Feb. 26, 1963 W. B. BLAIR 3,078,797

STRIP GUN IMPROVEMENTS

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Fig. 1

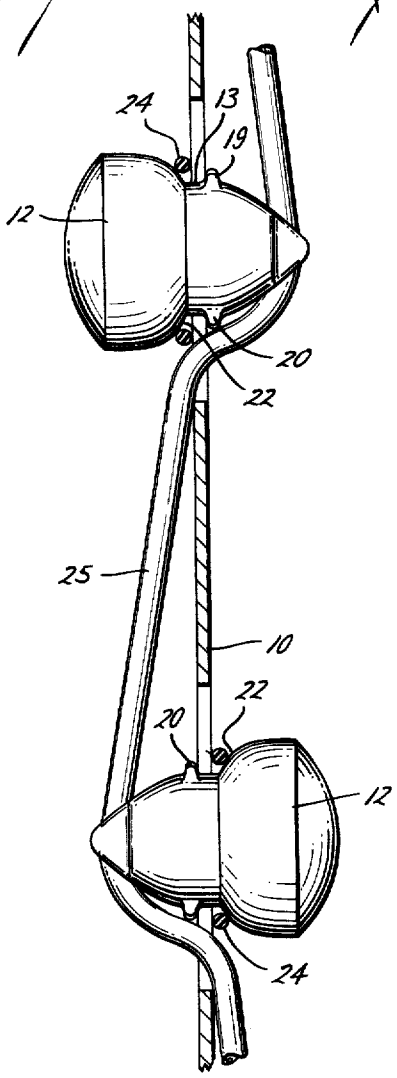
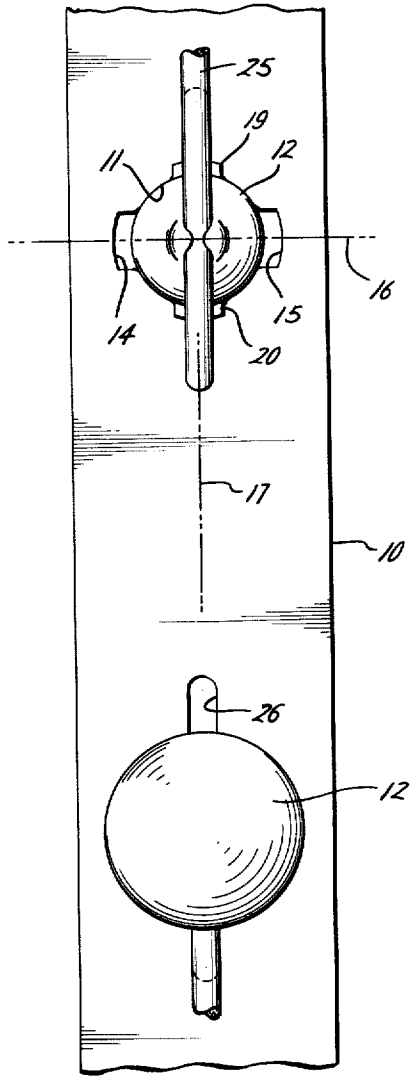


Fig. 2



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STRIP GUN IMPROVEMENTS

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This invention relates to shaped charge apparatus for use in completing oil wells and, more particularly, to so-called "strip guns" wherein shaped explosive charges in capsule-like containers are affixed to elongated metal strips.

Strip guns are commonly used for completing oil wells where it is necessary for the gun to pass through a small diameter tubing. One of the prime advantages of the strip gun is a reduction in the amount of debris left in the well bore. A strip gun construction normally includes an elongated flat strip of metal having apertures along its length for receiving individual containers which respectively enclose shaped explosive charges. The construction and material of the strip is strong enough to resist the detonation forces of the shaped explosive charges so that the strip is retrievable. Hence, the debris left in the well bore results from the break-up of the containers and whatever means provided to secure the containers to the strip. The characteristics of the debris, i.e., aggregate size, metallurgy, etc., as well as the amount of debris, assume an importance since the debris remains in the well bore.

To decrease aggregate size and improve the metallurgy characteristics of debris left in a well bore, containers constructed of glass have been successfully developed. However, glass containers for strip guns have been a problem, since it is difficult to secure the glass container to the strip without increasing the amount of undesirable debris.

Accordingly, it is an object of the present invention to provide new and improved means for securing glass charges in strip guns without an increase in undesirable debris.

Apparatus according to the present invention includes an elongated strip member with apertures therein for receipt of shaped charge containers. The shaped charge containers are provided with attaching means in the form of abutment portions on the periphery of the container adapted to engage opposite sides of the strip member. The spacing between the abutment portions is greater than the thickness of the strip member. The container is secured in position in the strip member by an annular, non-metallic, resilient member sized to circumscribe the container and wedge snugly between abutment portions to one side of the strip member and the strip member, bringing the remaining abutment portions on the opposing side of the strip member into contact with the strip member. The resilient member thereby provides frictional forces securing the container against rotational movement relative to the strip member.

The novel features of the present invention are set forth with particularity in the appended claims. The present invention, both as to its organization and manner of operation, together with further objects and advantages thereof, may best be understood by way of illustration and example of certain embodiments when taken in conjunction with the accompanying drawings in which:

FIG. 1 is a partial view in cross section of a strip member, shaped charge containers and securing means of the present invention; and

FIG. 2 is a partial frontal view of a strip member and shaped charge containers disposed therein.

In FIGS. 1 and 2, an elongated strip or strip member **10** has a number of apertures **11** disposed along its length. Disposed in the apertures **11** are shaped charge containers

12 which respectively contain conventionally arranged shaped explosive charges (not shown). The strip member **10** is flat, i.e., it has a rectangular cross section wherein its thickness is considerably less than its width. The strip member may be constructed, for example, of steel to withstand the explosive forces and thereby be retrievable. The containers **12** are generally egg-shaped with a corresponding forward end having a generally greater cross section than an aperture **11** and a rearward end having a generally lesser cross section. The containers may be constructed of glass. The size and disposition of the containers **12**, as well as the width of the strip **10**, are such that the entire assembly may be passed through a tubing or pipe section having a relatively small diameter.

The apertures **11** in the strip **10** are cylindrical and sized to receive a generally cylindrical section **13** of a container **12**. Each aperture in the strip **10** is provided with a pair of generally rectangular slots **14** and **15** (FIG. 2) disposed diametrically from one another on an axis **16** which is perpendicular to the central longitudinal axis **17** of the strip.

The cylindrical section **13** of each container is generally disposed intermediate of its length and has abutment portions **19**, **20** and a shoulder abutment **22** on either side thereof. The abutment portions **19** and **20** are disposed to the rearward side of a container and consist of a pair of diametrically opposed lugs which are sized to pass through the respective rectangular slots **14** and **15** in the strip when the rearward end of a container is inserted into an aperture. Hence, the cylindrical section **13** of a container **12** may be disposed in the cylindrical aperture **11**.

The shoulder abutment **22** disposed to the forward end of the container is an annular shoulder and, thus, the lugs **19** and **20** on a container **12** are passed through a pair of slots **14** and **15** in the strip, the shoulder abutment **22** abuts one side of the strip when the cylindrical section **13** is in an aperture. When the container is in this position, it can be rotated so that the lugs **19** and **20** and shoulder **22** thereby attach the container **12** to the strip because they cannot pass through aperture **11**. Since the spacing between the abutment portions (or the width of the cylindrical section) is greater than the width of the strip **10**, it will be appreciated that the container **12** is easily rotated to a position where the lugs **19** and **20** will pass through slots **14** and **15**.

To fix the container relative to the strip member **10**, an annular, resilient ring **24** is disposed between the annular shoulder **22** on the container and the strip member. The ring **24** is made roughly equal in diameter to the diameter of the cylindrical aperture **11**. The ring is thus stretched to pass over the enlarged cross section of the forward end of the container and thereafter wedges between the shoulder **22** and one side of the strip to snugly hold the lugs **19** and **20** to the other side of the strip. At the same time, the ring **24** serves to frictionally hold or secure the container **12** against movement relative to the strip member.

The ring is preferably constructed of oil and heat resistant material such as neoprene, sold as composition #334 by F. H. Maloney Co. of Houston, Texas. Hence, the composition of the ring does adversely contribute to the undesirable debris in the well.

A detonating cord **25** for detonating the shaped charges is secured in the respective rearward ends of the shaped charge containers **12**. For strip guns where the direction of firing is alternated, additional slots **26**, **27** along the central axis **17** of the strip may be provided to pass the detonating cord along the length of the strip.

While a particular embodiment of the present invention has been shown and described, it is apparent that changes and modifications may be made without departing from this invention in its broader aspects and, therefore, the

aim in the appended claims is to cover all such changes and modifications as fall within the true spirit and scope of this invention.

What is claimed is:

1. Apparatus for use in a well bore including an elongated and flat strip member having at least one aperture along the length of said strip, at least one shaped charge container having a cylindrical portion sized to be received by said aperture and having abutment portions spaced apart a distance slightly greater than the thickness of said strip and disposed along said cylindrical portion, said strip and said container respectively having complementary configurations to permit the disposition of the cylindrical portion of said container within said aperture with said spaced apart abutment portions respectively disposed on opposite sides of said strip, and annular, elastic ring means for said container received between one side of said strip and the abutment portions on said container which are disposed on said one side, said elastic ring means being sized for compression therebetween to frictionally secure said container to said strip.

2. Apparatus for use in a well bore including an elongated and flat strip of metal having a plurality of apertures spaced from one another along the length of said strip, shaped charge containers each having a cylindrical portion sized to be received by one of said apertures, said strip and said containers respectively having complementary slots and lugs to permit the disposition of the cylindrical portion of each container within a corresponding one of said apertures with said lugs disposed to one side of said strip, said container having an annular shoulder, said shoulder being spaced from said lugs a distance slightly greater than the thickness of said strip so as to be disposed on the other side of said strip, and annular, elastic ring means for said container received between the other side of said strip and said annular shoulder, said elastic ring means being sized for compression therebetween to frictionally secure said container to said strip.

3. Apparatus for use in a well bore including an elongated and flat strip of metal having a plurality of apertures spaced from one another along the length of said strip, each of said apertures having recesses about its periphery, shaped charge containers each having cylindrical portions sized to be received by one of said apertures and abutment portions spaced apart a distance slightly greater than the thickness of said strip and disposed along said cylindrical portion, one of said abutment portions on said cylindrical portion being lugs sized to fit said recesses and the other of said abutment portions on said cylindrical portion being an annular shoulder, said containers being receivable in apertures so that the abutment portions are disposed on opposite sides of said strip with the cylindrical portions thereof being disposed in the respective apertures, and annular, elastic rings for each container received between one side of said strip and one of said abutment portions, said elastic rings being sized for compression therebetween to frictionally secure each container to said strip.

4. Apparatus for use in a well bore including an elongated and flat strip of metal having a plurality of apertures spaced from one another along the length of said strip, shaped charge containers constructed of glass, each having a cylindrical portion sized to be received by one of said apertures and having abutment portions spaced apart a distance slightly greater than the thickness of said strip and disposed along said cylindrical portion, said strip and said containers respectively having complementary configurations to permit the disposition of the cylindrical portion of each container within a corresponding one of said apertures with said spaced apart abutment portions disposed on opposite sides of said strip and an annular, elastic ring constructed of heat and oil resistant material for each container received between one side of said strip and the abutment portions disposed on said one side, said elastic ring being sized for compression therebetween to frictionally secure each container to said strip.

5. Apparatus for use in a well bore including an elongated and flat strip member having at least one aperture along the length of said strip, at least one shaped charge container having a cylindrical portion sized to be received by said aperture and having abutment portions spaced apart a distance slightly greater than the thickness of said strip and disposed along said cylindrical portion, said strip and said container respectively having complementary configurations to permit the disposition of the cylindrical portion of a container within an aperture with said spaced apart abutment portions disposed on opposite sides of said strip, and non-metallic elastic means sized to be wedged in compression between said container and said strip to frictionally secure said container in an aperture in said strip.

References Cited in the file of this patent

UNITED STATES PATENTS

244,591	Griffin	July 19, 1881
2,629,325	Sweetman	Feb. 24, 1953
2,756,677	McCullough	July 31, 1956
2,764,938	Harcus	Oct. 2, 1956