

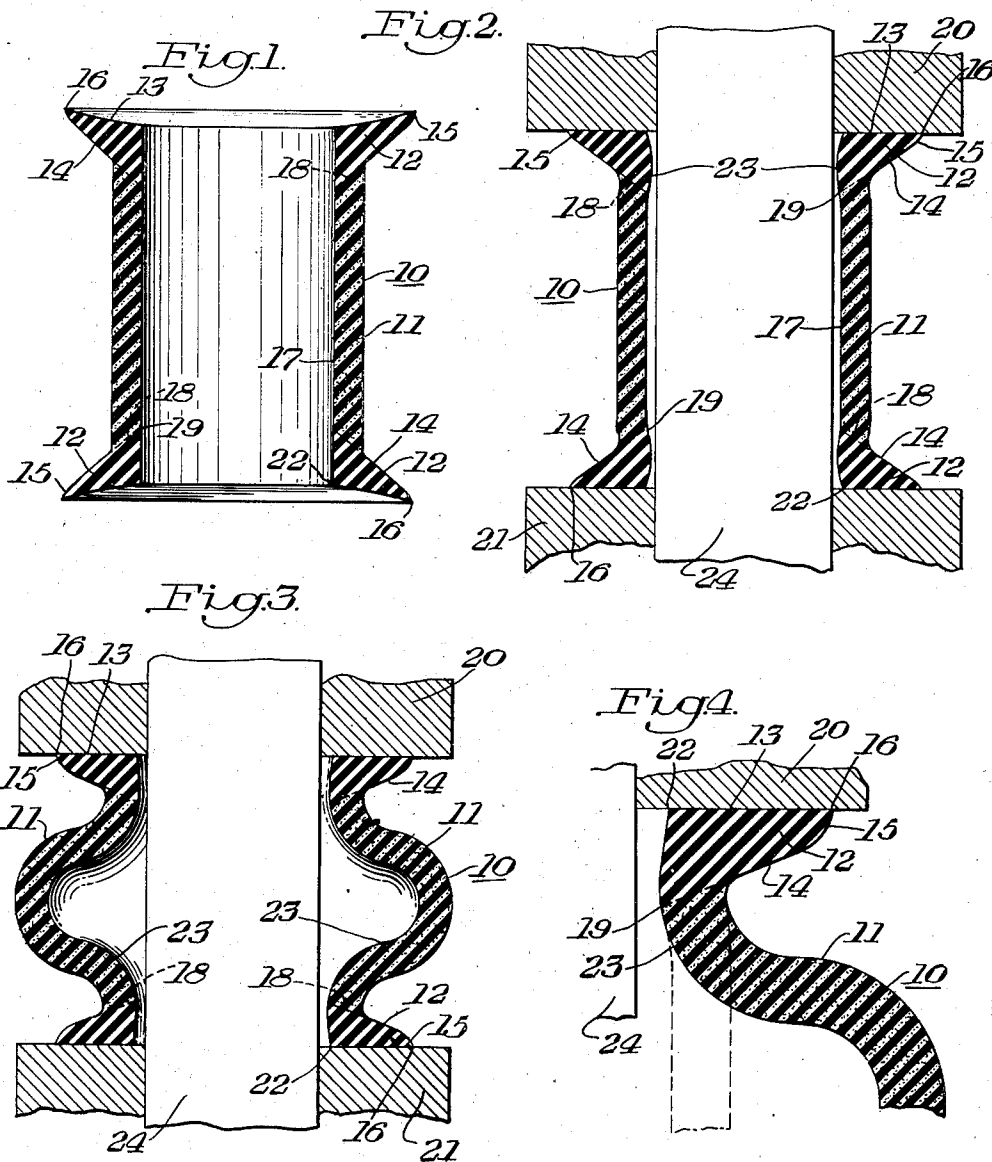
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RUBBER PROTECTOR

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RUBBER PROTECTOR

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3 Claims. (Cl. 288-2)

This invention relates generally to elastic protectors and more particularly to an elastic protector having resilient and flexible properties such as rubber, which protector is in the form of a sleeve for shielding a plunger, rod, shaft or the like from the erosive action of fluids carrying abrasive particles.

The protector comprising this invention is adapted to be placed over a rod member which extends between and operates within two housings or casings that have relative movement axially of the rod, for the purpose of protecting the latter which is exposed to the erosive action of fluid carrying abrasive properties. A structure of this character is employed in conjunction with a roll adjusting mechanism for a three high strip rolling mill where water under high pressure is discharged against the steel passing through the rolls and picks up scale, dirt and other loose particles. These particles strike the piston rod or plunger with such force that they cut or tightly adhere to the surface thereof and upon entering the close fitting chambers within which the rod member works, cause the latter to freeze. To free the rod member it is necessary to stop the mill and dismantle the mechanism which at times is so badly damaged when dismantled that it must be replaced.

The principal object of this invention is to provide a protective shield for movable machine parts, which shield is impervious to the erosive action of abrasive particles.

Another object is the provision of a protective sleeve shield that does not rely on fastening elements to produce a sealed enclosure, that prevents abrasive particles from coming in contact with the member being protected.

Another object is the provision of a rubber sleeve protector having flanged ends made of rubber with a different degree of hardness than the intermediate portion which flexes when the sleeve is in operative position.

Another object is the provision of a sleeve protector of relatively soft rubber having integral flanged ends of harder rubber which are so disposed relative to the sleeve that an axial compressive force causes the sleeve to expand radially outwardly.

Another object is the provision of a sleeve protector having annular flanged ends which are dished to produce a seal and control the direction of the flexing of the intermediate portion of the sleeve.

Other objects and advantages appear in the following descriptions and claims.

In the accompanying drawing a practical embodiment illustrating the principles of the invention is shown wherein:

Fig. 1 is a sectional view taken axially of the rubber sleeve protector comprising this invention.

Fig. 2 is a sectional view taken axially of the rubber sleeve protector showing it mounted under initial compression.

Fig. 3 is a view similar to Fig. 2 showing the rubber sleeve protector expanded under a compressive force.

Fig. 4 is an enlarged sectional view of one flange of the rubber sleeve protector when subjected to compressive force.

Referring principally to Fig. 1 of the drawing, the rubber protector sleeve 10 is in the shape of a spool comprising the cylindrical sleeve body 11 of uniform wall thickness and the annular flanges 12 at the end of the body. The flanges 12 have frusto conical faces and project radially from the body and diverge outwardly from each other, producing a dished or concave spool end. In the particular spool shown the outer face 13 of each flange is disposed at an angle of approximately ten degrees to a plane normal to the spool axis and the inner face 14 is approximately forty-five degrees. Both the outer and inner surfaces are slightly convex between their radial limits. Adjacent the perimeter of the flanges the inner face 14 is steeper, being disposed at an angle of approximately sixty degrees, as indicated at 15, which surface forms a sharp perimetral edge 16 with the outer face 13. This construction provides a firm sealing edge with an included angle of approximately fifty degrees, which is superior to one produced by an included angle of thirty-five degrees which would be formed by the faces 13 and 14.

The flanges 12 are formed integral with the cylindrical body 11 of the spool although the rubber from which they are made is harder or stiffer. The rubber from which the body 11 is made has a hardness of from twenty-five to thirty, whereas the hardness of the flanges range from sixty to sixty-five. These readings have been determined by the Shore Hardness Test. The harder rubber of the flanges 12 extends into the body 11 to the bore 17 of the spool substantially along the plane of the inner conical face 14 as indicated by the dotted lines 18. Thus the cross-sectional shape of the flanges 12 is substantially triangular and the inner angle extends into the bore of the spool as indicated at 19.

When the spool is mounted under sufficient initial compression between two housings or

blocks, such as indicated at 20 and 21 in Fig. 2, the end faces or outer sides 13 of the flanges 12 flatten against the surfaces of the blocks. Owing to the angular disposition of the faces 13 the perimetral edges 16 form a fluid-tight seal with the surface of the block. Since rubber is incompressible the whole of the triangular flange section 12 must deform to flatten the face 13 against the housing or block. The perimeter 16 expands and the whole of the triangular flange section 12, in effect, rotates on the heel 22 of the section, which movement forces the angle 19 inwardly of the bore as indicated at 23 in Figs. 2, 3 and 4. The body 11 being of a softer rubber offers less resistance to this movement of the flange 12. This annular indentation 23 adjacent the ends of the flange angles 19 produces a compressive force around the body portion, which intermediate of its ends is substantially normal in shape. This annular indentation 23 thus initially flexes the body 11 at these zones, creating a tendency for the ends of the body 11 to bulge the intermediate portion outwardly, which is exactly what happens when the spool is subjected to additional compression as the blocks 20 and 21 converge and the piston 24 enters further into the respective bores, as shown in Fig. 3.

This action occurs due to the shaping of the outer flange face 13 and not because of the difference between the hardness of the flange 12 and the body 11, although such a difference in the hardness of these sections naturally expedites the flexing tendencies of the body.

By constructing the spool in this manner a fluid tight seal will be formed by the flange 12 on the blocks 20 and 21 and the flexure of the intermediate portion of the body outwardly will be insured when the spool is subjected to material axial compression. Thus when the spool is surrounding a rod or shaft that has sharp edges, slots, holes or the like, it will always flex outwardly away from the path where it is likely to be injured. This is an important object of this invention.

As previously stated, it is not necessary to have the body 11 of softer rubber to guide or direct its deflection but it is preferable to employ the softer rubber in the body for two reasons: first, because it will stand up under a more frequent and greater degree of flexure and, secondly, because it is better able to resist the bombardment of abrasive particles carried by fluid under pressure. The

stiffer flange sections on the other hand produce better sealing qualities and form a firm integral foundation for the body of the spool.

I claim:

1. A flexible protector body for disposition about a member operable in aligned openings in spaced blocks movable relative to each other, consisting of a cylindrical rubber sleeve, a radially disposed rubber flange integral with each end of the sleeve forming a spool, and concave end faces on said flanges arranged to flatten in engagement on said blocks when under initial compression to cause the bore of the sleeve to bulge inwardly at the flanges and direct the centrally adjacent portions of the sleeve annularly outwardly to properly guide the flexing of the intermediate portion of the sleeve when the blocks move closer together.

2. A flexible protector body for disposition about a member operable in aligned openings in spaced blocks movable relative to each other, consisting of a cylindrical rubber sleeve, a radially disposed rubber flange integral with each end of the sleeve, each flange being broad at its base and extending outwardly to an apex at the flange perimeter, and concave end faces on the flanges arranged to flatten in engagement on said blocks when under initial compression to cause the bore of the sleeve adjacent the flanges to bulge inwardly and direct the centrally adjacent portions of the sleeve annularly outwardly to properly guide the flexing of the intermediate portion of the sleeve when the blocks move closer together.

3. A flexible protector body for disposition about a member operable in aligned openings in spaced blocks movable relative to each other, consisting of a cylindrical rubber sleeve, a radially disposed rubber flange integral with each end of the sleeve, each flange being triangular in cross section and extending from the bore outwardly to an apex at the flange perimeter, the rubber of the flanges being harder than the rubber of the sleeve, and concave end faces on the flanges arranged to flatten in engagement on said blocks when under initial compression to cause the bore of the flanges to bulge inwardly and direct the centrally adjacent portions of the sleeve annularly outwardly to properly guide the flexing of the intermediate portion of the sleeve when the blocks move closer together.

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