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ADJUSTING TOOL FOR PIPE PROTECTORS

Filed Nov. 6, 1953

2 Sheets-Sheet 1

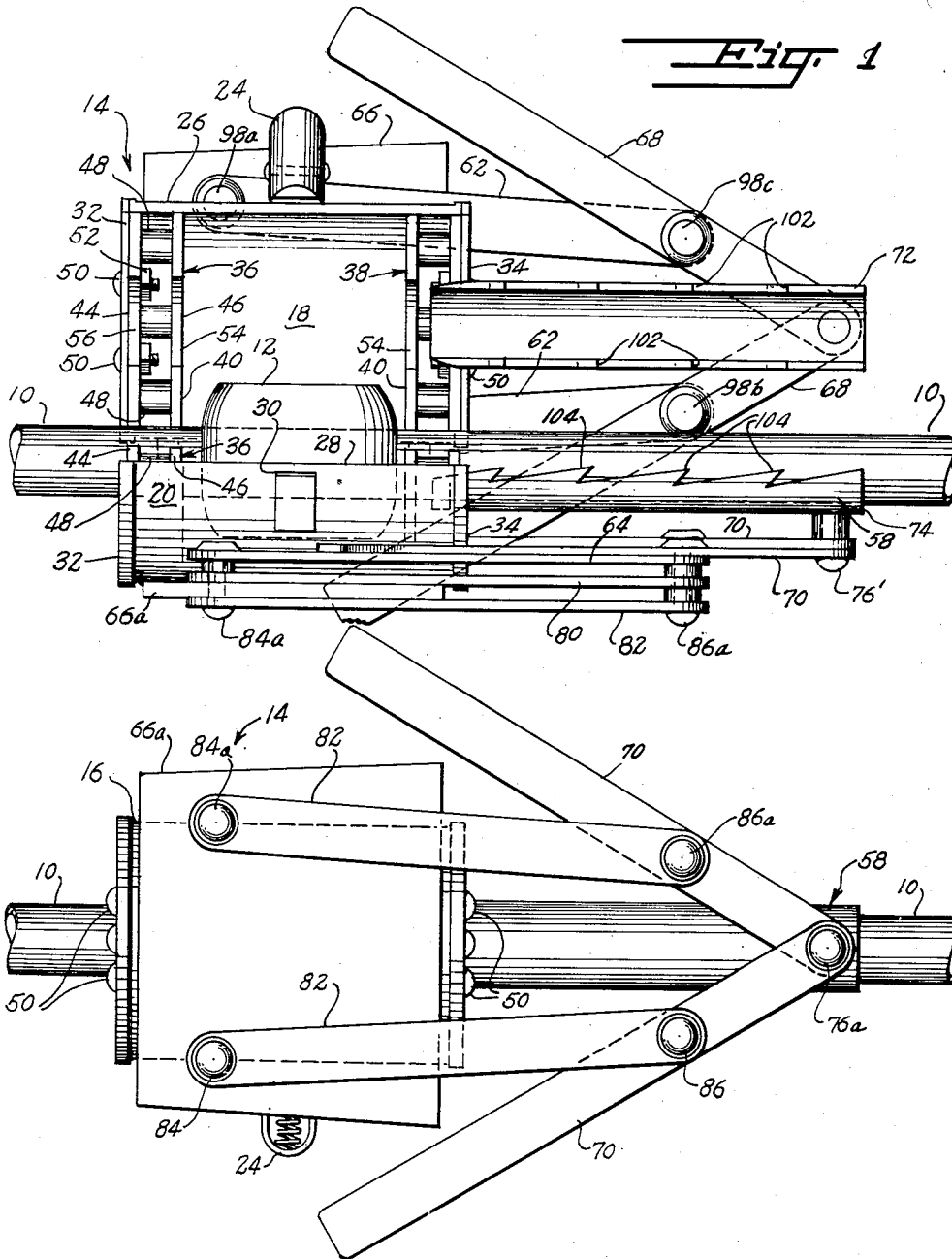


Fig. 2

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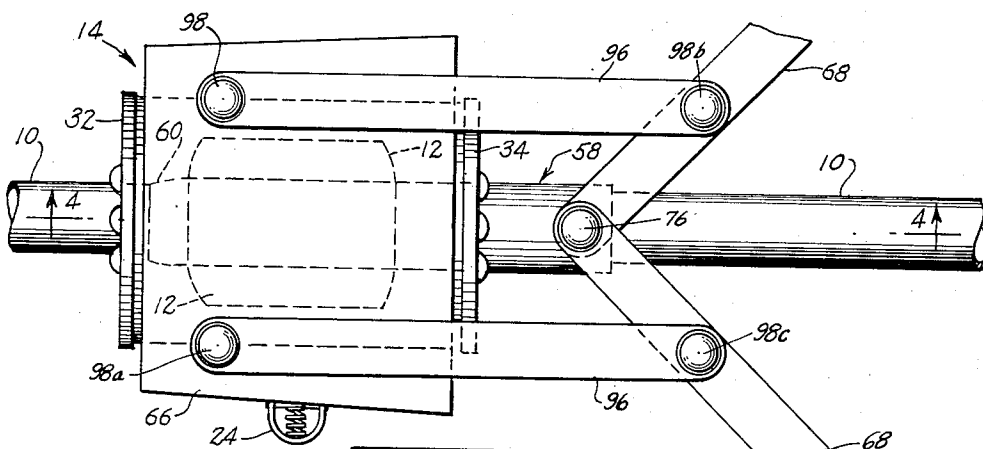


Fig. 3

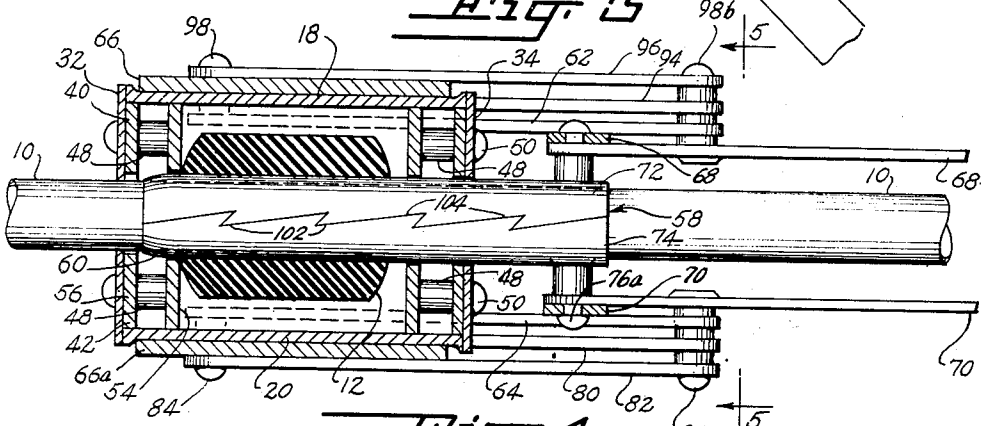


Fig. 4

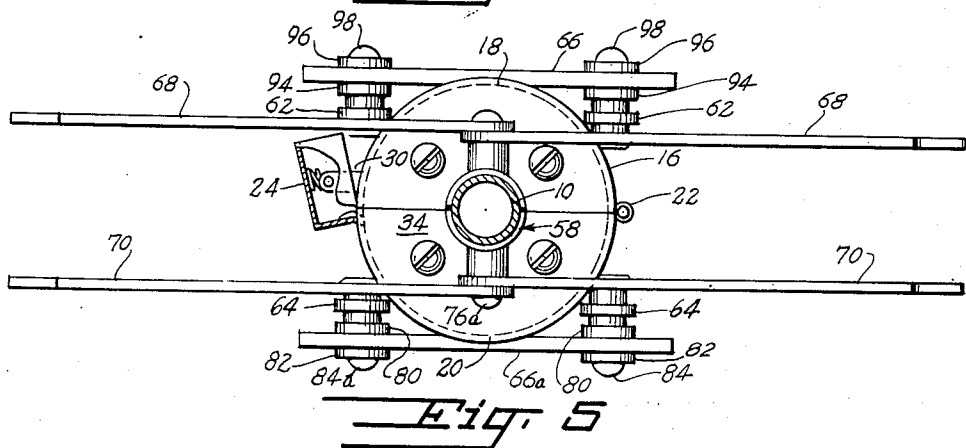


Fig. 5

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ADJUSTING TOOL FOR PIPE PROTECTORS

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1 Claim. (Cl. 29—236)

This invention relates to tools, and more particularly to a tool for moving drill pipe protectors longitudinally of the pipe casing.

It is customary in the drilling of oil wells by the rotary method to employ a drill pipe protector, usually made of rubber, to prevent wear of the casing and drill pipe during the drilling operation. Each section of the drill pipe may be provided with one or more of these protectors to prevent metal to metal contact between the drilling string and the casing, and these protectors fit snugly about the external surface of the pipe sections. During the drilling operation, it is not uncommon for these rubber protectors to slip either up or down on the drill pipe section from their normal position. When this happens, the protectors constitute a hazard to the drilling crews. Previously, when the rubber protectors slipped from their normal position, the protectors have been removed from the pipe by the destruction thereof, thereby terminating their usefulness in the drilling operation, and further, causing additional expense, since the destroyed protector will be incapable of further use.

It is, therefore, the primary object of this invention to provide a tool which may be readily mounted on the pipe section to move the protector longitudinally of the pipe, so as to return the protector to its normal position on the pipe casing section.

It is a further object of this invention to provide a tool for moving drill pipe protectors which is of simple, yet exceedingly rugged construction, and which constitutes a portable device which may be employed upon successive pipe sections of a drill string.

Other objects and advantages will become apparent from the following detailed description, forming the specification, and taken in conjunction with the accompanying drawings, in which:

Figure 1 is a side elevational view of the tool embodying this invention shown in relation to a drill pipe section and the drill pipe protector, and with one segment of the tool in its open position;

Figure 2 is a bottom plan view of Figure 1, but with the open segment now in its closed position;

Figure 3 is a top plan view similar to Figure 2, but showing the tool in its protector engaging position;

Figure 4 is a cross sectional view taken on line 4—4 of Figure 3; and

Figure 5 is a cross sectional view taken on line 5—5 of Figure 4.

With continued reference to the drawings, there is shown a portion of a drill pipe section 10 having a protector 12, made of rubber, mounted externally on the pipe section 10. The casing protector is normally formed of a natural or a synthetic rubber and normally is produced with an internal diameter somewhat smaller than the body of the drill pipe section 10, so that when mounted on the drill pipe, the elasticity of the protector will normally hold the protector in the normal position on the pipe casing section. However, during drilling operations, the

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rubber pipe protector 12 may be moved from its normal position, resulting in an undesirable condition for continued drilling operations.

A tool, generally indicated at 14, is provided to move the protector 12 when it has been moved from its normal position on the pipe section 10 during normal drilling operations. The tool 14 comprises a split cage 16 including semicircular sections 18 and 20 hingedly connected along one pair of adjoining edges, as at 22, and a latch 24 carried by the section 18 along the longitudinal edge 26 remote from the edge hingedly connected to the section 20. The latch 24 is spring urged, so that when the longitudinal edge 26 is moved into adjoining relation with the longitudinal edge 28, the latch 24 will engage a keeper 30 carried by the cage section 20 along the edge 28. The split cage 16 is provided with openings through the opposite end walls 32 and 34, so that the cage 16 will be adapted to encircle the drill pipe section 10 when the sections 18 and 20 are closed. As best seen in Figures 1 and 3, a pair of split retainer collars 36 and 38 are provided at the opposite ends 32 and 34 within the split cage 16, so as to confine the protector 12 within the cage 16 when the cage encircles the drill stem 10. Each of the collars 36 and 38 is formed of a pair of semicylindrical sections 40 and 42 which generally conform to the shape of the cage sections 18 and 20. Each of the collar sections 40 and 42 includes a pair of spaced plates 44 and 46 secured together in spaced parallel relation by a plurality of posts 48 extending therebetween and secured at their opposite ends to the respective plates 44 and 46. The plate 44 of each of the collar sections is secured upon the respective end walls 32 and 34 as by the bolts 50 and nuts 52. Each of the plates 44 and 46 in each of the collar sections 40 and 42 is provided with semicircular openings 54 and 56 which are adapted to mate and encircle the pipe stem 10, and are approximately of the same diameter, when mated, as the openings provided in the end walls 32 and 34, and register with these openings. In connection with the collar sections 40 and 42, it should be noted that the collar section 40 has one end extending beyond the longitudinal edge of the cage section 18 where it is hingedly connected to the companion section 20 and the opposite ends of the collar sections 40 are slightly spaced from the longitudinal edge 26. The collar sections 42, secured within the cage section 20, have their ends adjacent the longitudinal hinged edge of the cage section slightly spaced therefrom, while the opposite ends project beyond the longitudinal edge 28, so that the portions of the collar sections 42 which project beyond the longitudinal edge 28 and the portions of the collar sections 40 which project beyond the hinged longitudinal edge of the cage section 18 provide guides for the respective cage sections when these sections are closed about a pipe stem, so as to confine a protector within the cage. In addition, the collar sections by overlapping the mating edges of the cage sections 18 and 20 provide greater strength for the tool, since they serve to reinforce the joints formed by the mating edges of the cage sections.

A hollow mandrel, generally designated by the numeral 58, is positioned so that a portion adjacent one end extends through one of the end walls of the cage 16 and is mounted on the cage for movement toward and away from the other end wall of the cage. Specifically, the mandrel 58 embodies a pair of half sections 72 and 74, the half section 72 being carried by the cage section 18 and the half section 74 being carried by the cage section 20. The longitudinal edges of the half section 72 are provided with teeth 102 which mesh with teeth 104 formed on the longitudinal edges of the half section 74 when the sections 18 and 20 of the cage 16 have been moved to the closed position. The one end of the

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mandrel 58 when in closed position is beveled so as to provide a narrow sharp edge as indicated by the numeral 60. The end 60 of the mandrel 58 when in closed position is received within the opening in the end wall 34 of the split cage 16 and enters through the mated openings 56 and 54 of the retainer collar 38, so that the end 60 may move through the cage 16 immediately adjacent the drill stem 10, since the tube defining the mandrel 58 has its interior surface in contact with the exterior surface of the drill stem 10, and when so moved through the cage 16 the beveled end 60 will slip between the opening in the protector 12, so as to be interposed between the opening in the protector 12 and the exterior surface of the drill stem 10, and upon further movement, will extend entirely through the protector 12, so that the interior gripping surface of the protector will be spaced from the drill stem 10 by the mandrel 58.

Means are carried by the cage 16 and operatively connected to the mandrel 58 for projecting the mandrel through the drill pipe protector 12 confined within the cage 16. The means by which the mandrel 58 is projected through the cage 16 comprises a first linkage operatively connecting the mandrel section 72 to the cage section 18 for movement toward the other end of the cage 16 and a second linkage operatively connecting the mandrel section 74 to the cage section 20 for movement away from the other end of the cage 16. The first linkage for the section 18 of the cage 16 includes a plate 66 which is fixedly carried by the said section 18, and to this plate 66 is pivotally connected as at 98, one end of one of each of the three pairs of arms 62, 94 and 96, and also pivotally connected as at 98a, one end of the other of each of the pairs of arms 62, 94 and 96. The other end of the one of each of the pairs of arms 62, 94 and 96, is pivotally connected as at 98b to one of a first pair of lever arms 68 intermediate the ends thereof, and the other end of the other of each of the pair of arms 62, 94 and 96, is pivotally connected as at 98c to the other of the pair of lever arms 68 intermediate the ends thereof. The complementary one ends of the pair of lever arms 68 are pivotally connected as at 76 to the mandrel section 72.

The second linkage for the section 20 of the cage 16 includes a plate 66a which is fixedly carried by the section 20, and to this plate 66a is pivotally connected as at 84, one end of one of each of the three pairs of arms 64, 80 and 82, and also pivotally connected as at 84a, one end of the other of each of the pairs of arms 64, 80 and 82. The other end of the one of each of the pair of arms 64, 80 and 82, is pivotally connected as at 86 to one of a second pair of lever arms 70 intermediate the ends thereof, and the other end of the other of each of the pairs of arms 64, 80 and 82, is pivotally connected as at 86a to the other of the pair of lever arms 70 intermediate the ends thereof. The complementary one ends of the pair of lever arms 70 are pivotally connected as at 76a to the mandrel half section 74.

Thus, it will be seen that when the sections 18 and 20 of the cage 16 are moved from the open position shown in Figure 1 to the closed position as shown in Figures 4 and 5, sections 72 and 74 of the mandrel 58 are correspondingly moved into closed position with the teeth 102 and 104 of the sections 72 and 74 in mesh with each other. With the cage 16 and mandrel 58 in the thus described closed position actuation of the lever arms 68 so as to move same away from each other, results in the leading edge 60 of the mandrel 58 to enter into the space between the drill pipe 10 and protector 12 and move the

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mandrel 58 to a position to fully extend through the protector 12, to thereby shift the protector 12 out of engagement with the drill pipe 10 and move the protector to a new position along the drill pipe 10. At this point, the lever arms 70 are actuated so as to move same toward each other, resulting in the mandrel 58 to be wholly withdrawn from the protector in its new position on the drill pipe and the lever arms 68 restored to their original position. It is to be noted that the shape of the teeth 102 and 104 on the half sections 72 and 74 of the mandrel 58 when in closed position is such that upon actuation of the first pair of lever arms 68 to move relative to each other the teeth 102 on the section 72 exert a pushing force upon the complementary teeth 104 on the section 74 and upon actuation of the second pair of lever arms 70 to move relative to each other the teeth 104 on the section 74 exert a pulling force upon the complementary teeth 102 on the second 72.

What is claimed is:

The combination with a drill pipe, and a protector circumposed about said pipe, of a tool for adjusting the position of said protector on said pipe, said tool comprising a cage embodying a pair of semi-cylindrical sections hinged together along one pair of adjoining edges and an interengageable locking means carried by the other pair of adjoining edges, said cage being arranged so that the sections encircle the drill pipe with the locking means interengaged to hold the sections in encircling relation on the drill pipe, each of said cage sections having spaced end walls confining the protector within the cage and providing an abutment for preventing longitudinal movement of the protector during insertion of a mandrel, a hollow mandrel positioned so that a portion adjacent one end extends through one of the end walls of said cage, said mandrel comprising a pair of half sections arranged in close relation, one of said half sections having on its longitudinal edges teeth in mesh with teeth formed on the longitudinal edges of the other of said half sections for holding the sections in closed relation, said mandrel half sections being mounted on said cage semi-cylindrical sections for movement toward and away from the other end of said cage, a first linkage including a pair of lever arms movable relative to each other operatively connecting one of the mandrel sections to one of the cage sections for movement toward the other end of said cage and a second linkage including a second pair of lever arms movable relative to each other operatively connecting the other of the mandrel sections to the other of the cage sections for movement away from the other end of said cage, the shape of the meshing teeth on the mandrel sections being such that upon actuation of said first pair of lever arms to move relative to each other the teeth of said one mandrel section exert a pushing force upon the complementary teeth of said other mandrel section and upon actuation of said second pair of lever arms to move relative to each other the teeth of said other mandrel section exert a pulling force upon the complementary teeth of said one mandrel section.

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