Feb. 4, 1964 J. E. HALL, SR 3,120,271

CABLE WIPER

Filed Jan. 8, 1962

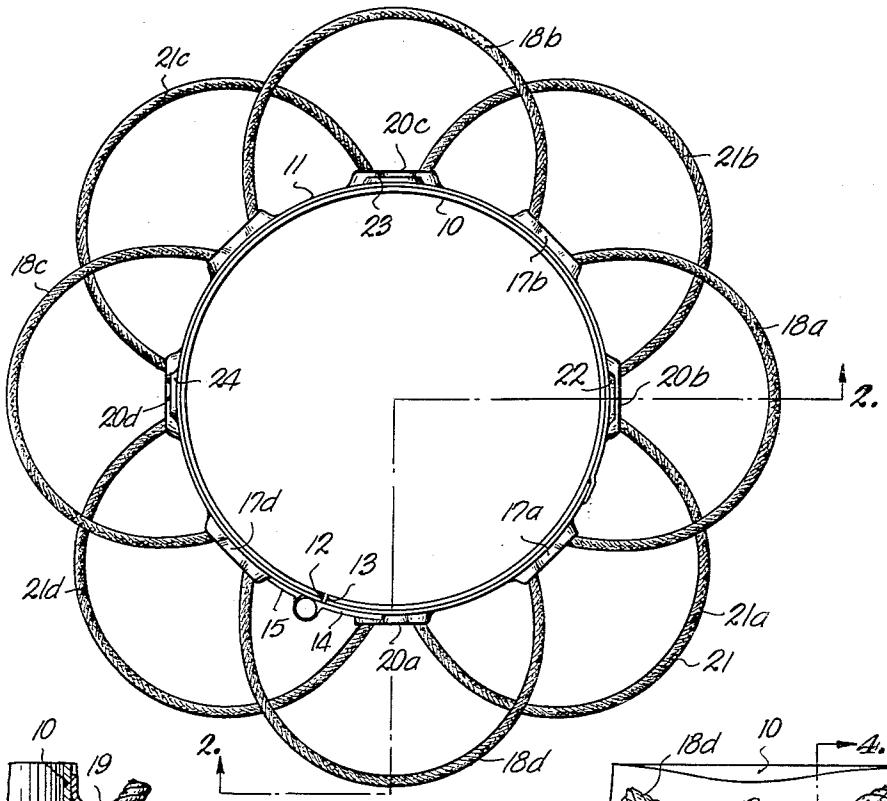


Fig. 1.

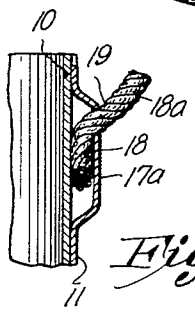


Fig. 4.

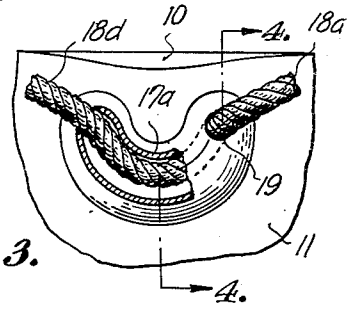


Fig. 3.

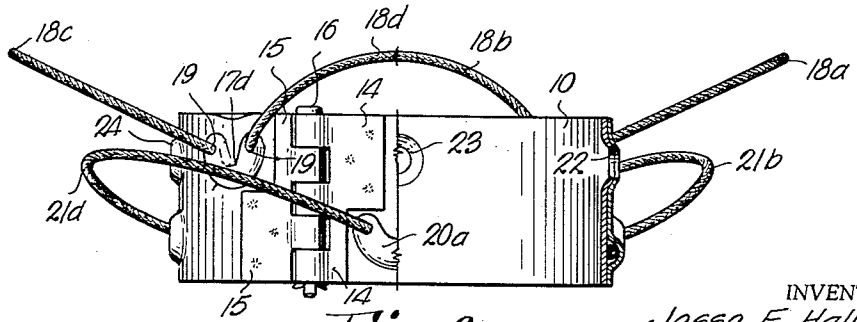


Fig. 2.

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CABLE WIPER

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This invention relates to devices for cleaning wellbores of oil wells and the like and refers more particularly to a wiping device employing a plurality of flexible, resilient cable loops to accomplish same.

This device is an improvement over the construction shown in the patent to Wright et al. 2,881,840 "Tool for Use in Cementing Well Casing" issued April 14, 1959, and the patent to Wright et al. 2,826,253 "Bore Wall Cleaner," issued March 11, 1958.

An object of the invention is to provide a cable wellbore wiping device which does not excessively tear, gouge, scratch or abrade the wall of the wellbore.

Another object of the invention is to provide a wellbore wiping device which is easily applied to and removed from the casing.

Another object of the invention is to provide a wellbore wiping device which is simple in construction, and relatively cheap and easy to manufacture.

Another object of the invention is to provide a wellbore wiping device having thereon a plurality of levels of cable wipers, the cable mountings staggered whereby to provide a complete wiping coverage of the wellbore wall circumferentially around the pipe in vertical reciprocation thereof.

Another object of the invention is to provide a wellbore wiping device which has extreme longevity in a wellbore, even under extreme conditions of rotation of the pipe and reciprocation of the pipe in the wellbore.

Another object of the invention is to provide a cable type wellbore wiping device with novel means for fixing the said cable wiping device in vertical position on the pipe and against rotation thereon after mounting the same on the pipe.

Another object of the invention is to provide a cable type wiping device employing lengths of cable each fixed at a plurality of circumferentially spaced positions around the collar of the wiping device whereby to simplify manufacture of the device.

Another object of the invention is to provide a cable type wiping device having a novel construction for mounting the cables on the collar thereof, said mounting means controlling and adjusting the desired pitch and angle of the cable to the collar of the wiping device.

Another object of the invention is to provide a cable type wiping device wherein there is a minimum of closing off of the circulation in the wellbore annulus between the pipe and the wellbore wall and where a minimum quantity of space is taken up by the mounting and securing means for the cable on the well tool.

Still another object of the invention is to provide a cable wiper with a plurality of cable levels whereby to effectively wipe the bore wall in rotation of the casing as well as in vertical reciprocation thereof.

Another object of the invention is to provide discontinuous cable mounting means on a cable type wiping device for use in a wellbore, said mounting means securely fixing the cable to the collar thereof and controlling the pitch and angle of the cables relative to the collar, yet providing a minimum of obstruction to the flow of fluids in the wellbore annulus.

Other and further objects of the invention will appear in the course of the following description thereof.

In the drawings, which form a part of the instant specification and are to be read in conjunction therewith, embodiments of the invention are shown and, in the various views, like numerals are employed to indicate like parts.

FIG. 1 is a plan view from above of the subject cable type wiper.

FIG. 2 is a view taken along the line 2—2 of FIG. 1 in the direction of the arrows.

FIG. 3 is a fragmentary close-up of one of the cable mounting means or tunnel members on the collar of the cable wiper with a portion thereof cut away to disclose the position and relationship of the cable relative to the securing and mounting means therefor.

FIG. 4 is a view taken along the line 4—4 of FIG. 3 in the direction of the arrows.

Referring to the drawings, at 10 is generally designated the inner one of the two collar members making up the collar assembly for the cable wiping device. This first collar member 10 is substantially circular in transverse cross section and has welded or otherwise fixedly attached to the outer surface thereof a second collar member 11 which is of like construction, but generally of lesser wall thickness. Either or both of the inner and outer collar members 10 and 11 may be made up of a plurality of formed pieces welded to one another or the other collar to provide a continuous double thickness collar assembly. The free ends 12 and 13 of each collar section 10 and 11 may be provided with hinge means comprising a first hinge member 14 welded or otherwise fixedly attached to the outer surface of collar member 11 at end edge 13 and second hinge member 15 welded or otherwise fixedly attached to the outer surface of opposing free end edge 12. The hinge members interengage as seen in FIG. 2 and may be joined by any suitable hinge pin 16.

A plurality of arcuate indentations, recesses or tunnel members are formed outwardly in outer collar member 11. A first upper set of said indentations 17*a–d*, inclusive, receives at intervals first continuous cable length (generally designated 18) to provide a plurality of loops 18*a–d*, inclusive, externally of the engagements thereof with the upper set of indentations 17*a–d* inclusive. Unless the cable length 18 is endless, the free ends thereof are received in and rigidly engaged by or spot welded in one of the indentations 17*a–d*, inclusive.

FIGS. 3 and 4 show the details of the engagement of a portion of the cable 18 with one of the upper tunnel members 17*a*). Openings 19 are provided at the extremities of the arcuate indentations 17*a–d*, inclusive, with the position of the openings on the walls of the tunnel members determining the exit angle of the cable relative to the collar outside surface. In the construction shown in the drawings, the openings 19 are provided in the substantially flat outer walls of the tunnel members 17*a* whereby the cable exiting from the members takes a sharp outward turn away from its substantially flat position within the indentions. Thus turn plus the relative rigidity of the cable makes for a rigid securement of the cable relative to the indentations in this particular application although spot welding or compression of the tunnel members on the cable may be employed also. Referring to FIG. 3, the upper right-hand corner thereof, it should be noted that the opening 19 could be moved onto the upper inwardly extending face of the member 17*a* to reduce the outward angle of extension, to the left in FIG. 3 to make a sharper angle between the confined cable and the exiting portion thereof or to the right in FIG. 3 to make a lesser angle with same. Thus, the positioning of the openings 19 can vary the cable loop configuration a good deal. The depth of the members 17*a–d*, inclusive, is preferably equal to or slightly less than the thickness of the cable whereby to compact same within said indentation to confine it against movement therethrough, in addition to the confinement and locking caused by the angular exit of the cable from the indentation.

A second series of external tunnel members 20*a–d*, inclusive, is preferably provided in a circumferentially spaced row at a level below the upper members 17*a–d* and positioned intermediate same whereby no member has another either directly above or below itself. Indentations 20*a–d* receive and confine portions of a second cable length (generally designated 21) producing loops thereof 21*a–d*, inclusive. The statements made relative to the engagement of cable 18 with the members 17*a–d* are herewith repeated for the engagement of members 20*a–d* with cable 21. By provision of the alternated vertically spaced cable receivers or members 17 and 20, with resultant spaced cable loops 18 and 21, it is seen that (1) complete wiping coverage of the wellbore wall is achieved in vertical motion of the casing carrying the wiper and (2) a minimum vertical obstruction of the outer surface of the collar is achieved by having discontinuous vertically spaced cable receiving indentations.

Additionally, by providing one tunnel member (upper and lower) on each side of the hinge, the hinge may be expanded to readily fit onto the casing.

Positioned at a plurality of circumferentially spaced locations, preferably precisely above and centered over the lower indentations 20*a–d* are a plurality of outwardly dimpled perforations 22, 23 and 24. Nails of the type shown in Hall, Sr. 2,836,446, "Stop Collar" issued May 27, 1958 may be employed by driving same laterally into the openings with the tips thereof penetrating past the outwardly dimpled collar portions 10 and 11 to make their own grooves and fix the collar in position on the pipe. The heads of the nails may be driven so that they fall into the holes and do not protrude beyond the casing collar. By positioning the outwardly dimpled nail holes 22–24 between the upper indentations and above the lower same, the nails may be driven downwardly at an angle between the adjacent upper and lower indentations to wedge the collar tight with access provided to the nail from above with a minimum of obstruction and interference.

In operation, the cable wiper may be clasped around the pipe or casing and slid into desired position on the pipe or casing. Suitable nails are then driven into the outwardly dimpled openings 22–24, as required, to fix the collar on the pipe or casing once it is located as desired by the operator. The pipe is then moved into the wellbore and to the zone it is desired to clean. As the cable loops normally are angled upwardly, a minimum of damage is accomplished in moving to the zone to be abraded. Vertical reciprocation of the casing in the wellbore then accomplishes the wellbore wall wiping desired with complete coverage achieved. Rotary movement of the casing in either direction achieves a substantial rotary wiping effect also due to the length of the cable loops and their vertical overlapping.

From the foregoing it will be seen that this invention is one well adapted to attain all of the ends and objects hereinabove set forth together with other advantages which are obvious and which are inherent to the structure.

It will be understood that certain features and subcombinations are of utility and may be employed without reference to other features and subcombinations. This is contemplated by and is within the scope of the claims.

As many possible embodiments may be made of the invention without departing from the scope thereof, it is to be understood that all matter herein set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

Having thus described my invention, I claim:

1. A cable wiping device comprising a generally cylindrical collar adapted to encircle a well pipe, a plurality of sets of hollow tunnel members positioned on the outer face of said collar, said tunnel members having an opening thereinto adjacent each extremity thereof, each set of said tunnel members positioned at a different level on said collar, individual tunnel members of each set thereof spaced at intervals around said collar and staggered thereon in relation to tunnel members of other sets, and a plurality of elongate cable members extending around said collar, each said cable member engaged at spaced portions thereof by tunnel members of a set thereof and having the nonengaged portions thereof communicating with said tunnel members through the openings thereof and arrayed in a series of loops.

2. A device as in claim 1 wherein each said tunnel member is arcuate in form and said arc opens toward one edge of the collar.

3. A device as in claim 1 including a hinge in the collar between adjacent tunnel members of different sets.

4. A device as in claim 1 wherein each cable member is an endless loop.

5. A device as in claim 1 wherein the collar is formed from two concentric collar pieces and the tunnel members comprise perforate outwardly indented portions of the said outer collar piece.

6. A device as in claim 1 including a plurality of outwardly dimpled openings in the collar wall each said opening positioned between a pair of tunnel members of one set.

7. A device as in claim 6 wherein the collar has an upper and a lower edge and the outwardly dimpled openings are positioned between tunnel members adjacent the said upper edge.

8. A cable wiping device comprising a generally cylindrical collar adapted to encircle a well pipe, at least one set of hollow tunnel members positioned on the outer face of said collar, said tunnel members arcuate in form, the arcs opening toward one edge of the collar, said tunnel members having an opening thereinto adjacent each extremity thereof and spaced at intervals on said collar, the openings in said tunnel members angled considerably from the direction of extension of the tunnel members, said tunnel members of said one set all substantially on the same level on the collar and spaced substantially equidistant from one another, and an elongate cable member extending around said collar and engaged at spaced portions thereof in said tunnel members of said one set with nonengaged portions thereof communicating with said tunnel members through the openings in the latter and arrayed in a series of loops.

9. A cable wiping device comprising a generally cylindrical collar adapted to encircle a well pipe, a plurality of hollow tunnel members positioned on the outer face of said collar, said tunnel members having an opening thereinto adjacent each extremity thereof and spaced at intervals on said collar, an elongate cable member extending around said collar and engaged at spaced portions thereof in said tunnel members with nonengaged portions portions thereof communicating with said tunnel members through the openings in the latter and arrayed in a series of loops, and a plurality of outwardly dimpled openings in the collar wall, said openings each positioned between a pair of said tunnel members.

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