The present invention relates generally to improvements in a pipe holder, and is more particularly concerned with a holder conventionally known as a drill pipe slip; such as utilized in the drilling of oil wells to engage and hold the drill string suspended, while sections of drill pipe are added or removed as the drill string is lowered or raised.

Various constructions have been utilized in slips for such purpose, it being a common arrangement to hingedly interconnect a plurality of slip sections to provide an articulable body assembly which may be readily handled as a unit and easily set into the main bushing of a rotary table in a manner well understood in the art.

In practice, conventional constructions of the above type have been found to have undesirable inherent characteristics, in that the slip sections may not be equally engaged by the main bushing of the rotary table or the wedging action with respect to the seated slip sections may not be the same. Under such circumstances there is a possibility of relative movement occurring between the slip sections, and as a consequence the hinge pins may be subjected to stresses of sufficient magnitude to cause shearing of the pins and damage to the device.

With the foregoing in mind, the present invention has for one object the provision of an improved interconnection between the slip sections, which has resilient characteristics, and which will relieve the hinge members from shear load stresses.

A further object is to provide an improved hinge joint for articulating interconnection of slip sections, and whereby the slip sections are limited in relative movements longitudinally or in a vertical direction.

Another object is to provide improved means for retaining the slip section pipe engaging buttons in assembled position.

Further objects of the invention will be brought out in the following part of the specification, wherein detailed description is for the purpose of fully disclosing the invention without placing limitations thereon.

Referring to the accompanying drawings, which are for illustrative purposes only:

Fig. 1 is a perspective view of a pipe slip embodying the features of the present invention;

Fig. 2 is an enlarged fragmentary view of the interconnection between adjacent slip sections;

Fig. 3 is an enlarged fragmentary elevation view of the interconnection, portions being cut away to disclose essential features; and

Fig. 4 is a fragmentary section, taken substantially on line 4—4 of Fig. 3.

Referring now to the drawings, for illustrative purposes, the invention is more specifically disclosed in Fig. 1 as comprising a body structure in which slip pipe engaging sections are interconnected to form an articulated unit adapted to be associated with the main bushing of a rotary table.

More specifically, the body structure embodies a central slip section 10 and associated side sections 11 and 12, the sections being assembled in side-by-side relationship and interconnected along their adjacent edges to provide an articulable assembly, as will hereinafter be explained in detail.

In general, the construction of each slip section is similar, an includes an elongate inner wall 13 of transverse arcuate section so as to present a surface adapted to substantially conform with the surface of an associated drill pipe. Integrally formed with the inner wall is an outer wall structure 14 which is inclined with reference to the inner wall so as to converge towards the lower end of the section and form in effect a wedge. The outer wall in integrally connected with the inner wall by a plurality of spaced webs 15, which result in a skeletal construction.

The upper end of each section is strengthened by providing a transversely extending wall 16 which is spaced from the upper end of the inner wall 13 and forms the upper terminus of the wedge shaped portion of the section adjacent the upper end of the outer wall 14. The transversely extending wall 16 is interconnected with the upper portion of the inner wall by a radially extending rib (not shown) for the center section 10, and angularly disposed ribs 17 and 18 for the side sections 11 and 12 respectively.

Handles 19 are pivotally connected at their inner ends as by pivot pins 20 to the ribs 17 and 18, and the radially extending rib associated with the center section 10. These handles provide means for manually raising and lowering the slip and placing it around the drill pipe, as well as removing it, when desired.

The adjacent sides of the side sections 11 and 12 are provided with confronting projecting flanges 21 which form extensions of the walls 16 and provide abutments which upon engagement limit the movement of the adjacent walls of the side sections towards each other.

The inner walls 13 of the slip sections are provided with pipe engaging inserts or buttons 22 which may assume various forms of construction. In the present disclosure, the buttons 22 are constructed and mounted in the inner wall of the slip section in the manner disclosed in the patent of A. T. Boatright, No. 2,552,618, dated May 15, 1951.

More specifically, as shown, the inner wall of each slip section is provided with one or more series of aligned counter bores 23 which are located closer together than the diameter of the counter bores, so that they intersect to form a relatively wide channel 24 extending longitudinally of the slip section. Centrally of each counter bore is an opening 25 which extends in a radial direction through the inner wall of the slip section, as shown in Fig. 4.

Each insert or button comprises a head portion 26 adapted to seat in a counter bore 23. Integrally formed with the head portion is a shank 27 adapted to extend through the opening 25 and project rearwardly of the associated inner wall 13 of the slip section.

As shown in Fig. 1, the head portion is provided with an edge notch 28 which is adapted to receive the adjacent edge of the contiguous head portion of the insert or button next to it.

As shown in Figs. 3 and 4, the projecting ends of the shanks 27 of the inserts are provided with transversely extending passages or openings 29 which are arranged to be aligned, when the inserts are assembled in correct position in the channel 24. For retaining the inserts against removal, an elongate rod 30 is inserted endwise through the aligned openings 29 of the inserts. This rod at its upper end is provided with a deflected end portion 31 which is arranged to extend around the shank 27 of the endmost insert and frictionally retain the rod 30 against inadvertent removal, and yet providing a retain-
ing member which may readily be removed to release the inserts for replacement or repair.

Referring now to Figs. 2 and 3, the interconnection between the slip sections utilized to form an articulate assemblage, will now be described. The side sections 11 and 12, except for their being right and left hand, are similarly constructed. The adjacent edges of the center section 10 and one of the side sections, in this case section 12, are each provided with a pair of confronting lugs. As shown more specifically, the section 10 has a pair of lugs 32a and 32b which project towards and are associated with a pair of confronting lugs 33a and 33b carried by the side section 12. One pair of lugs is provided with projecting flanges, in this case the lugs 32a and 32b are provided with flanges 34a and 34b which overlie and extend over the confronting edges of the lugs 33a and 33b so as to retain the lugs against relative movement in a direction longitudinally of the slip sections, for a purpose to be explained hereafter.

As shown, the lugs 32a and 32b are provided with openings 35a and 35b, while lugs 33a and 33b are provided with openings 36a and 36b which are arranged in the case of each pair of lugs in axial alignment for receiving the legs 37 and 38, respectively, of a U-shaped connecting link member 39, which in effect provides a double pin connector by which the confronting pairs of lugs are hingedly interconnected so that the center section and side sections may be relatively articulated. When so connected, it will be observed that the flanges 34a and 34b cooperate with the other pair of lugs to prevent relative axial movement of the lugs to any great extent longitudinally of the legs 37 and 38 of the connecting link.

The leg ends are threaded to receive retaining nuts 40 which are additionally secured against removal by a suitable cotter pin 41. In order to prevent movement of the link 39 downwardly under gravity to a point where the bridging portion might prevent swinging movement of the interconnected slip sections, the link 39 is retained in a raised floating position by means of an abutment formed on one of the slip sections, in this case the side section having a projecting flange 42 which extends under the end of leg 38.

Since the slip sections, when the slip is inserted in the main bush of the rotary table, may have a slightly different wedging action so that there may be a tendency of one slip section to relatively move with respect to another slip section, it has been found through experience to be desirable to provide some means for preventing shearing of the hinge pins conventionally utilized for hinged connection of the slip sections. It is a feature of the herein described construction to utilize a U-shaped link 39 for interconnecting the lugs of the slip sections which is constructed of a resilient material so that by deflecting or permitting slight spreading of the legs portions 37 and 38 of the connecting link, shearing forces are relieved so that these legs, which serve as hinge pins, will not be Sheared or otherwise damaged under normal operating conditions.

As a safety precaution against permanent deformation of the leg portions 37 and 38 beyond their elastic limits by being spread apart by abnormal operating forces, a bridging bar 43 is provided at the ends of the leg portions 37 and 38. This bar has slightly elongated openings 44 which receive the leg portions therethrough, the bar being positioned between the nuts 40—40 and the adjacent legs 32b and 33b. Under normal conditions of operation, the leg portions are free to be resiliently flexed; however, upon the application of abnormal forces the spreading of the leg portions is kept within safe limits.

Various modifications may suggest themselves to those skilled in the art without departing from the spirit of my invention, and, hence, I do not wish to be restricted to the specific form shown or used mentioned, except to the extent indicated in the appended claim.

I claim:

A drill pipe slip, comprising: a plurality of slip sections having pipe engaging surfaces; means including a U-shaped resilient link interconnecting said sections into an articulate body structure; and a bridging bar connecting the leg ends of said link, said bar having elongate openings for receiving the leg ends, whereby the spreading of said legs above a predetermined amount under abnormal operating forces is prevented.

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