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F. A. THAHELD

**2,013,903**

WELL SWAB

Filed Aug. 28, 1935

3 Sheets-Sheet 1



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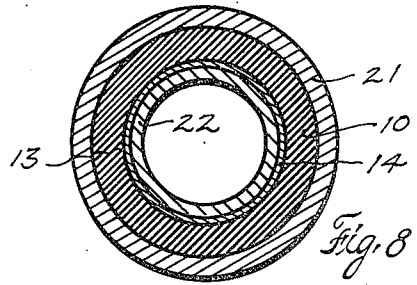
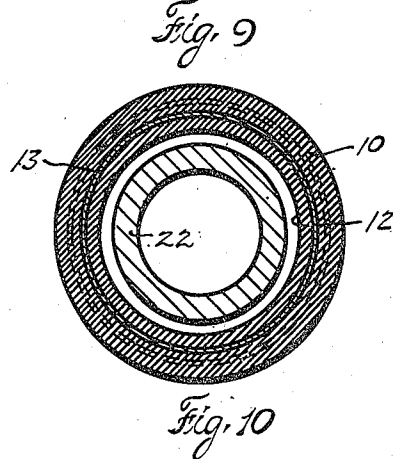
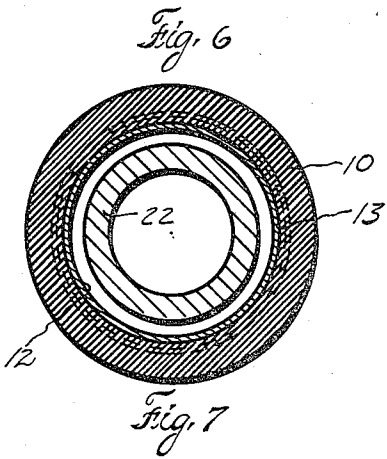
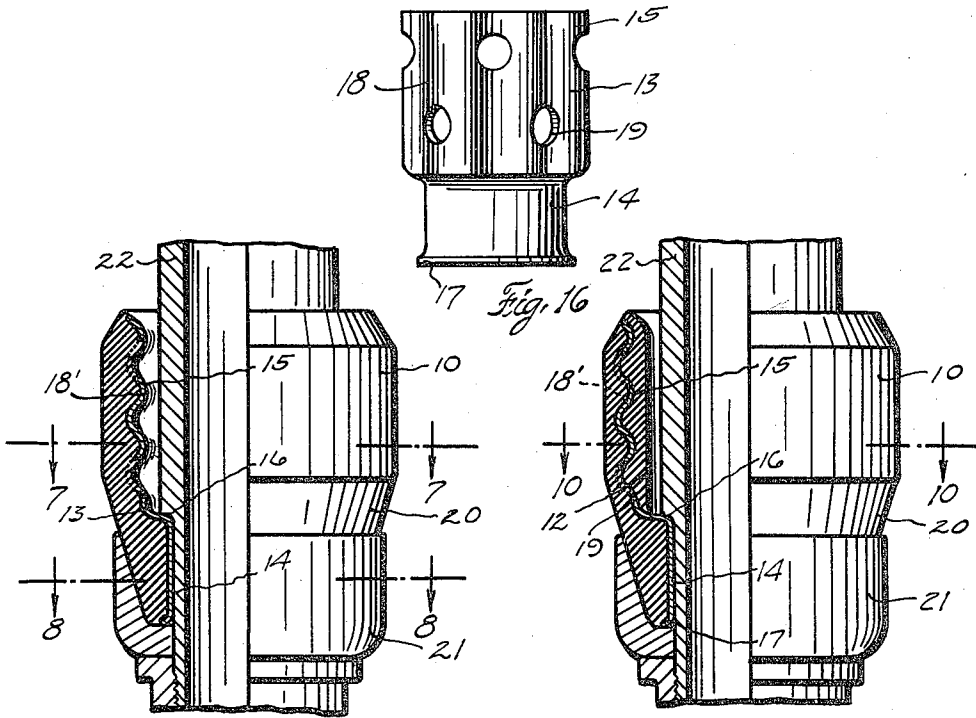
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WELL SWAB

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3 Sheets-Sheet 2



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WELL SWAB

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3 Sheets-Sheet 3

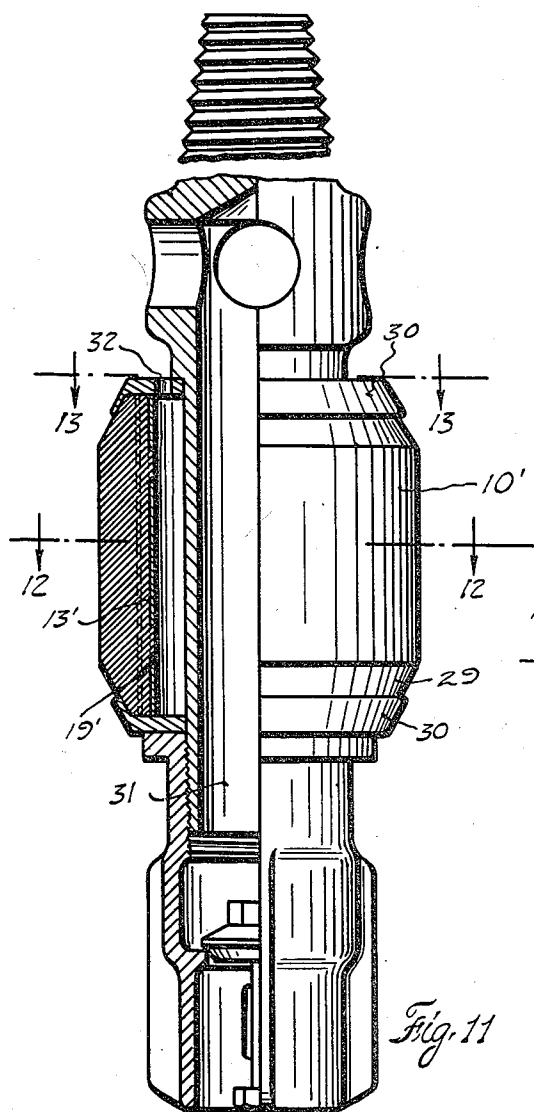


Fig. 11

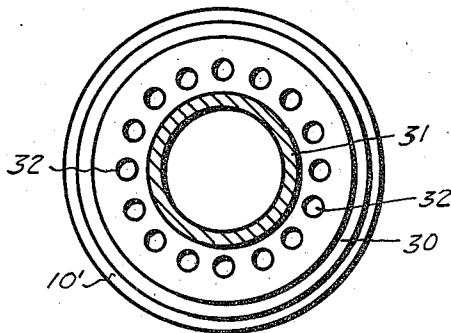


Fig. 13

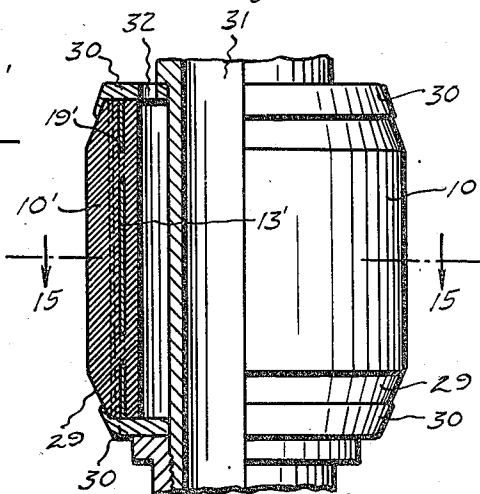


Fig. 14

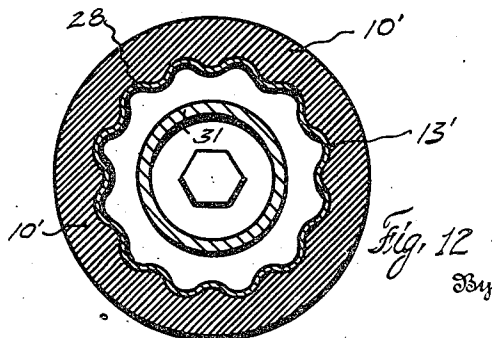


Fig. 12

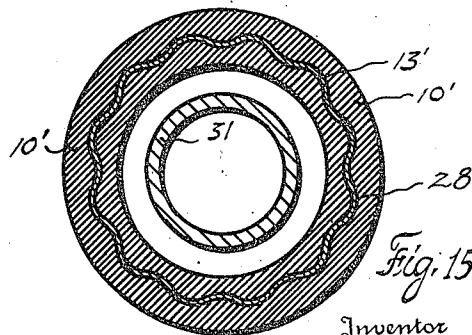


Fig. 15

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## UNITED STATES PATENT OFFICE

2,013,903

## WELL SWAB

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tion of Delaware

Application August 28, 1933, Serial No. 687,144

9 Claims. (Cl. 309—33)

This invention relates to new and useful im-  
provements in well swabs.

One object of the invention is to provide a flex-  
ible swab body reinforced in an improved man-  
ner, whereby said body is supported against undue  
expansion, distortion and blowouts.

An important object of the invention is to pro-  
vide a reinforcing bushing or liner arranged to  
permit a limited radial expansion of the body  
and at the same time affording a continuous  
metallic reinforcing support, which will prevent  
excessive expanding, distension or disrupting of  
the swab body. The advantage of such an ar-  
rangement is that the life of the swab body will  
be prolonged and its expansion will be more uni-  
form, thus assuring more efficient swabbing.

A further object of the invention is to provide  
a reinforcing bushing or liner for a swab cup,  
which bushing or liner is not only continuous cir-  
cumferentially, but extends substantially the en-  
tire length or height of the swab body, whereby  
longitudinal distortion or so-called compression  
of the body is prevented and also whereby the  
body is uniformly expanded and its outer sur-  
face is evenly engaged with the tubing or casing  
instead of being bowed or arched, as is usually the  
case.

A particular object of the invention is to pro-  
vide a bushing or liner for a swab body having  
a continuous corrugated portion capable of radial  
expansion, but acting to restrain undue expan-  
sion.

A construction designed to carry out the in-  
vention will be hereinafter described, together  
with other features of the invention.

The invention will be more readily understood  
from a reading of the following specification and  
by reference to the accompanying drawings in  
which an example of the invention is shown, and  
wherein:

Figure 1 is a view, partly in elevation and  
partly in section, of a swab constructed in ac-  
cordance with the invention,

Figure 2 is a horizontal cross-sectional view  
taken on the line 2—2 of Figure 1,

Figure 3 is a horizontal cross-sectional view  
taken on the line 3—3 of Figure 1,

Figure 4 is a view partly in elevation and part-  
ly in section of a modified form of the invention,

Figure 5 is a horizontal cross-sectional view  
taken on the line 5—5 of Figure 4,

Figure 6 is a view partly in elevation and part-  
ly in section of another modified form of the in-  
vention,

Figure 7 is a horizontal cross-sectional view  
taken on the line 7—7 of Figure 6,

Figure 8 is a horizontal cross sectional view  
taken on the line 8—8 of Figure 6,

Figure 9 is a view partly in elevation and partly  
in section of still another modified form of the  
invention,

Figure 10 is a horizontal cross-sectional view  
taken on the line 10—10 of Figure 9,

Figure 11 is a view partly in elevation and part-  
ly in section showing another form of swab body,

Figure 12 is a horizontal cross-sectional view  
taken on the line 12—12 of Figure 11,

Figure 13 is a horizontal cross-sectional view  
taken on the line 13—13 of Figure 11,

Figure 14 is a view of still another form of  
swab body partly in section and partly in ele-  
vation,

Figure 15 is a horizontal cross-sectional view  
taken on the line 15—15 of Figure 14, and

Figure 16 is a detail of the reinforcing bushing.

In carrying out the invention, it may be ap-  
plied to various forms of swab bodies, and in  
Figures 1 to 10, inclusive, of the drawings, I have  
shown the swab body in the form of a cup indi-  
cated by the numeral 10; while in Figures 11 to  
15, inclusive, the body is shown in the form of a  
sleeve or cylinder 10'. The cup or the sleeve may  
be made of rubber, rubber compound, or any  
other suitable material capable of use for a swab  
body. The invention is not to be limited to the  
particular shape of the body nor to the material  
of which it is composed.

The cup 10, as shown in Figures 1 to 10, in-  
clusive, is provided at its lower portion with an  
axial bore 11, and above this bore with a coun-  
terbore or well 12. The bore 11 is adapted to  
receive the support on which the cup is mounted,  
while the wall is spaced from the support for  
receiving the liquid or fluid which expands said  
cup. Within the cup and extending longitudinally  
thereof is a metallic reinforcing cylindrical bush-  
ing or liner 13, which is preferably formed of  
sheet metal or any other material suitable for  
the purpose and lending itself to ready shaping.

The bushing includes a sleeve or collar 14 and  
an offset apron or flange 15 united with the col-  
lar by an annular shoulder 16. The collar fits  
snugly within the bore 11 and has its lower end  
turned outwardly to form a lip 17 engaging  
around the lower end of said bore. The shoulder  
16 extends outwardly from the top of the collar  
and forms the bottom of the well 12.

The important feature of the invention is the  
formation of the apron 15. In Figures 1 to 5 in-

clusive, the apron is shown as provided with vertical or upright corrugations or convolutions 18, while in Figures 6 to 10 inclusive, the apron is formed with circumferential or horizontal corrugations 18'. The corrugations extend from the shoulder 16 to the upper end of the apron, but this is not essential, as the corrugations may be placed and may have such extension as is found most advantageous.

In Figures 1, 2, 3, 6, 7 and 8, the apron 15 forms a liner and contacts with the upright surface of the well 12, while in Figures 4, 5, 9 and 10 the apron is embedded in the wall of the well to reinforce the same. In making the swab the cup is in all instances cast or molded upon the bushing and to assure adhesion the apron is provided with openings 19 for receiving the material of the body whereby the bushing is bonded thereto, as is shown in Figure 16.

Where the apron forms a liner, it is preferable to extend it to the extreme upper edge of the well 12, but where it is embedded in the wall it may be terminated just below the top edge, but this is optional. In all cases it is extended to approximately the top edge of the well so as to reinforce the wall thereof. It is pointed out that the apron is continuous and, therefore, can expand radially only so far as its corrugations will permit, and after undergoing such expansion it becomes a rigid, continuous support preventing further or undue expansion. One of the great troubles experienced in using swabs results from undue or over-expansion, whereby the body is cut, broken, disintegrated and often entirely blown out. The corrugated apron will prevent these difficulties and will increase the life of the swab.

The cup may be mounted in any suitable manner, but I have illustrated a suitable mounting in Figures 1, 6 and 9, wherein each cup 10 is shown with its lower tapered end 20 supported in a thimble 21 and its collar 14 snugly embracing a mandrel 22 passing therethrough. The lip 17 of each bushing rests upon the bottom of the thimble and protects the lower end of the cup. The shoulder 16 of the upper cut is shown in engagement with the overhanging shoulder 23 on the mandrel, while the shoulder 16 of the lower cup supports a spacer sleeve 24, which in turn supports the thimble 21 of the upper cup. The lower thimble 21 is supported by the valve case 25, which is screwed onto the lower end of the mandrel. The reinforcing bushings 13 prevent distortion of the cups when the mandrel is assembled.

The sleeve 10', shown in Figures 11 to 15 inclusive, is provided with a metal reinforcing bushing 13' having holes 19', similar to the holes 19. This bushing has upright corrugations 28 extending longitudinally thereof and preferably the entire length of the sleeve. In Figures 11, 12 and 13, the bushing is shown as a liner for the sleeve, while in Figures 14 and 15, it is embedded in the sleeve. By extending the bushing from end to end of the sleeve, the latter can not be compressed or distorted longitudinally, and a uniform radial expansion is assured.

While the sleeve may be mounted in any suitable manner, I have shown a practical mounting in Figures 11 and 14. Each end of the sleeve is beveled at 29 and these beveled portions are clamped between caps 30 secured on a mandrel 31. The upper cap has perforations 32 for admitting fluid to the interior of the sleeve for expanding the same in the usual manner. The

bushing 13' prevents crushing of the sleeve when the caps are clamped in position.

I am aware that reinforcing bushings have been previously used, but no one in so far as I am aware has ever used a continuous corrugated bushing, and particularly one extending to approximately the top of the swab body. It will be seen that unless the apron of the bushing or the bushing itself is continuous, the expansion would not be restrained and unless the bushing is corrugated, there could be no radial expansion. Where reinforcing fingers with portions of rubber therebetween are used, there is nothing to prevent undue radial expansion or blowing out of the swab body.

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

1. A swab comprising, a flexible body having an axial opening extending therethrough, and a metallic reinforcing bushing secured permanently within the body coextensive with said opening and having longitudinal corrugations.

2. A swab comprising, a flexible cup body, and a reinforcing bushing molded in the cup and comprising a cylindrical collar and an annular corrugated apron extending upwardly from the collar to substantially the top of the body.

3. A swab comprising, a flexible body having an axial opening extending therethrough, and a reinforcing member permanently secured in said body around said opening and extending substantially the entire length of said body, said member being corrugated to permit radial expansion of said body and to limit such expansion to prevent throughout substantially the entire length of said body blowing out thereof when said body is expanded.

4. A swab comprising, a flexible body having an axial opening extending therethrough, and a metallic reinforcing member permanently secured in said body around said opening and extending substantially the entire length of said body, said member being corrugated to permit radial expansion of said body and to limit such expansion to prevent throughout substantially the entire length of said body blowing out thereof when said body is expanded.

5. A swab comprising, a flexible body having an axial opening extending therethrough, and a reinforcing member permanently secured in said body around said opening and extending substantially the entire length of said body, said member having a portion which is corrugated to limit the expansion of said body and a portion which is not corrugated and which substantially defeats radial expansion of a portion of said body.

6. A swab comprising, a flexible body having an axial opening extending therethrough, and a metallic reinforcing member permanently secured in said body around said opening and extending substantially the entire length of said body, said member being corrugated to permit radial expansion of said body and to limit such expansion to prevent throughout substantially the entire length of said body blowing out thereof when said body is expanded, the corrugations being exposed in the axial opening of the body.

7. A swab comprising, a flexible body having an axial opening extending therethrough, and a metallic reinforcing member permanently secured in said body around said opening and extending substantially the entire length of said body, said member being corrugated to permit radial expansion of said body and to limit such expansion to prevent throughout substantially the entire

length of said body blowing out thereof when said body is expanded, the corrugations of said member being embedded in the body.

8. A swab comprising, a flexible body having an axial opening extending therethrough, and a metallic reinforcing member permanently secured in said body around said opening and extending substantially the entire length of said body, said member being corrugated to permit limited radial expansion of said body and to limit such expansion to prevent throughout substantially the entire length of said body blowing out thereof when said body is expanded, the corrugations of said member being annular.

9. A swab comprising, a flexible body having an axial opening extending therethrough, and a metallic reinforcing member permanently secured in said body around said opening and extending substantially the entire length of said body, said member being corrugated to permit radial expansion of said body and to limit such expansion to prevent throughout substantially the entire length of said body blowing out thereof when said body is expanded, the corrugations of said member extending vertically thereof.

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