March 25, 1941. C. S. KALEEL 2,236,140

CRIMPING TOOL FOR DYNAMITE CARTRIDGES

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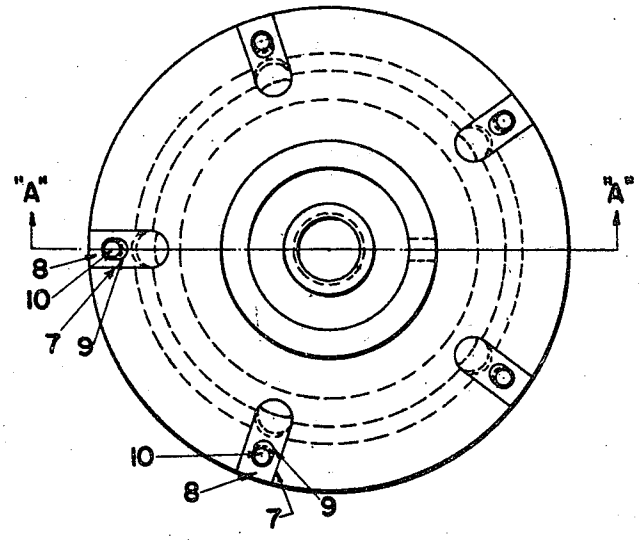



FIG.-1

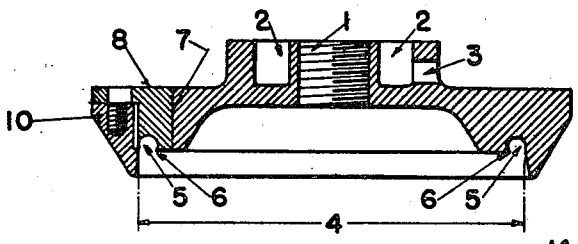



FIG.-2

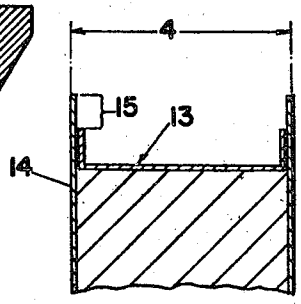



FIG.-6

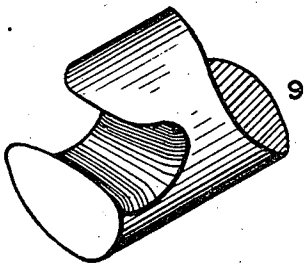


FIG.-8




FIG.-3

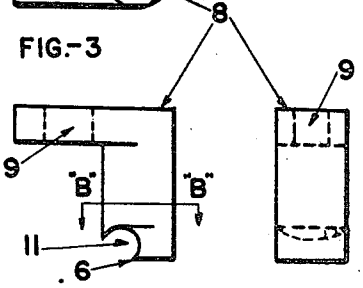



FIG.-4




FIG.-5

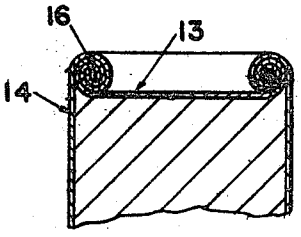



FIG.-7

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## CRIMPING TOOL FOR DYNAMITE CARTRIDGES

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2 Claims. (Cl. 86—39)

This invention relates to a crimping device for closing the ends of a paper cartridge and more particularly to an improved crimping tool for use in closing the ends of paper dynamite cartridges.

At present dynamite cartridges are manufactured by forming a hollow paper cylinder of the desired diameter and length and closing one end by folding a portion of the cylinder's side wall across the end. To complete the cartridge, after charging it with dynamite, the remaining open end is also closed by folding a portion of the cylinder's side wall across the end. This method gives fairly satisfactory results in regard to tightness of the end closure, ease of waterproofing the cartridge, and rigidity of the finished article if the cartridge diameter is small, for example, under two inches. However, the dynamite cartridges having a diameter greater than two inches do not lend themselves readily to efficient closing by the folding method. This difficulty of efficiently closing the end of large diameter cartridges is due to the greater amount of paper folded across the ends of the cartridge. The folds of paper produce a bulky closure that is not rigid or tight and therefore presents a cartridge that is very hard to waterproof.

It is the object of this invention to provide a means of closing the ends of dynamite cartridges in a manner that will produce a cartridge of improved water resistance. A further object of this invention is to provide a tool that will close the ends of dynamite cartridges in a manner that will give a rigid construction to the cartridge. A still further object of this invention is to provide a means of forming a spiral bead joint between a paper cylinder dynamite cartridge and a paper cup end insert. Further objects will appear hereinafter.

Now in accordance with this invention, I have found that by the use of an especially designed and novel crimping tool I may curl two layers of paper together in a manner that forms a very tight spiral bead joint. Therefore, in accordance with this invention I have produced a dynamite cartridge by inserting a shallow paper cup within the end of a cylinder of paper and forming a bead joint between the two by the use of my improved crimping tool. The bead joint so formed provides the cartridge with a rigid end that is easily waterproofed. Further, the entire formation of the bead joint between the paper cup and the paper cylinder is performed by the crimping tool of this invention, quickly and in one simple and efficient operation.

Now having indicated in a general way the nature and purpose of this invention, there follows a more detailed description of preferred embodiments thereof with reference to the accompanying drawing in which

Figure 1 is a plan view of the crimping tool.

Figure 2 is a section view of Figure 1 along the line AA.

Figures 3, 4, and 5 show the plan, side, and end view respectively of one of the die members of the crimping tool.

Figure 6 shows a dynamite cartridge consisting of a paper cylinder into which is positioned a shallow paper cup preparatory to crimping.

Figure 7 shows the dynamite cartridge of Figure 6 after the paper cylinder and paper cup have been crimped together in accordance with this invention.

Figure 8 is an enlarged perspective view of that section of the die member, Figure 4, below line BB.

A complete description of the construction and operation of my crimping tool may be understood by referring to Figures 1 and 2 of the drawing in which:

The screw thread 1 provides a means of attaching the tool into an adapter that may be fitted into a horizontal or vertical revolving medium. The tool shown in the drawing contains an annular groove 2 that serves to lighten the tool and causes a more even distribution of the stress between the adapter and the tool. The hole 3 is provided to receive a pin that may be used to tighten or loosen the tool on the adapter. The tool may be keyed in any suitable manner to the adapter to allow revolving in either direction. It is to be understood that other suitable methods are contemplated for attaching the tool to the adapter such as for example bolting or keying.

The size of the crimping tool is dependent on the size of the dynamite cartridge to be crimped. The relation between tool and the cartridge lies in dimension 4 which dimension approximately equals the outside diameter of the dynamite cartridge that is to be crimped.

The crimping tool contains a bead-forming concavity 5 cut concentrically with thread 1 in a manner that leaves a small hook 6, this hook 6 acts as a guide in the formation of the crimp bead. The bead-forming concavity 5, further, contains a plurality of specially cut slots 7 into which are fitted die members 8 that are radially movable. The construction of these die members 8 is shown in detail in Figures 3, 4, and 5 and includes an elongated hole 9 that allows radial ad-

justment of the die 8 in the slot 7 of the crimping tool, said die after being adjusted is securely held in place by a cap screw, not shown, that fits through elongated hole 9 and into screw hole 10. The concavity 11 of the dies 8 correspond to the bead-forming concavity 5 in shape but is further rounded at the edges as is indicated by the line 12, and by Figure 8 which is a perspective view of the die 8. This method of rounding the edges of the concavity 11 prevents the cartridge on which the die members 8 are acting from being torn. It will be noted that the die members 8 have the concavity 11 rounded on both edges, indicated by line 12 and by Figure 8, which construction feature allows the crimping tool to be revolved in either direction with equally good results.

The successful operation of the crimping tool of this invention depends upon the die members 8 and their radial adjustment. These die members 8 are so adjusted outward from the bead-forming concavity 5 that they exert an uninterrupted drag on the paper dynamite cartridge and this drag causes the formation of a spiral bead joint between the paper cylinder and the paper cup insert. The action of the crimping tool in forming the spiral bead joint is diagrammatically shown in Figures 6 and 7 and said tool operates as follows:

The paper cup 13 is inserted in the paper cylinder 14 and held in such a position that the distance 15 is approximately equal to the depth of the cup 13; the crimping tool while revolving is brought into contact with paper cylinder 14 containing the paper cup insert 13 and the action of the dies 8 and the bead-forming concavity 5 form an interlocking spiral bead 16 between the paper cup insert 13 and the paper cylinder 14. This spiral bead 16 is a tight and rigid joint that may be easily waterproofed.

A specific example of the operation of a crimping tool in accordance with my invention may be made with reference to the closing of the end of a dynamite cartridge 4" in diameter, but it will be understood that this is but one exemplification of my invention and that cartridges of various diameters, for example, from about 2" to about 7½", may be effectively closed by similar crimping tools prepared in accordance with this invention.

Now to prepare a 4" outside diameter dynamite cartridge a paper cup insert about ⅝" deep is positioned, by the use of a mandrel, within a 4" diameter paper cylinder so that the amount of the paper cylinder extending above the edge of the paper cup is about ⅝" or approximately equal to the depth of the cup. The crimping tool and cartridge are brought together by suitable means, for example, by moving the tool or cartridge or by moving both the tool and cartridge. When the crimping tool is brought into contact with the cartridge it may be revolving within the range of about 100 to about 1000 R. P. M. but preferably within the range of about 550 to about 650 R. P. M. The action of the die members turns the paper cylinder over the paper cup and then further tucks and rolls the two layers of paper together to form a spiral bead. The crimping tool and cartridge are then disengaged and the cartridge is ready to be loaded with an explosive. After filling the cartridge with an explosive, the remaining open end is also closed, by the crimping head of this invention, in the manner described above with the exception that the explosive itself acts as a mandrel to hold the paper cup insert in position. It will be understood that the cartridge or parts thereof may be treated in any desirable manner such as, for example, labeling, printing, or waterproofing, at any time during or after the crimping operation.

The die members control the formation of the spiral bead and will by proper radial adjustment produce a small tight bead or a large loose bead. It is to be noted that if the die members are positioned so that they coincide exactly with the bead-forming concavity of the crimping tool, the resulting bead formed will not consist of a spiral but will consist of a simple overlapped joint. This overlapped bead does not present the rigidity obtained by a spiral bead and further is much more difficult to effectively waterproof. I, therefore, in accordance with this invention adjust the die members radially and prefer to adjust the dies outward from the bead-forming concavity about $\frac{3}{32}$ of an inch, as this distance turns the bead sufficiently tight to make a rigid cartridge of very creditable appearance that is easy to effectively waterproof. I also prefer to use an odd number of die members in the crimping tool as the spacing of an odd number of dies allows their adjustment with a micrometer. The number of dies may vary with the diameter of the cartridges being crimped but for optimum operation I prefer to use three, five, and seven dies with cartridges having diameters of 2 to 3, 3 to 5, and over 5 inches respectively.

I have found that when the crimping tool of this invention has a bead-forming concavity ¼" in diameter and the die member surfaces are adjusted outward about $\frac{1}{32}$" from the concavity, I may successfully crimp all dynamite cartridges made of paper between about .005" and about 0.06" in thickness. If the paper to be used is outside the above range of thickness, I may obtain successful crimping by varying the diameter of the bead-forming concavity and the adjustment of the die members. The actual optimum conditions of diameter of the bead-forming concavity and adjustment of the die members for various thickness of paper may best be determined experimentally.

An advantage resulting from this invention and due to the spiral bead formed by the bead-forming concavity and die members of the crimping head is the possibility of producing dynamite cartridges that have a much superior water resistance. A further advantage of cartridges with ends closed in accordance with my invention is the improved rigidity. This improved rigidity overcomes spreading of the ends of the cartridges and subsequent spilling of the dynamite from the cartridge, a condition that is often encountered while handling and transporting cartridges having their ends closed by folding. A still further advantage is the improved appearance of the cartridges of my invention.

It will be understood that the details and examples given hereinbefore are illustrative only and in no way limiting on my invention as broadly described hereinbefore and in the appended claims.

What I claim and desire to protect by Letters Patent is:

1. In a device for spirally interlocking the wall of a cylindrical paper cartridge adapted to contain an explosive with the flange of a paper cup end-insert, the combination of a revoluble

crimping tool which has an annular concavity shaped to provide a downwardly and outwardly extending hook-like portion for receiving and rolling the said wall inwardly and over the flange of the said end-insert, whereby said wall and flange are rolled into a spiral and a plurality of turning dies each having a concavity conforming in shape to the annular concavity of said crimping tool positioned circumferentially about said annular concavity.

2. In a device for spirally interlocking the wall of a cylindrical paper cartridge adapted to contain an explosive with the flange of a paper cup end-insert, the combination of a revoluble crimping tool which has an annular concavity shaped to provide a downwardly and outwardly extending hook-like portion for receiving and rolling the said wall inwardly and over the flange of the said end-insert, whereby said wall and flange are rolled into a spiral and a plurality of turning dies each having a concavity conforming in shape to the annular concavity of said crimping tool positioned circumferentially about said annular concavity, said dies having their leading edge rounded whereby turning of the said wall and flange to form said spiral is facilitated.

CHARLES S. KALEEL.