRESSION

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DEVICE FOR OBTAINING IMPRESSION

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This invention relates to oil well equipment and more particularly to a device for obtaining an impression of an oil well casing or other tubular members.

One of the major problems in oil wells is the obtaining of information which indicates the extent of internal corrosion of the well casing or the conditions of the perforations in the liner. In the past, it has been suggested that deformable members be lowered into the well and then expanded by means of internal pressure to obtain an impression of the inner surface of the casing. The deformable member was then collapsed and the device withdrawn from the well leaving an impression of the corrosion or the perforations on the outer surface of the deformable member. While such a device is satisfactory it has several disadvantages, for example, if the deformable member is not completely collapsed the impression obtained on its outer surface will be partially destroyed during withdrawal of the device. Furthermore, in using such a device it is necessary to supply a source of pressurized fluid to the device in order to expand the deformable member into contact with the inner surface of the casing. This requires the running of a conduit or pipe string into the well in order to supply the fluid pressure to the device as it is lowered into position. Thus, the devices of the prior art are expensive to run and at times fail to give satisfactory results.

Accordingly, it is the principal object of this invention to provide a novel device for obtaining an impression of the inner surface of an oil well casing which may be lowered and retrieved from a well by means of a wire line.

It is a further object of this invention to provide a unique device for obtaining an impression of the inner surface of the well which utilizes a mechanical movement for expanding the deformable members into contact with the inner surface of the casing and then mechanically retracts the deformable members in order that the device may be withdrawn from the well without injuring or destroying the impression on the outer surface of the deformable member.

The above objects and advantages of this invention are obtained by a device utilizing a plurality of deformable members arranged as the individual segments of a cylindrical member. Each of the members is fastened to a mechanical expanding means which is driven by a reversible electrical motor. The electrical motor will thus move the individual segments outwardly into contact with the inner surface of the casing to obtain an impression of the casing surface and then retract them inwardly so that the device may be removed from the well. The mechanical movement is arranged so that when the segments are moved outwardly the outer surface of the segments remain substantially parallel with the axis of the casing and thus a clear and distinct impression of the surface is obtained. The device is lowered into the well on the end of a cable which in addition contains suitable electrical conductors for supplying power to the reversible motor. The use of a single cable permits the device to be lowered and retrieved from the well in a manner similar to that used for lowering other wire line equipment. The use of wire line equipment in oil wells is well known in the art and will not be described in this application.

The above and other objects of this invention will be

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more easily understood from the following detailed description of a preferred embodiment when taken in conjunction with the attached drawing showing an elevation view partly in section of one device constructed in accordance with this invention.

Referring now to the drawing there is shown a device constructed according to this invention disposed in a section of an oil well casing 10. While the device is shown and described as being used for obtaining impressions of an oil well casing or liner it is of course to be understood that the device may be used for obtaining the impressions of the inner surface of any similar tubular member. The device is lowered into the casing and retrieved on the end of a cable 11 which contains suitable electrical conductors 16 for supplying power to the reversible electric motor 20. The lower end of the cable is secured to a pressure-tight housing 12 by means of a suspension flange 13 with a sealing means 14 being disposed around the cable to insure a pressure-tight seal around the cable 11. The housing 12 is formed from a cup-shaped member 17 and a bottom plate 18 which is secured to the cup-shaped member 17 by a plurality of bolts 19. A sealing ring 21 is disposed between the mating flanges of the cup-shaped member 17 and bottom plate 18 to insure a tight seal. Four centralizing members 15 are secured to the outer surface of the cup-shaped member 17 for aligning the axis of the housing with the axis of the casing. The centralizing members 15 are preferably formed of a spring type material in order that they may have sufficient resiliency to allow easy passage of the device past irregularities or obstructions in the casing. The motor 20 is disposed within the housing 12 and supported by means of motor supports 27 which extend downwardly from the motor casing and are fastened to the bottom plate 18 by any desired means such as welding or the like. The motor shaft 22 extends from the lower end of the motor through the bottom plate 18 of the pressure-tight housing 12. The shaft opening in the bottom plate is sealed by means of a sealing ring 23 or other sealing arrangement.

Secured to the lower end of the motor shaft 22 is a drive shaft 29 having two threaded portions 24 and 28. The threaded portions 24 and 28 on the drive shaft should have threads having opposite directions of advancement in order that two nut members 25 and 30 will be drawn together or moved apart depending upon the direction of rotation of the motor 20. A spline or guide member 31 is fastened to the bottom plate 18 of the pressure-tight housing 12 and extends downwardly to engage a slot formed in the nut members 25 and 30. The spline 31 thus prevents rotation of the nut members and insures that they will travel longitudinally along the threaded portions 24 and 28 as the motor rotates.

A plurality of impression pad holders 32 are secured to the two nut members 25 and 30 by toggle links 33. The opposite ends of the toggle links 33 are pivotally connected to both the impression pad holders 32 and the nut members 25 and 30, respectively. While any number of impression pad holders may be used it is preferable to use at least two in order to obtain an impression of substantially the complete inner surface of the casing. The area covered by the device will be increased as more holders are utilized since the space between the individual segments can be made smaller and still insure that the segments may be moved radially out to obtain an impression and then retracted to permit withdrawal of the device from the well. Removably secured to the outer surface of the impression pad holders 32 are impression pads 34. The impression pads 34 are formed of a material which may be easily deformed by the irregularities on the inner surface of the casing as the impression pad is moved radi-

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ally outwardly and remain in this deformed state after they are withdrawn from contact with the inner surface of the casing. Suitable materials are soft metallic materials, for example, lead or the like or plastic materials, for example, raw rubber. If raw rubber is used it will be necessary to supply sufficient heat to cure or vulcanize the rubber after the impression pads have been moved into contact with the inner surface of the casing. In some cases, the heat required for vulcanizing the raw rubber may be the heat of the formation surrounding the casing while in cases where the formation heat is not sufficient electrical heating elements may be incorporated in the impression pads. After the raw rubber has been vulcanized the impression formed on the surface of the impression pads will remain.

In operating the above-described tool the complete assembly is lowered into the well casing or liner to a predetermined depth, the depth being located at the point in the casing at which it is desired to obtain an indication of the condition of the inner surface of the casing. Electrical power is then transmitted to the reversible motor 20 in order to rotate the lead screw in a direction to draw the nut members 25 and 30 closer together. The action of the screw driven toggle members will then move the impression pad holders 32 radially outwardly while maintaining the outer surface of the impression pads 34 substantially parallel with the axis of the casing. In order to insure this parallel movement the individual toggle links 33 should all be of substantially the same length and the nut members 25 and 30 should be properly positioned along the threaded portion of the drive shaft 29. This radial movement will then press the deformable impression pads against the inner surface of the casing and the mechanical advantage of the toggle mechanism will apply sufficient pressure to the impression pads 34 to obtain a well defined impression of the surface even though relatively stiff metal such as lead or the like is used for the impression pads. After the impression has been obtained the direction of rotation of the motor 20 is reversed in order to retract the impression pads from the surface of the casing. After the impression pads have been retracted the device may be withdrawn from the well and the impression pads inspected to ascertain the condition of the surface of the casing.

From the above description it should be noted that it is possible to completely retract the impression pads in order that the device may be withdrawn from the well without injuring or damaging the impression contained on the pads. Furthermore, the only equipment required for operating the device is a suitable cable 11 and a source of electric power at the surface of the well. This greatly simplifies the use of the device since it is not necessary to supply pressurized fluid to the device as it is lowered into the well in order to expand the impression member into contact with the surface of the casing. Also, the use of individual impression pads 34 which are mechanically moved into contact with the inner surface of the well eliminates the necessity of pressure-tight fittings for attaching the deformable members to the device on which they are mounted for containing the expanding pressure. Thus, this invention provides a novel impression device which may be lowered into a well by means of a wire line or cable to obtain an accurate impression of the inner surface of the casing. Accordingly, this invention should not be limited to the particular details described but only to its broad spirit and scope.

We claim as our invention:

1. A device for obtaining an impression of the inner surface of a tubular member comprising: an expanding impression element formed from a plurality of individual segmented impression pad holders; a deformable impres-

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sion pad mounted on the outer surface of each pad holder; at least two substantially equal toggle links pivotally secured to each pad holder at one end and pivotally secured to threaded nuts at their opposite ends; a threaded lead screw passing through both nuts, said toggle links and nuts being disposed with the surface of the impression pad substantially parallel with the axis of the lead screw; a reversible electric motor disposed in a housing and coupled to said lead screw; centering elements disposed on said housing for substantially aligning the axis of said lead screw and motor with the axis of the tubular member; and means for suspending said housing on a cable to lower said housing into the tubular member and retrieve said housing.

2. A device for obtaining an impression of the inner surface of a tubular member comprising: a tubular expanding impression element formed from a plurality of individual elongated segmented impression pad holders; a deformable impression pad mounted on the outer surface of each pad holder; at least two substantially equal length toggle links being pivotally secured to each pad holder, the opposite end of each link being pivotally secured to one of two nut members, both of said nut members being disposed on a lead screw; a pressure-tight housing adapted to be secured to the end of a cable for lowering and retrieving from the interior of a tubular member; an electric motor disposed within said housing and having a motor shaft projecting through said housing, said motor shaft being coupled to said lead screw; guide means projecting from said housing and engaging said nut members to prevent rotation of said nut member when the lead screw rotates; and resilient center members secured to said housing to align the axis of said housing with the axis of the tubular member.

3. A device for obtaining an impression of the inner surface of an opening formed in a material comprising: an expanding impression element formed from a plurality of individual segmented impression pad holders; a deformable impression pad mounted on the outer surface of each pad holder; at least two substantially equal toggle links pivotally secured to each pad holder at one end and pivotally secured to threaded nuts at their opposite ends; a threaded lead screw passing through both nuts, said toggle links and nuts being disposed with the surface of the impression pad substantially parallel with the axis of the lead screw; means for driving said lead screw to expand said impression pad holders into contact with the inner surface of the opening to obtain an impression thereof and then retract said impression pad holders, whereby said pads are held from contacting the surface when in the retracted position; means coupled to the device for lowering the device into the opening and retrieving the device after said impression pad holders are retracted and centering means on said device to maintain the device in alignment with the axis of the opening.

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