Feb. 2, 1954 G. R. HUNT 2,667,929

WIPER FOR STRINGS ENGAGED IN WELLS

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Fig. 1.

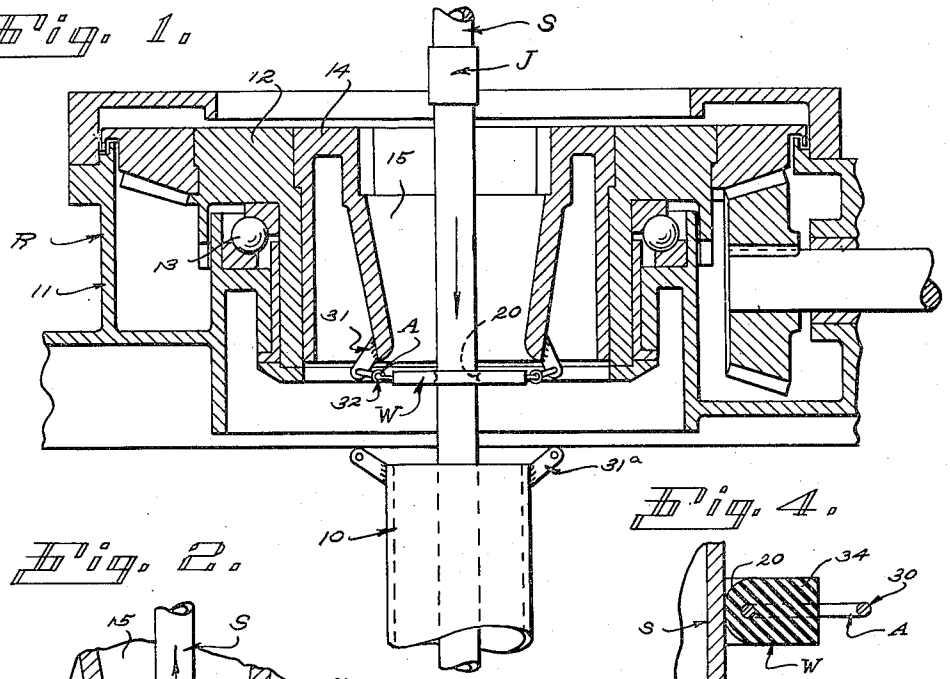


Fig. 2.

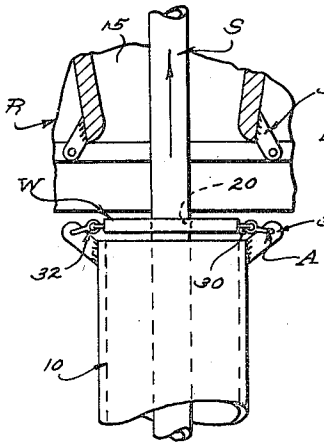


Fig. 4.

Fig. 3.

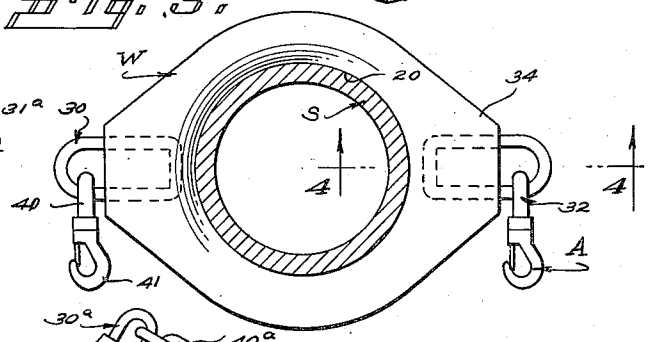


Fig. 5.

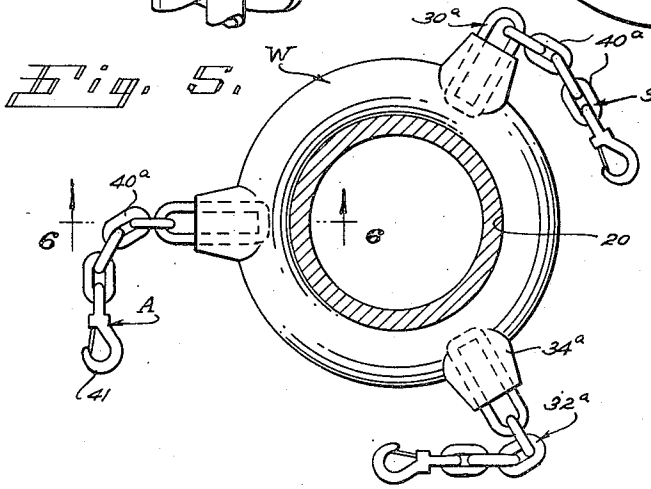
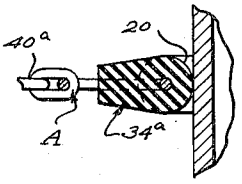


Fig. 6.



INVENTOR.
Gerald R. Hunt
BY
Attorney

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Fig. 7.

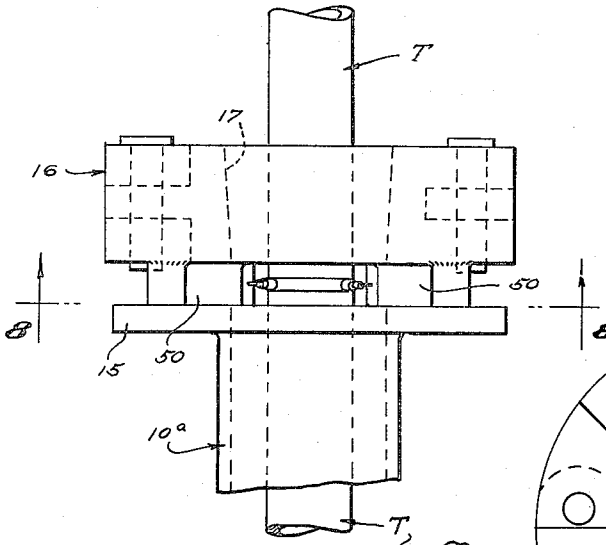


Fig. 8.

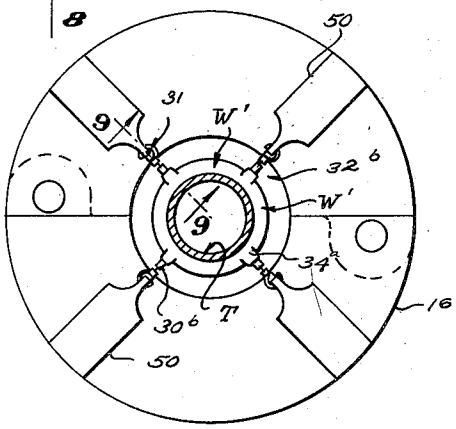


Fig. 9.

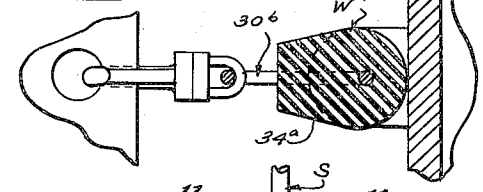


Fig. 10.

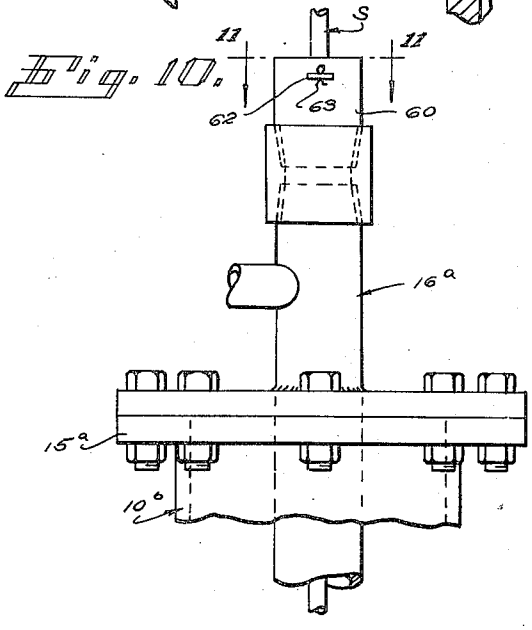
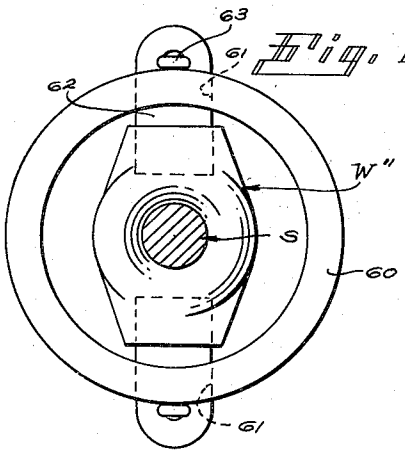


Fig. 11.



INVENTOR.
Gerald R. Hunt
BY
Attorney

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WIPER FOR STRINGS ENGAGED IN WELLS

Gerald R. Hunt, Long Beach, Calif.

Application December 10, 1948, Serial No. 64,508

6 Claims. (Cl. 166—16)

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This invention is concerned with wipers to engage or act on parts engaged in a well, and more specifically it is concerned with wipers for use in connection with elements of a well at the top or head thereof and serving to engage a string engaged or entered in the well in order to wipe or strip material therefrom in the course of being withdrawn from the well. It is a general object of the invention to provide a wiper or device of the general character referred to which is of simple inexpensive construction, which is easily and quickly applied or established in operating position, and which is highly effective in action.

Wipers are commonly used in connection with drill pipes employed in wells for the purpose of wiping or stripping material from the pipe as it is being withdrawn from the well, and to incidentally check accidental introduction of small objects or tools into the well, such as may otherwise occur if the upper end of the well is open and unobstructed.

The usual wiper is characterized by a disc having a central hole therein slidably passing the drill pipe and the outside diameter of the disc is substantially greater than the well elements in connection with which or between which the wiper is engaged. The peripheral portion of the wiper is usually reinforced as by means of a metal ring so that in action the wiper, being larger than the parts between which it is located, and being stiff so that it cannot be collapsed, floats in operating position without being definitely fixed or attached to any particular parts.

A wiper constructed and arranged as just described is rather slow and difficult to install for operation as it requires stripping over the drill pipe, and when it is related to a rotary table used to handle drill pipe it requires that the master bushings be removed in order to pass the wiper through the table to working position where it is between the table and the well casing. Furthermore, the usual wiper constructed as above described is large and heavy and involves a substantial quantity of rather expensive material making it a costly item of manufacture.

It is a general object of this invention to provide a wiper to be related to one or more elements of a well structure, the wiper being related to such element or elements so as to be insertable into operating position without requiring displacement or removal of any part of the structure.

A further object of my invention is to provide a wiper of the general character referred to which is of minimum size and is such that it may be of light, simple, inexpensive construction.

Another object of my invention is to provide a

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wiper construction of the general character referred to which does not require a metal ring or body of reinforcing material, such as characterizes the ordinary wiper.

It is another object of the invention to provide a wiper construction including anchoring means by which the wiper is secured or anchored to a well part to be maintained in operating position, as distinguished from being confined by the well parts, as is the case with the ordinary wiper.

The various objects and features of my invention will be fully understood from the following detailed description of typical preferred forms and applications of my invention, throughout which description reference is made to the accompanying drawings, in which:

Fig. 1 is a view illustrating the top of a well showing the upper end of a casing, a rotary unit and a drill pipe extending through the unit and into the casing, parts being broken away to show in section, and a wiper of the present invention being shown in operating position. Fig. 2 is a view of a portion of the structure shown in Fig. 1 showing the wiper in operating position but anchored to another element of the well structure. Fig. 3 is an enlarged plan view of the wiper showing it engaged on a pipe and apart from other elements of the well structure. Fig. 4 is a detailed sectional view taken as indicated by line 4—4 on Fig. 3. Fig. 5 is a view similar to Fig. 3 showing a different or modified form of construction. Fig. 6 is a view taken as indicated by line 6—6 on Fig. 5. Fig. 7 is a view showing the upper or head end portion of a well with a head structure or spider on the upper end of a casing in which tubing is located. Fig. 8 is a transverse section taken as indicated by line 8—8 on Fig. 7. Fig. 9 is an enlarged detailed sectional view taken as indicated by line 9—9 on Fig. 8. Fig. 10 is a view similar to Fig. 7 showing a head construction on a well casing accommodating a sucker rod, and Fig. 11 is a plan view taken as indicated by line 11—11 on Fig. 10.

The wiper provided by my present invention is such as to be used in connection with well parts or elements, and it is intended to serve as a wiper for removing mud, oil, or other material from a string extending from a well casing, which string may be a string of drill pipe, tubing, or a string of sucker rods. The well structure in conjunction with which the wiper is employed or in combination with which it operates may involve elements such as a well casing, or the head or a head-like structure on a casing, a rotary unit, or other like parts or structures.

In illustrating the invention it has been shown in several different situations in order to facilitate an understanding of the manner in which the invention may be adapted to different services. In Figs. 1 and 2 of the drawings the invention is shown applied in a manner to operate advantageously on or in connection with a string of drill pipe, or the like. In this case I illustrate certain elements of a typical structure employed during drilling operations, for instance, I show the casing 10 terminating below the rotary unit R and a string S of drill pipe is shown engaged through the rotary unit and entering the casing 10.

The rotary unit R illustrated shows a typical structure of this general character and is shown as involving a base or frame 11 supporting a table 12 through a suitable bearing 13 while a master bushing 14 is carried in the table establishing a central opening 15 concentric with the casing 10. The opening 15 is typical of the opening found in rotaries and is designed to receive slip bushings which are distinguished from the master bushings by being relatively light, simple, and easy to handle, and in practice the slip bushings, not shown in the drawings, are frequently arranged in and removed from the table, whereas the master bushing 14 is commonly left in the table over long periods of time.

In the general arrangement illustrated in Figs. 7 and 8 of the drawings, the casing 10^a is provided with a head construction such as is employed when tubing T or the like is engaged in the casing. In the case illustrated the casing 10^a is shown provided at its upper end with a flange 15 and a tubing spider 16 is mounted on or supported by the flange 15, the spider being provided with a slip opening for handling slips engageable with the tubing.

In the form of the invention illustrated in Figs. 10 and 11 there is a head construction on the casing 10^b suitable for handling a sucker rod S or the like. In this case a flange 15^a is provided on the upper end of casing 10^b and a head 16^a is secured to the flange 15^a and is such as to normally carry packing which engages around a polish rod which forms a part of the sucker rod, the structure being such that the packing and polish rod are removed in the course of handling or manipulating the sucker rod, as for instance, while pulling the sucker rod, at which time the wiper of the present invention is employed.

Referring first to the form of the invention illustrated in Fig. 1 of the drawings, the invention provides a wiper W engageable around the drill pipe S, and anchoring means A coupling the wiper W to an element of the well structure in order that the wiper may be maintained in proper position.

The wiper W provided by the present invention is preferably a simple disc-shaped element having a central opening 20 passing the pipe S and it is preferably formed of a material which allows for expansion of the wiper so that joints J of or on the pipe S may be passed through the wiper in the course of moving the string S vertically. In practice the wiper W may be formed of a simple flat disc-like body of rubber or rubber-like material. In referring to the wiper as being of rubber it is to be understood that this term is intended to include rubber substitutes or rubber-like compositions and in practice I prefer to employ so-called rubber substitutes or synthetic rubber which is not appreciably affected by oil, or the like. This type of material is desirable in the situation illustrated in that the material wiped from the string S is often laden, more or less, with oil.

A feature of the present invention is the formation of the wiper W so that its outside diameter is so related to the opening 15 through the rotary R as to allow the wiper to be arranged in and removed from a position between the rotary and the casing 10 without removing or disturbing the master bushing, or like parts of the rotary. In the case illustrated in Fig. 1, the wiper W is substantially smaller in outside diameter than the opening 15 and it will be apparent that the wiper may readily be stripped over the string S and lowered through the opening 15 to a position at or below the lower end of the master bushing 14.

The anchor or anchoring means A provided by the present invention serves to releasably secure the wiper W to an element or part of the well structure, for instance either to the rotary or to the casing 10. As shown in Fig. 1 the wiper W is secured by the means A to the lower end portion of the master bushing 14 so that the wiper occurs at the lower end of the master bushing or between the master bushing and the casing 10. The anchoring means A involves circumferentially spaced eyes 30 on the wiper W, circumferentially spaced anchor elements 31 on the structure of the well to which the wiper is to be secured, and suitable coupling devices 32 joining the eyes and the anchor elements.

In the form of the invention shown in Figs. 1, 2, 3 and 4 of the drawings the wiper W is provided with but two eyes 30 and these are located at diametrically opposite parts of the wiper at the periphery thereof. The particular wiper illustrated is shown provided with radially extending or projecting parts 34 which hold or secure the eyes 30, the eyes being shown as loops of material or ring-like parts so embedded in the portions 34 as to have projecting portions engageable by the coupling devices 32.

In the case illustrated in Fig. 1 anchor elements 31 are shown provided on the master bushing 14 and like or corresponding anchor elements 31^a are provided on the casing 10. The anchor elements 31 are shown as lug-like parts welded or otherwise secured to the lower end portion of the master bushing so that they have spaced parts, preferably apertured, for reception of the coupling devices 32. The anchor elements 31 correspond in number and arrangement with the eyes 30 on the wiper to be secured, and they preferably depend somewhat from the lower end of the master bushing to be readily accessible, as illustrated in the drawings.

The anchor elements 31^a shown provided on the casing 10 are like or similar to the anchor elements above described, that is, they are lug-like parts welded or otherwise secured to the casing 10 and they are spaced to correspond to the spacing of eyes on the wiper and they preferably project upwardly to be readily accessible. Ordinarily but one wiper will be employed at a time and it may be coupled by the couplers 32 either to the elements 31 or to the elements 31^a. In Fig. 1 the wiper is shown attached to the elements 31, whereas in Fig. 2 it is shown attached to the elements 31^a.

The coupling devices 32 provided by the present invention are provided to releasably connect the eyes 30 and the coupling elements and it is preferred that they join these parts so that suitable freedom of movement is allowed the wiper. It is preferred that the coupling elements 32 be link-like parts which loosely couple or link the eyes

and anchor elements. In the case illustrated in Fig. 3 each coupling device 32 involves a link 40 engaged with or carried by an eye 30 and a snap hook 41 carried by the link and engageable with an anchor element, for instance either with an element 31 or an element 31a, as may be desired. It is to be understood that any suitable releasable fastening device such as a spring type latch or snap hook 41 may be employed to afford the desired releasable connection joining the wiper W with the well part, that is, either with the rotary unit R or the casing 10.

In the application of the wiper shown in Fig. 2 the snap fasteners or snap hooks 41 are applied to the elements 31a, in which case the wiper is secured in a position somewhat closer to the end of the casing 10a than is the case when it is applied to the elements 31 on the master bushing.

In the form of the invention illustrated in Figs. 5 and 6 the wiper W is provided with three circumferentially spaced eyes 30a supported or embedded in projecting parts 34a and the coupling devices 32a involve a plurality of links 40a so that each is a chain-like structure longer than the couplings shown in Fig. 3 and having considerably more flexibility than the coupler shown in Fig. 3. It will be apparent that the chain-like construction illustrated in Figs. 5 and 6 may be employed in cases where substantial freedom of the wiper is desired, or where the proportioning of the parts requires such a construction.

In the form of the invention illustrated in Figs. 7 and 8 the wiper W' is shown provided with four circumferentially spaced eyes 30b while the head structure on the casing 10a carries anchor elements 31c that receive releasable coupling devices 32b. In the particular case illustrated the tubing spider 16 is spaced above the flange 15 by blocks or ribs 50, the inner ends of which are provided with the apertured anchor elements 31c.

In the form of the invention illustrated in Figs. 10 and 11 the portion of the head 16a normally carrying packing for engaging around a polish rod is provided with an extension 60 tubular in form and provided with circumferentially spaced openings 61. The wiper W'' in this case is shown engaged around the sucker rod S and projecting parts 62 are secured to the wiper W and project radially therefrom to engage in or through the openings 61. Suitable keys or retainers 63 are engaged with the outer projecting ends of the parts 62 and serve to retain the wiper W'' in operating position.

It is to be observed that in each case or application of the present invention the wiper proper, which is the rubber disc-like part engaged with the part from which the material is to be wiped, is smaller than the opening in the supporting or connected structure of the well so that the wiper may be arranged in place and the anchoring means A engaged without removing or in any way disturbing the well parts.

In the case shown in Figs. 1 and 2 the wiper may be easily inserted through the rotary table and the operator may reach down through the table and engage the anchoring means without disturbing any part of the well structure. Further, in like manner the wipers can in these cases be disengaged and removed at will, without disturbing parts of the well structure.

In the structure shown in Figs. 7 and 8 of the drawings it will be apparent how the wiper may be stripped over the tubing T and then arranged through the opening 17 in the spider 16 to be finally anchored in place, as shown in the drawings.

In the form of the invention illustrated in Figs. 10 and 11 the wiper may be initially installed in the part 60 which is stripped over the sucker rod and applied to the head 16a, or, if desired, the flexibility of the wiper may be utilized to allow it to be inserted in the part 60 and then flexed or manipulated so that the parts 62 are inserted through the openings 61. In considering this form of the invention it is to be understood that the parts fit loosely or freely so that engagement and disengagement of the wiper from operating position may be effected easily and quickly.

Having described only typical preferred forms and applications of my invention, I do not wish to be limited or restricted to the specific details herein set forth, but wish to reserve to myself any variations or modifications that may appear to those skilled in the art and fall within the scope of the following claims.

Having described my invention, I claim:

1. A wiper for an object extending through an opening in a rotary located above a well including, a continuous annular bodily expansible body of flexible material defining a central opening adapted to slidably pass the object, the exterior of the body being smaller in diameter than the opening in the rotary, and a releasable means adapted to secure the said body in operating position between the casing and rotary for limited movement relative thereto.

2. A wiper for an object extending through an opening in a rotary located above a well casing including, a disc-shaped body of flexible material expansible as a whole and having a central opening slidably passing the object and having an exterior smaller in diameter than the first mentioned opening and anchoring means adapted to retain the body between the rotary and casing for limited universal movement relative thereto including circumferentially spaced radially projecting parts on the body at the exterior anchor elements, and couplings circumferentially spaced relative to the body and releasably connecting said parts and the anchor elements, the couplings including releasable fasteners.

3. A wiper for an object extending through an opening in a rotary spaced above a well casing including, a disc-shaped body of flexible material expansible as a whole and having a central opening slidably passing the object and having an exterior smaller in diameter than the first mentioned opening, and anchoring means including circumferentially spaced parts fixed on the body at the exterior thereof, anchor elements fixed on the rotary, and couplings releasably connecting said parts and anchor elements, the couplings including releasable fasteners engageable with the anchor elements and a single link connecting each fastener to one of said parts.

4. In combination, two well parts, one a well casing and the other a rotary spaced above the casing and having an opening aligned with the casing and adapted to pass an object into the casing, a flexible bodily expansible annular wiper including a disc-shaped body defining a central aperture adapted to slidably pass the object, and anchoring means releasably securing said wiper to one of said parts with said wiper located between said parts, the outside diameter of the wiper being smaller than the said opening.

5. In combination, a rotary adapted to be arranged over a casing and having an opening adapted to slidably pass a string into the casing,

a flexible bodily expansible wiper insertable through the opening in the rotary and defining a central aperture adapted to slidably pass said string, anchor elements on the rotary at the bottom thereof, and releasable fasteners carried by the wiper and engageable with said elements holding the wiper below the rotary for limited universal movement relative thereto.

6. In combination, a well casing, a rotary arranged over and spaced from the casing and having an opening adapted to pass a string into the casing, a flexible bodily expansible annular wiper insertable through the opening in the rotary and defining central aperture adapted to slidably pass said string, anchor elements on the casing at the upper end thereof and releasable fasteners carried by the wiper and engageable with said elements connecting the casing and wiper for limited universal movement of the wiper relative to the casing and rotary.

GERALD R. HUNT.

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