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3,197,263

VIBRATION DAMPENER AND STABILIZER FOR SUCKER RODS

Filed Jan. 30, 1963

2 Sheets-Sheet 1

Fig. 1.

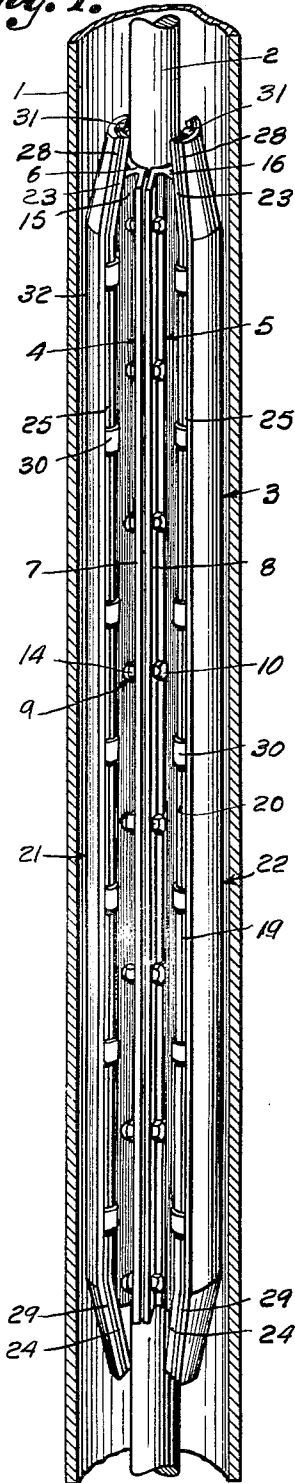
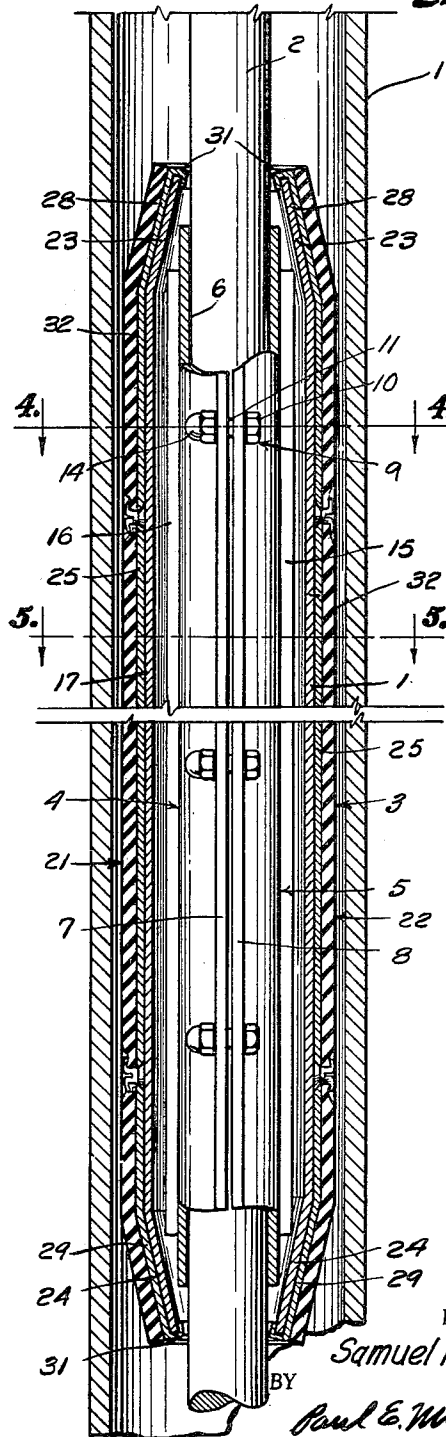


Fig. 2.



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Fig. 3.

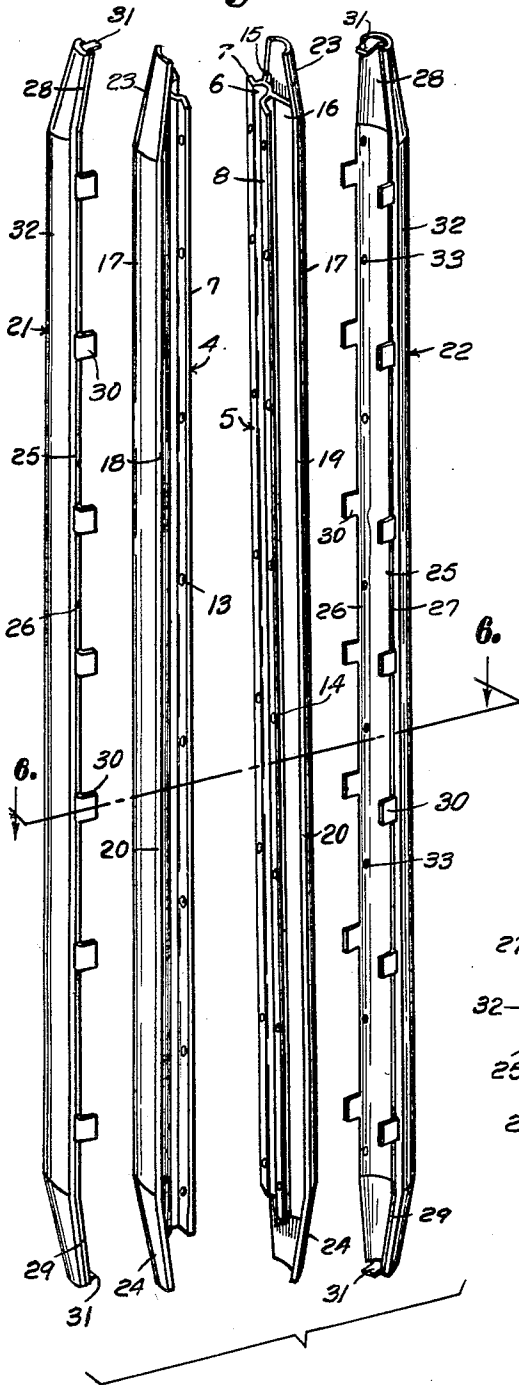


Fig. 4.

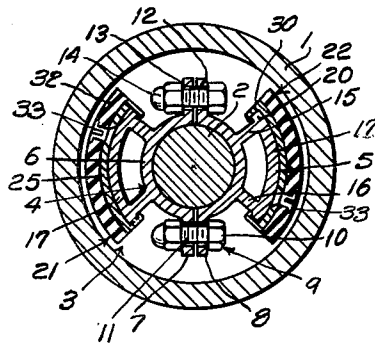


Fig. 5.

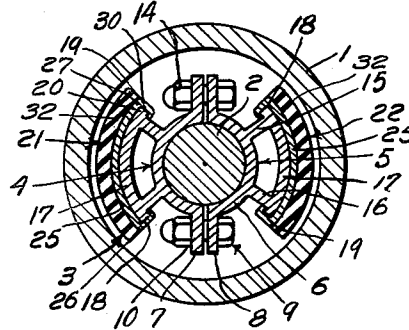
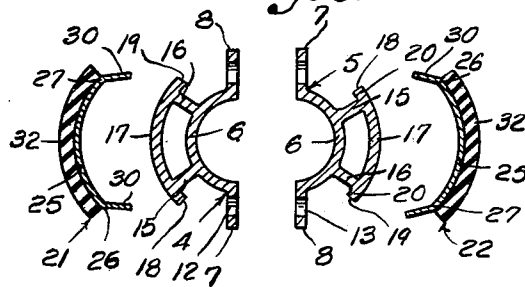


Fig. 6.



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3,197,263 VIBRATION DAMPENER AND STABILIZER FOR SUCKER RODS

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3 Claims. (Cl. 308—4)

This invention relates to a sucker rod vibration dampener and rod stabilizer for application to sucker rods operating within a well tubing.

In the mechanical pumping of wells, a tubing is run into the bore hole of the well to carry the pump on the lower end and provide for flow of fluid from the pump to the top of the well. Connected with the reciprocating element of the pump is a string of sucker rods that extends longitudinally within the tubing to connect with the pumping jack or other power capable of producing reciprocation of the rods and elevation of the well fluid through the tubing. In deep wells, such as oil wells, there is a tremendous load on the rods, resulting from weight of the rods, weight of the column of fluid in the tubing, friction, and the like, which produces stretch of the rods. The stretch of the rods increases on the upstroke and decreases on the downstroke, consequently, the rods are in constant vibration, which produces crystallization and results in ultimate breakage of the rods.

All wells are crooked, because it is impossible to drill a straight bore hole, therefore there is a rubbing and slapping of the rods on parts of the tubing. This not only increases stress on the rods, but produces wear thereon and rubbing through or splitting of the tubing. In deep wells, rod and tubing failures are frequent. Breakage of the rods, of course, necessitates shutting down of the production and difficult fishing jobs and replacement of the rods and tubing.

Various attempts have been made to provide rod guides, vibration dampeners, and the like, but most of them are unsatisfactory because they interfere with running the rods into and out of the well, interfere with flow of well fluid, and it has been difficult to make them rugged enough to withstand tremendous loads. In fact, tension of the rods literally crushed them against the tubing and caused the fastening devices and parts thereof to break loose and drop into the tubing so as to become wedged and difficult to remove.

It is, therefore, the principal object of the present invention to provide a sucker rod vibration dampener and rod stabilizer which eliminates the above described difficulties and greatly prolongs the life expectancy of the rods.

Other objects of the invention are to provide a relatively light weight sucker rod vibration dampener and stabilizer which is ruggedly constructed and capable of withstanding the working stresses to which they are subjected; to provide for mounting the dampener and stabilizer on the rods in such a manner that the fastening devices are out of contact with the tubing; to provide a vibration dampener and stabilizer with shoes covered with a composition material, to avoid metal-to-metal contact and to better dampen the vibration of the rods; to provide for securely retaining the composition material on the face of the shoes; and to provide a secure means for retaining the shoes on the clamping parts with which the dampener and stabilizer is secured to the sucker rod.

Further objects of the invention are to provide a vibration dampener and stabilizer which permits increasing the speed of the pump with less power cost; and to provide straightening of the rod action with respect to the tubing in crooked wells.

In accomplishing these and other objects of the invention, I have provided improved structure, the preferred form of which is illustrated in the accompanying drawings, wherein:

FIG. 1 is a vertical section through a portion of well tubing, showing a sucker rod therein that is equipped with a vibration dampener and stabilizer embodying the features of the present invention.

FIG. 2 is an enlarged section through the flow tubing and through the vibration dampener and stabilizer, to better illustrate the construction and mounting thereof on the sucker rods.

FIG. 3 is a perspective view of the parts of one of the vibration dampeners and stabilizers, shown in disassembled, spaced relation.

FIG. 4 is a transverse section on the line 4—4 of FIG. 2, showing the position of the bolts and flanges of the support members and how they are kept out of contact with the wall of the tubing by the shoes of the device.

FIG. 5 is a similar section taken on the line 5—5 of FIG. 2.

FIG. 6 is a transverse sectional view of the parts of the stabilizer and dampener in spaced apart relation and taken on the line 6—6 of FIG. 3.

Referring more in detail to the drawings:

1 designates a portion of well tubing that extends from the top of a bore hole to the bottom thereof for carrying a pump (not shown) on the lower end for elevating well fluids to the top of the well. 2 designates a portion of a string of sucker rods extending downwardly through the tubing to actuate the reciprocating element of the pump. The rods 2 are suspended at the upper end from the walking beam of a pumping jack (not shown) or the like, by which the rods are reciprocated as in the usual practice in the pumping of an oil well. As above mentioned, the string of rods reaching from the pumping jack to the well pump in deep wells is under considerable stretch, not only from weight of the rods themselves but also the added weight of the column of fluid being lifted in the tubing on each upstroke. Stretching of the rods varies during reciprocation, increasing on the upstroke and lessening on the downstroke, causing the rods to vibrate and pound with such force that they are under extreme stress and soon crystallize and, sometimes, break after only a short period of operation.

It is impossible to drill a bore hole straight, so that the tubing deviates from the perpendicular with deviation in the bore hole. Therefore, when the rods are reciprocated they make contact with the tubing at these places, with the result that the sucker rods exert tremendous pressure and wear upon the tubing, causing the tubing to be worn away and actually split apart under thrust of the rods thereon.

However, with the present invention the vibration on the rods and the excessive forces on the tubing are stabilized by providing the string of rods at places along the length thereof with vibration dampeners and stabilizers 3, as now to be described, only one being illustrated in the drawings, since the stabilizers and dampeners are all of like construction and may be located along the length of the string of sucker rods wherever they may be needed.

In accordance with the present invention, each vibration dampener and stabilizer includes two or more supporting members 4 and 5, each having a nearly semicylindrical collar portion 6 having an inner radius of such size as to firmly seat upon the face of the rod 2. The collar portions 6 each have laterally extending flanges 7 and 8 of only sufficient width to accommodate fastening devices 9 by which the collar portions are drawn tightly about the sucker rod 2, as shown in FIGS. 1, 4 and 5. The flanges 7 and 8 must be of ample strength to accommodate fast-

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ening devices of the proper size, but they must be kept to minimum size because they occupy fluid space, and if made longer they are apt to contact the tubing. The collar portions are elongated and may be two or three feet in length, to provide stabilizers and dampeners having desired contact with the inner face of the tubing 1.

The fastening devices 9 preferably comprise bolts 10 having threaded shanks 11 of a length to extend through registering openings 12 and 13 in the respective flanges and to mount acorn nuts 14, so as to cover the threads of the bolts, since the threads would otherwise be subject to the corrosive action of the well fluids.

Extending radially outwardly from the collar portions 6 are web portions 15 and 16, preferably formed integrally with the collar portions 6, to carry a plate portion 17 that is of arcuate cross section, as best shown in FIGS. 4, 5 and 6. The plate portions 17 have marginal edges 18 and 19 that project from outer faces of the web portions sufficient distances to provide anchoring flanges 20 for shoes 21 and 22, as later described. The upper and lower ends of the arcuate plate portions 17 extend beyond the ends of the collar portions 6 and taper inwardly toward the sucker rod, as designated by the numerals 23 and 24, FIGS. 2 and 3.

The shoes 21 and 22 are of like construction, and each consists of a shell 25 having an arcuate cross section corresponding to the arcuate cross section of the plate portions 17, and the shells have longitudinal edges 26 and 27, preferably terminating in registry with the edges of the flanges 20. The shells also have inwardly tapering ends 28 and 29 corresponding to the tapered ends 23 and 24 of the plate portions that back them.

The edges 26 and 27 of the shells have tongues 30 spaced along the length thereof. The ends 28 and 29 of the shells also have one or more tongues 31. The tongues are bent over the flanges 20 and over the ends 23 and 24 of the arcuate plate portions 17 of the supporting members 4 and 5.

Each of the shells has a facing 32 of composition material which may include a fabric incorporated in a synthetic rubber that is resistant to the action of the well fluids. The facings 32 are preferably vulcanized to the shells and further secured by rivets 33, as best shown in FIGS. 3 and 4.

In assembling the parts of the vibration dampener and stabilizer on a sucker rod, the shells, with the facings thereon, may be secured to the plate portions 17 of the supporting members 4 and 5 by placing the concave side of the shells over the convex sides of the plate portions 17, so that the shells fit snugly on the plate portions both in circumferential and longitudinal directions. The tongues 30 are then hammered over the flanges 20, as shown in FIGS. 1, 4 and 5, so that the shells 25 of the shoes 21 and 22 are drawn tightly and immovably against the outer faces of the plate portions 17 of the supporting members. The end tongues 31 are likewise bent over the ends 23 and 24, as shown in FIGS. 1 and 2. The supporting members 4 and 5 are then placed on opposite sides of the sucker rod 2 and secured thereto by the fastening devices 9, the nuts 14 of which are drawn tight to clamp the collar portions 6 firmly against the sides of the sucker rod, so that the assembled vibration dampener and stabilizer is immovable thereon even under the stresses that are imparted between the sucker rod and tubing when the sucker rods are in operation.

A vibration dampener and stabilizer 3 may be applied as needed along the length of the string of sucker rods 2, for example, one of them may be applied to each sucker rod, or only at places therealong that show rubbing of the sucker rods on the tubing.

With the sucker rods in reciprocation, as when fluid is being pumped through the tubing, the facings 32 ride in frictional contact with the tubing so as to dampen vibrations that produce breakage of the rods.

Attention is directed to the fact that the fastening de-

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vices 9 are readily manipulated in the spaces between the side edges of the shoes 21 and 22, yet the shoes are sufficiently wide to prevent contact of the fastening devices 9 or the flanges 7 and 8 with the tubing when the sucker rods are in operation. The spaces also, together with the spaces between the webs 15 and 16, provide ample passage for flow of the well fluid to the top of the tubing 1.

When the facings 32 become worn, the shells may be removed by hammering loose the tongues, so that the old shoes can be removed and replaced with new shoes.

From the foregoing, it is obvious that I have provided a vibration dampener and stabilizer which may be readily applied at desired points along the length of the sucker rods to provide adequate support for straightening the string of sucker rods within the tubing and reduce the vibration which is so destructive to sucker rods. It is also apparent that the dampeners and stabilizers constructed as described are constructed to withstand the forces that are applied thereto.

What I claim and desire to secure by Letters Patent is:

1. In combination,
 - a flow tubing,
 - a string of sucker rods reciprocable within the flow tubing, and
 - a stabilizer bodily mounted on one of the sucker rods and reciprocable therewith for sliding contact with the flow tubing to stabilize lateral movement of the rod and to dampen vibration,
- said stabilizer including
 - elongated collar segments seating upon and substantially encircling the sucker rod and having outwardly extending flanges terminating short of the tubing,
 - fastening devices extending through the flanges of said collar segments for drawing the segments together in gripping contact with the sucker rod,
 - a plate of arcuate cross section coextensive with each collar segment,
 - said plates having edges spaced circumferentially from each other and from said flanges to accommodate insertion of the fastening devices and provide flow passages therebetween,
 - shoes conforming with and covering outer faces of the arcuate plates,
 - means for securing the shoes to said arcuate plates, and
 - a composition facing having fixed connection with outer faces of the shoes for sliding contact with the flow tubing and to prevent contact of the flanges with the flow tubing during reciprocation of the rods.
2. In combination,
 - a flow tubing,
 - a string of sucker rods reciprocable within the flow tubing, and
 - a stabilizer bodily mounted on one of the sucker rods and reciprocable therewith for sliding contact with the flow tubing to stabilize lateral movement of the rod and to dampen vibration of the string of sucker rods,
- said stabilizer including
 - elongated collar segments seating upon and substantially encircling the sucker rod and having outwardly extending flanges terminating short of the flow tubing,
 - fastening devices extending through the flanges of said collar segments for drawing the segments together in gripping contact with the sucker rod,
 - a plate of arcuate cross section coextensive with each collar segment,
 - said plates having edges spaced circumferentially from each other and from said flanges to accommodate insertion of the fastening devices and provide flow passages therebetween,
 - said plates having inwardly tapering ends projecting beyond upper and lower ends of the collar segments,

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shoes conforming with and covering outer faces of the arcuate plate portions and having similarly tapering ends covering the tapering ends of the plates to fix the shoes from longitudinal movement of the shoes on said plates,

means for securing the shoes from radial movement on said arcuate plates, and

a composition facing having fixed connection with the plates to provide outer faces for sliding contact with the flow tubing and to prevent contact of the flanges with the flow tubing during reciprocation of the rods.

3. The combination as described in claim 2, wherein said means for securing the shoes comprises tongues on the shoes and bent over edges of the plates.

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