Feb. 25, 1941. D. G. ASHCROFT 2,233,068

APPARATUS FOR WRAPPING CYLINDRICAL ARTICLES

Filed June 7, 1939 3 Sheets-Sheet 1

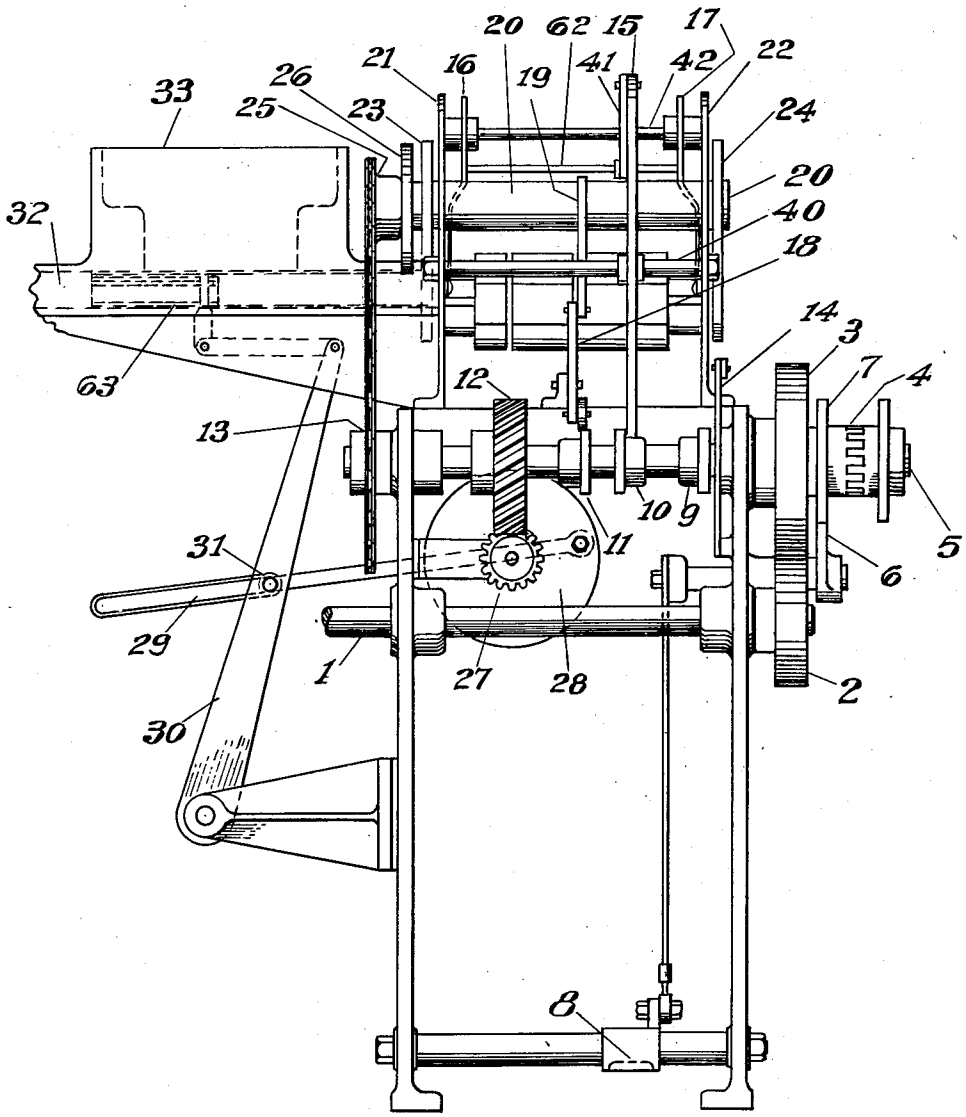


Fig. 1

INVENTOR

Donald George Ashcroft

BY Thos. A. Wilson

ATTORNEY

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APPARATUS FOR WRAPPING CYLINDRICAL ARTICLES

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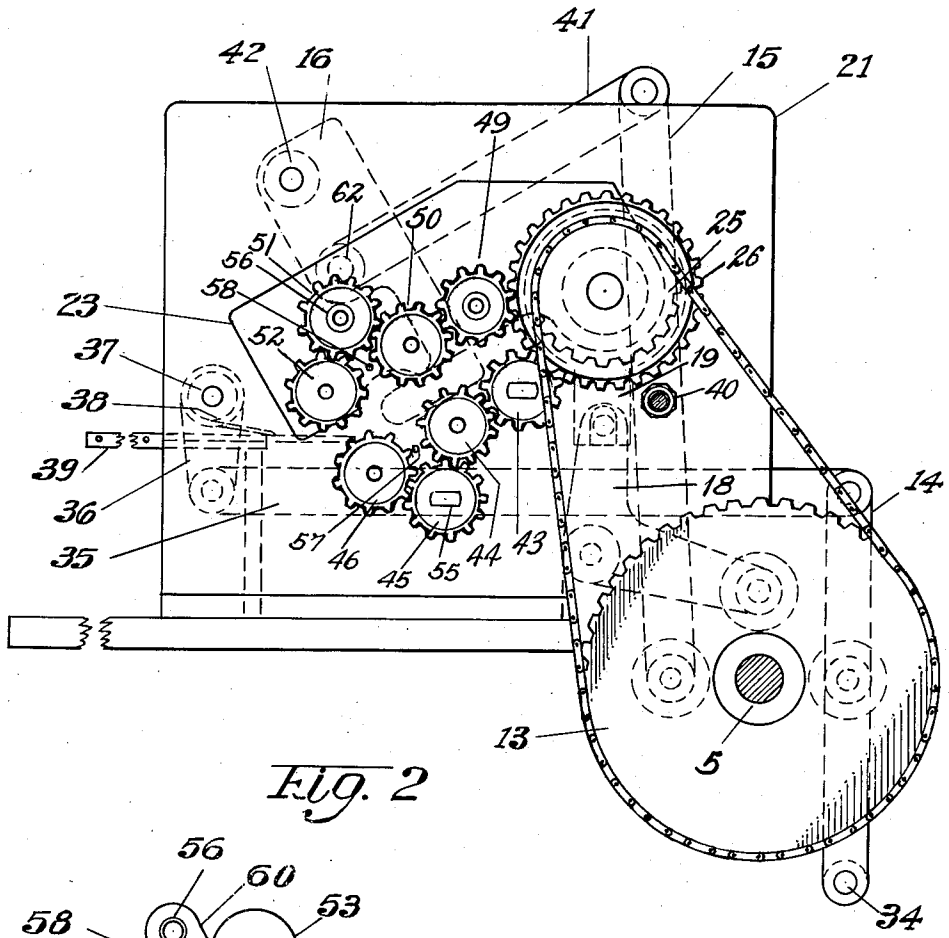


Fig. 2

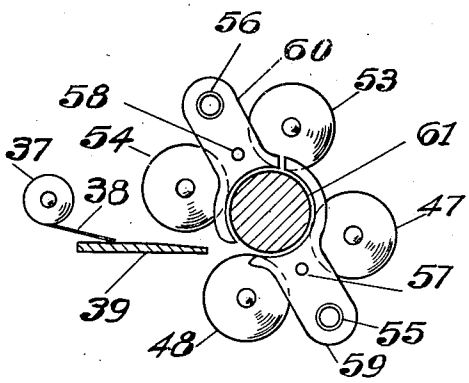


Fig. 3

INVENTOR

Donald George Ashcroft

BY Thos. A. Wilson

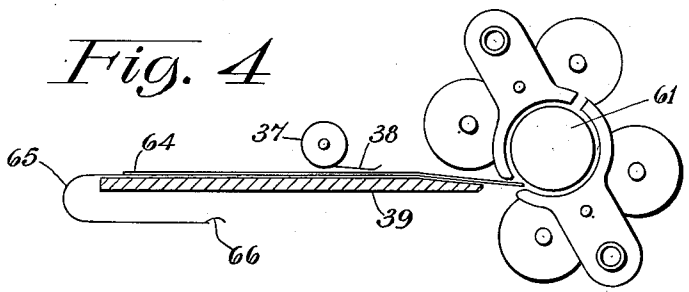
ATTORNEY

Feb. 25, 1941. D. G. ASHCROFT 2,233,068

APPARATUS FOR WRAPPING CYLINDRICAL ARTICLES

Filed June 7, 1939 3 Sheets-Sheet 3

Fig. 4



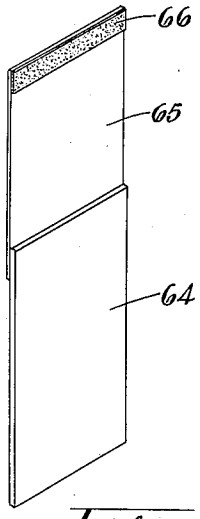


Fig. 5

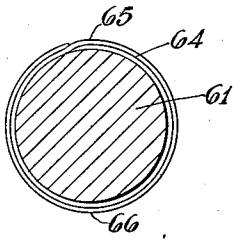


Fig. 6

Donald George Ashcroft INVENTOR

BY Thos. A. Wilson

ATTORNEY

Patented Feb. 25, 1941 2,233,068

UNITED STATES PATENT OFFICE

2,233,068

APPARATUS FOR WRAPPING CYLINDRICAL ARTICLES

Donald George Ashcroft, Saltcoats, Scotland, assignor to Imperial Chemical Industries Limited, a corporation of Great Britain

Application June 7, 1939, Serial No. 277,761
In Great Britain June 9, 1938

3 Claims. (Cl. 93—2)

This invention relates to an improved apparatus for wrapping cylindrical articles, particularly cylindrical explosive cartridges, with a substantial thickness of sheet material, especially sheet material that is of substantial thickness, or is not very pliable.

Explosives of a kind in which the explosive cartridge is wrapped in a safety sheathing material have recently come into use. The sheathing material comprises, in sheet form, a uniform mixture of a fibrous bonding material with a preponderating portion of a cooling salt or a mixture of cooling salts, e. g., as described in Patent 2,078,240. Such sheets are of substantially greater thickness than ordinary wrapping paper; and, although sufficiently flexible to be rolled around the cartridge, they are rather friable and are not adapted to withstand rough handling, e. g., by the usual forms of wrapping machine. Another type of cooling sheath for safety blasting explosives has been proposed, in the form of sheets adapted to be wrapped round the explosive and comprising one or more cooling salts mixed into a paste with an aqueous solution of a suitable organic bonding agent, such as gelatine, and a hygroscopic polyhydric alcohol, such as glycerine, formed into sheets, and dried, as described in British Patent No. 424,784.

Mechanical devices have been employed to wrap gelatinous or semi-gelatinous explosive cartridges in ordinary or waxed paper wrappers. Such wrappers have substantial tensile strength and do not produce a marked increase in the diameter of the cartridges to which they are applied. The mechanical devices used in such cases are devised to take advantage of these useful features, and are ill-adapted to handle thick or friable sheet materials such as the sheathing materials mentioned in the preceding paragraph.

This invention has as an object to devise a new method and apparatus for wrapping blasting explosive cartridges. A further object is to devise such a method and apparatus which will be particularly useful for wrapping safety sheathing materials round blasting explosive cartridges. A still further object is to devise a method and apparatus for wrapping safety sheathing materials round blasting explosive cartridge without damage to the sheathing or cartridge. Further objects will appear hereinafter. These objects are accomplished by the following invention.

An apparatus for wrapping cylindrical blasting explosive cartridges with a substantial thickness of sheathing material in sheet form comprises: a wrapping mechanism consisting of two sets of driven rollers, of which one set is fixed and the other is movable, means for moving this second set so that it bears with constant pressure on and adjusts its position to the increasing diameter of the cartridge being wrapped, and retractable members adapted to engage the ends and prevent longitudinal movement of the cartridge being wrapped; means for feeding a succession of cartridges to the wrapping position and for expulsion of a wrapped cartridge therefrom; means for the positive separation of the rollers and the retraction of the centring members during the operation of the said feed means; and means for applying a constant tension to a sheet of wrapping material while being wrapped around a cartridge. The wrapping rollers are preferably fitted with means for compelling the sheathing material, which is fed to a position between the cartridge and a wrapping roller, to conform closely to the cylindrical surface of the cartridge.

One form of machine constructed according to the invention, and adapted for semi-automatic working, is illustrated in the accompanying drawings.

Figure 1 represents a rear elevation of the machine, and shows the operation of the driving gear and the cartridge feed mechanism.

Figure 2 represents a view of the wrapping mechanism from the left-hand side of Figure 1, and shows the operation of the gears driving the sectionally-divided wrapping rollers and of the cam-operated levers.

Figure 3 represents a section through one of the divisions in the rollers, and shows the method of attachment of the wrapper guides.

Figure 4 represents a side view of the wrapping rollers showing a cartridge in position and also of the feeding platform showing a layer of sheathing material being fed into the nip between the cartridge and the fixed bottom roller.

Figure 5 shows a sheet of sheathing material prepared for use in this invention.

Figure 6 shows a section through a wrapped cartridge. Normally the cartridges will be already wrapped in paper before being fed to this machine to be wrapped in safety sheathing material.

In Figure 1, the main driving shaft 1 drives a gear 2 which engages with a gear 3 on the friction clutch 4. The friction clutch operates on a camshaft 5, which is normally kept at rest by means of a pawl 6 engaged in a step on a collar 7. Pressure on a pedal 8 disengages the

pawl and permits the drive to be transmitted to the camshaft while the pawl is so disengaged.

The camshaft 5 carries cams 9, 10, and 11, a spiral gear 12 and a chain sprocket 13. Cam 9 operates a lever 14 (see Figure 2) which pivots at 34 and is connected by a link 35 to lever 36 on a roller 37, which carries the tension fingers 38 bearing on the feed platform 39. Cam 10 operates a lever 15 which is pivoted on a shaft 40 and connected by a link 41 to a rod 62 fixed to the centring fingers 16, 17, thus causing them to pivot on the shaft 42. Cam 11 operates a bell-crank lever 18 which is linked to a lever 19 on the shaft 20. This shaft is journalled in side plates 21, 22, and carries crank plates 23, 24 between which are mounted the movable rollers of the wrapping mechanism. The rollers on levers 14, 15 and 18 are kept in contact with the operating cams on the shaft 5 by the action of springs or counterpoises not shown. The chain sprocket 13 drives a chain sprocket 25 and a gear 26, both of which rotate freely on the shaft 20. The gear 26 drives the gears of the wrapping rollers. The spiral gear 12 drives a spiral gear 27 on the shaft of the crank wheel 28, which gives an oscillatory motion to a slotted connecting rod 29, and thereby operates the cartridge feed mechanism. The oscillatory motion is conveyed to a lever 30 by means of a pin 31 fitting in the slot of the rod 29. The length of the slot is at least equal to the throw of the crank wheel 28, so that a jam in the feed preventing the forward movement of the lever 30 merely disconnects it from the movement of the rod 29. Normally, the lever 30 is kept in the depicted operating position by a spring or counterpoise, not shown. This lever 30 is connected by a suitable linkage to a cylindrical piston 63, which oscillates in a cylindrical bore 32 at the base of the cartridge magazine 33.

The gears 12 and 27 are so proportioned that a single rotation of the shaft 5 produces a complete oscillation of the piston 31, which is fully forward when the pawl 6 is in register with the step on the collar 7.

The gear 26 drives a train of gears 43, 44, 45, 46 on the side plate 21; of these, 44 and 46 are fixed on the shafts of the wrapping rollers 47, 48, and 43, 45 are idlers. The gear 26 also drives a train of gears 49, 50, 51, 52 on the crank plate 23; of these, 50 and 52 are fixed on the shafts of the wrapping rollers 53, 54, and 49, 51 are idlers.

The idle gears 45, 51 run on fixed rods 55, 56 which, in conjunction with rods 57, 58, position the wrapper guides 59, 60. The rods 55, 57 connect the side plates 21 and 22, and are fixed; the rods 56 and 58 connect the crank plates 23 and 24, and move with them.

The wrapping rollers 47, 48, 53 and 54 are divided at intervals along their lengths to accommodate wrapper guides of the shape shown in Figure 3. The guides are each made in two portions as shown; the joint opposite the feed platform is cut away to admit the forward edge of the thick sheathing material, and the other joint is flush with the surface of the roller 53 so that it cannot foul the edge of the sheathing material.

The mode of operation of the machine is as follows. At the commencement of a cycle of operations, the pawl 6 is engaged in the top of the collar 7, and the piston 63 is fully forward, having pushed a cartridge 61 from the base of the magazine 33 along the cylindrical bore 32, through a gap in the side plate 21 and under the wrapping rollers 53 and 54 into the wrapping position. These wrapping rollers now bear on the cartridge which is held between the centring fingers 16 and 17.

A sheet of the sheathing material, provided at the rear edge with a strip of thin outer wrapping material tipped with adhesive and of suitable dimensions for complete envelopment of the wrapped cartridge, is laid on the feed platform 39 and pushed under the tension fingers 38 until its forward edge is nipped between the cartridge 61 and the roller 48. The pedal 8 is now depressed by the operator, and the shaft 5 rotates; whereupon the pedal is released.

The wrapping rollers 47, 48, 53 and 54 immediately rotate the cartridge. The crank wheel 28 rotates and moves the piston 63 to the left until, at the end of the stroke, a fresh cartridge drops in front of it from the magazine. As the cartridge 61 is rotated between the rollers, the sheathing material is drawn in and guided around the cartridge by the series of guides 59 and 60. The rollers 53 and 54 and the crank plates 23 and 24 gradually rise as the diameter of the wrapped cartridge increases, so that the cartridge is wrapped under constant pressure and the sheath is fed under the constant tension of the fingers 38. As the adhesive end of the outer wrapping material passes under the fingers, they are momentarily lifted by the action of the cam 9 on the lever 14, so that the fingers do not become soiled by the adhesive. When the cartridge 61 is fully wrapped, the cam 10 withdraws the centring fingers, the cam 11 lifts the rollers 53 and 54 clear of the wrapped cartridge, and the forward motion of the piston 63 pushes the fresh cartridge into the wrapping position, displacing the wrapped cartridge through an aperture in the side plate 22.

The cam 10 now releases the centring fingers, which adjust the position of the cartridge and the cam 11 allows the rollers 53 and 54 to descend on to it. The pawl 6 re-engages the step in collar 7 and arrests the operation of the machine.

Referring to Figure 4, this shows a sheet of sheathing material being fed to the cartridge 61. The cartridge has just been placed in position between the rollers which have not yet closed to hold the cartridge firmly.

The sheet of sheathing material which is shown in Figure 5 consists of a rectangle of felted material 64 having attached to it a stout paper outer wrapper 65 which is gummed at the edge as shown at 66 just before wrapping takes place. In Figure 4 this sheet can be seen on the feeding platform 39 being fed into the nip between the bottom roller and the cartridge, while Figure 6 shows a completed sheathed and wrapped machine, the cartridge originally 1¼" in diameter, having now two turns of felted material and a turn and a half of paper wrapper around it, is of diameter between $1\frac{7}{8}$" and 1½".

The machine is preferably constructed so that it may be readily converted for use with any desired length or diameter of cartridge; for instance, the magazine and piston unit may be adjustable or interchangeable with other units of appropriate size, and the wrapping rollers may be detachable and replaceable by others of suitable diameters.

This invention is a valuable advance in the art as safety sheathing materials are very easily cracked and it must in consequence be guided

and smoothed very carefully around the cartridge so as to avoid localised bending and fracture, and it must be fed to the cartridge under a very steady but gentle tension. I have also found it useful in avoiding cracking or wrinkling of these thick wrappers that the fixed and movable sets of rollers are geared to the same driving gear so that as these rollers are moved apart during wrapping, there is a slight but certain drag of the moving rollers in comparison with the stationary ones. Comparative tests using a machine having this slight drag and machines having rollers independently driven, show that when using thick wrappers the machines of this invention wrap with a greater certainty and smoothness.

As many apparently widely different embodiments of this invention may be made without departing from the spirit and scope thereof, it is to be understood that the invention is not limited to the specific embodiments thereof except as defined in the appended claims.

I claim:

1. An apparatus for wrapping cylindrical blasting explosive cartridges with a substantial thickness of sheathing material in sheet form comprising two sets of driven rollers, of which one set is fixed and the other movable, said fixed and movable sets of rollers being geared to the same driving gear permitting a certain drag of said moving rollers in comparison with the stationary ones as said sets of rollers are moved apart during wrapping, means for moving the set of moving rollers so that it bears with constant pressure on and adjusts its position to the increasing diameter of the cartridge being wrapped, and retractable members adapted to engage the ends and prevent longitudinal movement of the cartridge being wrapped, means for feeding a succession of cartridges to the wrapping position and for expulsion of a wrapped cartridge therefrom, means for the positive separation of the rollers and the retraction of the centring members during the operation of the said feed means, and means for applying a constant tension to a sheet of sheathing material while being wrapped around the cartridge.

2. An apparatus for wrapping cylindrical blasting explosive cartridges with a substantial thickness of sheathing material in sheet form comprising two sets of driven rollers, of which one set is fixed and the other movable, said fixed and movable sets of rollers being geared to the same driving gear permitting a certain drag of said moving rollers in comparison with the stationary ones as said sets of rollers are moved apart during wrapping, means for moving the set of moving rollers so that it bears with constant pressure on and adjusts its position to the increasing diameter of the cartridge being wrapped, and retractable members adapted to engage the ends and prevent longitudinal movement of the cartridge being wrapped, means for feeding a succession of cartridges to the wrapping position and for expulsion of a wrapped cartridge therefrom, cooperating wrapper guides for drawing in the sheathing material and guiding the same around the cartridge, means for the positive separation of the rollers and the retraction of the centring members during the operation of the said feed means, and means for applying a constant tension to a sheet of sheathing material while being wrapped around the cartridge.

3. An apparatus for wrapping cylindrical blasting explosive cartridges with a substantial thickness of sheathing material in sheet form comprising two sets of driven rollers, of which one set is fixed and the other movable, said fixed and movable sets of rollers being geared to the same driving gear permitting a certain drag of said moving rollers in comparison with the stationary ones as said sets of rollers are moved apart during wrapping, means for moving the set of moving rollers so that it bears with constant pressure on and adjusts its position to the increasing diameter of the cartridge being wrapped, and retractable members adapted to engage the ends and prevent longitudinal movement of the cartridge being wrapped, means for feeding a succession of cartridges to the wrapping position and for expulsion of a wrapped cartridge therefrom, wrapper guide means as described, positioning means for said guide means including fixed rods connecting the side plates and the crank plates, means for the positive separation of the rollers and the retraction of the centring members during the operation of the said feed means, and means for applying a constant tension to a sheet of sheathing material while being wrapped around the cartridge.

DONALD GEORGE ASHCROFT.

CERTIFICATE OF CORRECTION.

Patent No. 2,233,068. February 25, 1941.

DONALD GEORGE ASHCROFT.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, first column, line 72, for the word "top" read --step--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 18th day of March, A. D. 1941.

Henry Van Arsdale,
Acting Commissioner of Patents.

(Seal)