Sept. 7, 1937. A. H. HAUPT 2,092,066

METHOD AND APPARATUS FOR WRAPPING CYLINDRICAL ARTICLES

Filed Feb. 7, 1935 2 Sheets-Sheet 1

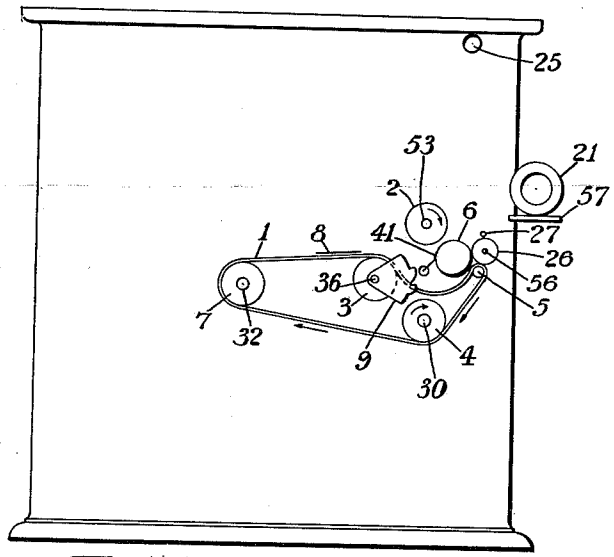


Fig. 1

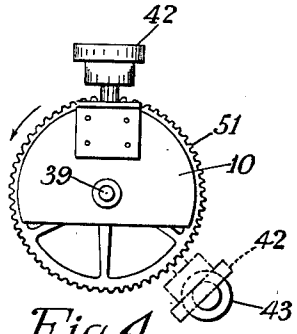


Fig. 4

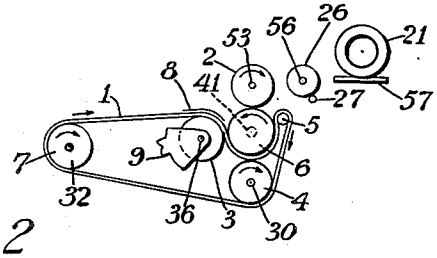


Fig. 2

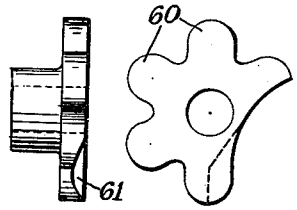


Fig. 6 Fig. 7

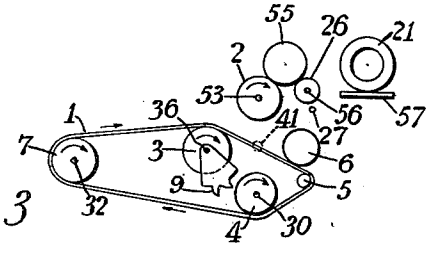


Fig. 3



Fig. 8

INVENTOR.
Albertus Hendrik Haupt
BY *Roger S. Brown*
ATTORNEY.

Sept. 7, 1937. A. H. HAUPT 2,092,066

METHOD AND APPARATUS FOR WRAPPING CYLINDRICAL ARTICLES

Filed Feb. 7, 1935 2 Sheets-Sheet 2

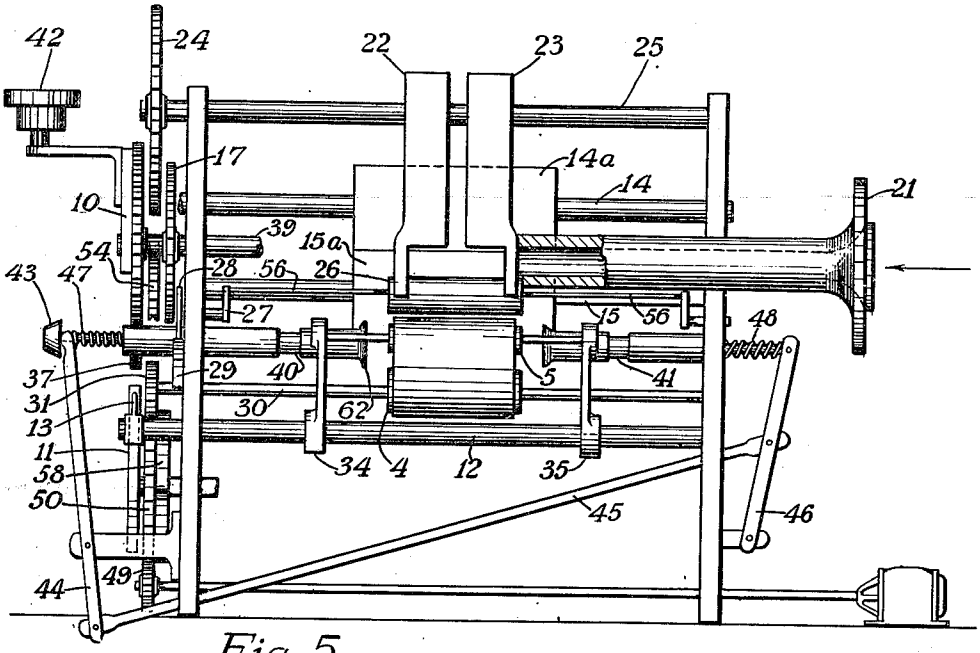


Fig. 5

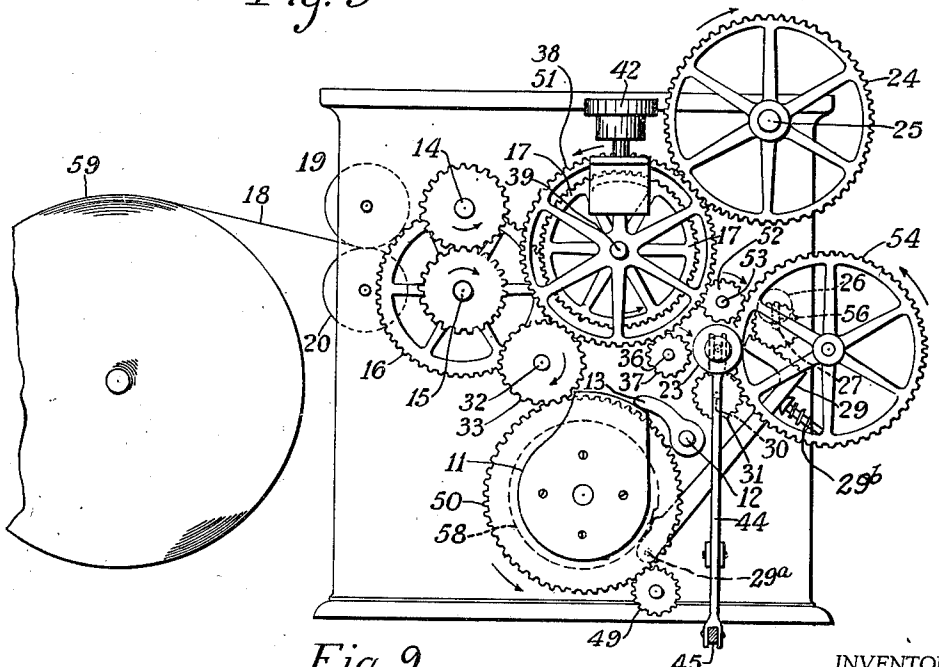


Fig. 9

INVENTOR.
Albertus Hendrik Haupt
BY
Roger S. Brown
ATTORNEY.

Patented Sept. 7, 1937 2,092,066

UNITED STATES PATENT OFFICE

2,092,066

METHOD AND APPARATUS FOR WRAPPING CYLINDRICAL ARTICLES

Albertus Hendrik Haupt, Somerset West, Union of South Africa, assignor to Imperial Chemical Industries Limited, a corporation of Great Britain

Application February 7, 1935, Serial No. 5,458
In Great Britain February 7, 1934

4 Claims. (Cl. 93—5)

This invention relates to an improved method and apparatus for wrapping cylindrical articles, especially cylinders of gelatinous or plastic blasting explosive or other semi-plastic materials which require delicate handling. Hitherto cylinders of gelatinous or plastic blasting explosives have been wrapped by hand or the gelatinous material has been extruded into previously formed cylindrical shells. It has also been proposed to wrap cylinders of plastic explosive in paper by means of a machine in which a stationary flat sheet of paper is picked up by a cylinder of the plastic explosive rolling over the sheet. For the action of the machine referred to it is necessary that adhesion should take place between the cylinder and the end of the paper which it first meets in its travel, and if the cylinder itself is not composed of sufficiently sticky material, it must be provided with an adhesive. The usual gelatinous or plastic blasting explosives are not sufficiently sticky to cause the adhesion of the waxed or other paper which is generally used for wrapping them.

The principal object of the present invention is to provide a new and improved method and apparatus for wrapping cylindrical articles, which, when applied to the wrapping of gelatinous or plastic blasting explosive, will avoid the disadvantages of the methods referred to in the preceding paragraph, namely, the slowness of hand wrapping, the drawbacks of the process of extrusion into previously formed cylindrical shells (previous preparation of the shells, limited scope of the method), and the use of an adhesive.

According to the present invention cylindrical articles are wrapped by a method comprising the following steps; feeding a cylindrical article into rotating relationship with a roller supported loop of an endless travelling belt and a superposed confining roller, subsequently feeding to the same position a sheet of wrapping material, maintaining the article in rotating relationship with the belt and the superposed roller until wrapping is completed, and displacing the endless travelling belt so that the wrapped article is released in a forward direction.

According to a preferred form of the present invention cylindrical articles are wrapped by a method comprising the following steps; feeding a cylindrical article to the surface of an endless travelling band at a position, in the direction of travel, beyond a superposed driven roller, displacing a roller supporting the belt at a position beyond the article, the displacement being so conducted that the cylindrical article is confined and rotated between the superposed roller and a loop of the travelling band, feeding a sheet of wrapping material forwardly on the surface of the band, synchronizing the feeding of the article and of the wrapping sheet and the displacement of the roller in such a manner that the wrapping sheets come into wrapping relationship with the article after the latter has been enclosed in the loop of the travelling band, and restoring the displaced supporting roller in order to release the wrapped article in a forward direction. The distance between the superposed roller and the surface of the belt carried on the fixed roller which supports one arm of the loop must be too small to permit of the passage of the cylindrical article.

It is also desirable to provide a further roller immediately below the lower extremity of the loop so that when the article is in the wrapping position it is supported between the three fixed rollers and the one movable roller, it being understood, of course, that the travelling band is interposed between the surface of the article and all the rollers except the superposed roller.

The rollers supporting the loop of the belt are preferably free, the belt itself being driven through an auxiliary supporting roller. The roller immediately below the lower extremity of the loop is also preferably driven so that when the cylindrical article is in the wrapping position it is solely rotated by the torque applied by driven rolls above and below, the drive from below being transmitted through the medium of the wrapping belt. In this way any tendency is avoided to distortion of the plastic cylindrical article or to any drag on its surface.

In this specification and in the appended claims, the term "free" roller is employed to distinguish from the term "driven" roller and signifies that the roller is free to rotate on its axis and does not transmit the drive from any external source of power. The term "displace" as used with reference to the rollers may relate either to free or to driven rollers, as defined above, and indicates a movement or displacement of the roller as a whole in a direction transverse to its longitudinal axis.

In this process, whereas the sheet of wrapping material is fed forwardly in the direction of travel of the band, the cylindrical article, after being brought into contact with the surface of the travelling band, is caused by displacement thereof to move backwardly a short distance. It follows in consequence that in restoration of the position of the travelling band the wrapped ar-

ticle is carried away from the wrapping position without special manipulation.

The sheet of wrapping material employed is cut somewhat wider than the cylindrical article to be wrapped, and at a suitable stage in the sequence of operations the portions of the wrapping sheet which project beyond the ends of the article are folded inwards by means of any suitable or known crimping and tapping devices.

It is important that the cylindrical articles should be fed to the belt, in correct alignment with the axes of the rollers, and that the moment of delivery should be accurately synchronized in relationship to the feeding of the sheet of wrapping material and the movement of the displaceable roller. The article should be delivered a very short interval of time before the displacement of the belt is effected, and the article should have reached the loop of the band before the sheet of wrapping material comes into contact with it. A suitable device for feeding the article in this manner comprises a displaceable free roller adapted to cooperate with the superposed roller in such a manner that, in the one position the article to be wrapped is supported between the two rollers, but that on displacement of the one roller the article is allowed to slide between them and on to the belt. Other types of feeding device, however, may be employed provided that distortion of the plastic cylindrical article does not occur. Thus, for example, the displaceable roller referred to may be replaced by a suitably inclined plate also cooperating with the superposed roller and adapted to deliver the cylindrical article to the belt by lateral or angular displacement.

One form of the invention will now be described with reference to the accompanying drawings.

Figs. 1, 2, and 3 are diagrams showing respectively the sequence of movements of the wrapping portion of the apparatus.

Figs. 4, 6, 7, and 8 are details of the end closing devices.

Fig. 9 is a diagrammatic side elevation, and Fig. 5 is a diagrammatic end elevation showing the general arrangement of the machine.

In the drawings there are shown six rollers and in practice this number is to be preferred, though the apparatus may be adapted to work with more or less rollers.

Referring to Figures 1 to 3, an endless belt 1 operating at a suitable constant speed passes over the driven rollers 4 and 7 and the free rollers 3 and 5.

The roller 5 is carried by and is free to revolve in arms 34 and 35, which are fixed to the shaft 12, as shown in Figures 5 and 9, the shaft 12 being oscillated by the lever 13 and the cam 11. A spring, not shown, keeps the lever 13 in contact with the cam 11.

When the roller 5 is in the position shown in Figure 1 a cylinder 6 of the plastic material, previously cut to the required length, is delivered on to the belt as shown, with its axis substantially parallel to the axes of the rollers 2 and 5.

The movement of the cam 11 causes the lever 13, held against it by a spring, not shown, to rotate partially the shaft 12 which, by means of the arms 34 and 35, moves the roller 5 from the position shown in Fig. 1 to the position shown in Figure 2, which results in the cylinder 6 being held between the driven roller 2 and the belt 1 which is kept in the required position by the rollers, 3, 4 and 5 and the cylinder 6.

The movement of the belt 1 and the rotation of the roller 2 cause the cylinder 6 to rotate.

A sheet of paper or other wrapping material 8 broad enough to wrap the cylinder 6 and form the end flaps is placed on the belt 1 in such a position and at such time that it passes between the belt 1, where the belt curves over the roller 3 and the driven roller 2, and under the cylindrical article 6 after the roller 5 is in the wrapping position shown in Figure 2. It is then wrapped round the cylindrical article by the combined motion of the belt 1, the cylindrical article 6 and the driven roller 2.

The wrapping material 18, which is preferably paper, is drawn from a roll 59 through the guide rollers 19 and 20 by cutting rollers attached to the shafts 14 and 15.

The cutting rollers are so constructed and geared as intermittently to cut the material to the required shape and deliver it at the required intervals to the conveyer belt 1. They are more fully described in my United States application Serial No. 738,886, filed August 7, 1934, and corresponding pending British appln. No. 22,399/33 and no claim for the paper cutting device is made in the present application.

A number of sheets of wrapping material cut to a suitable size and shape are fed in succession on to the belt 1. Sheets cut to the shape of a rhomboid are preferred.

The plastic material to be wrapped is extruded from any suitable type of extruding machine of which the nozzle only is shown as 21.

The extruded material is cut into pieces of the required length by the cutters 22 and 23 fixed to the shaft 25, shown in Figure 5.

This device is claimed and more fully described in my United States application Serial No. 738,887, filed August 7, 1934, and corresponding pending British application No. 22,400/33 and no claim thereto is made in the present application. As disclosed in said applications, the knives are carried projecting forward from swinging arms of considerable width so that the arms will automatically propel the cut portion of plastic off the cutting shelf after it is cut.

The cutters, in addition to cutting the plastic material into cylindrical pieces of the required length, serve to propel the cut cylinders from off the platform 57 upon which the plastic material has been extruded, so that they are successively supported between the driven wrapping roller 2 and a free roller 26 when the latter is in the position shown in Figure 2 and Figure 3.

In Figure 3, in addition to the wrapped cylinder 6, shown as being discharged from the apparatus, another, (the next ensuing cylinder of plastic material to be wrapped) is shown as 55, resting on the rollers 2 and 26.

The roller 26 is so constructed that it revolves freely upon the crank pin 56 of a crank shaft oscillating about the axis of its shaft 27.

On the shaft 27 is fastened the gearwheeel 28 with which the quadrant gear shown as 29 in Figure 4 engages. The quadrant 29, pivoted at 29a, is held against the cam 58 by a spring device 29b.

The cam 58 is attached to the gear wheel 50.

At the appropriate time the rotation of the cam 58 allows the quadrant 29 to move inwardly towards the centre of the cam 58, under the influence of the spring above-mentioned, causing the gear 28 and the crank shaft 27 to rotate about half a revolution. This causes the crank pin 56 and the roller 26 to move from the position shown in Figure 2 and Figure 3 in a direction away from the driven roller 2 to the position shown in

Figure 1, thus allowing the cylindrical article to fall by gravity from the position occupied by the cylinder 55 in Figure 3 on to the belt and into the position occupied by the cylinder 6 in Figure 1.

This method of feeding ensures that the cylindrical articles are delivered to the belt at the correct time and in correct alignment, at right angles to the direction of motion of the belt.

As soon as the roller 5 has closed to the position shown in Figure 2 the cam 58 moves the quadrant 29 in an outward direction, and, through the gear 28 and the crank shaft 27 restores the roller 26 to the position shown in Figure 2 and Figure 3, when it is ready to receive another cylindrical article moved off the platform 57 by the cutters 22 and 23.

After the cylindrical article 6 has been wrapped, suitably synchronized and positioned crimping fingers 9 rotate around the axis of the roller 3 in such a manner as to move up to the cylinder and fold in each projecting end of the wrapping material and then move on past the cylinder. Separate crimping devices, one for each end of the cylindrical article are provided. One only is shown as 9 in Figures 1, 2, and 3.

The crimpers are fixed to the shaft 36 which is rotated at interrupted intervals by the gear 37 on the shaft 36 engaging with an interrupted gear 38 fixed on the shaft 39, and the proportions of these gears being such that the shaft 36 makes one revolution and then comes to rest.

When the ends of the wrapped article have been crimped in the fingers of the crimpers come to rest leaving the crimped ends of the article exposed.

The folded ends are then crushed flat by two suitably positioned and synchronized tapping rods 40 and 41 which advance into contact with the wrapped article at each end, and then withdraw from it. Tapping rod 40 is advanced towards one crimped end by the action of the roller 42 striking the head 43 of the tapper 40. The roller 42 is carried on a bracket attached to a disc which is fixed to shaft 39 as shown in Figure 5.

By means of the link motion 44, 45, and 46, the tapper 41 is advanced towards the other crimped end of the wrapped cylindrical article simultaneously with the movement of the tapper 40.

The springs 47 and 48 retract the tappers when the roller 42 has moved past the tapper head 43.

I show this particular means of operating the tapping rods but I do not restrict myself to this method. Other suitable means may be used.

Referring to Figures 6 and 7 the fingers 60 are chamfered off on their leading edges as shown at 61.

The tapping rod is shown in detail in Figure 8. The cupped portion 62 first presses the crimped end of the material covering the cylindrical article and as the tapping rod 40 continues to advance the end of this rod 63 presses the centre of the crimped end while its periphery is held by the cupped portion 62.

Upon the tapping rod 40 being withdrawn from the wrapped article the spring 64 causes the portion 62 to re-assume the position shown in Figure 8.

The method of transmission of the drive to the various parts of the machine is as follows. The pinion 49 is rotated at a constant speed by any suitable mechanical means and drives the gear wheel 50 fastened to which are the cams 11 and 58. The gear 50 drives the gear wheel 33 which is attached to the shaft 32 upon which the roller 7 is fixed. The gear 33 drives the gear 51 fixed on the shaft 39, upon which also the gear 17 is fixed. The gear 17 drives the gear 16 which is fixed to the shaft 15 upon which one of the rotary wrapping material cutters is fixed. The gear 51 also drives the gear 52 which is fixed to the shaft 53 upon which the wrapping roller 2 is fixed. The gear 51 also drives the gear 24 which is fixed to the shaft 25 upon which the cutters 22 and 23 for the plastic material are fastened. The gear 52 drives the gear 54 which drives the gear 31 fixed to the shaft 30 upon which the wrapping roller 4 is fastened.

By the suitable disposition and proportioning of the above described gears the cutting of the plastic material and of the wrapping material, the wrapping of the cylindrical articles, and the crimping, tapping and ejectment of the wrapped articles from the apparatus are successively carried out in the required sequence and at the appropriate times.

The timing of the various movements is shown by means of gear wheels, but other methods such as chains and sprockets might be employed, or some of the movements could be performed hydraulically or pneumatically. The invention is not limited to any particular means.

The invention is particularly suitable for the wrapping of cartridges of gelatinous or plastic materials and has the advantage of a rapid output and economy in floor space and can be worked by a single operator.

I claim

1. In a wrapping machine for wrapping cylindrical articles, in combination, a closed driven belt for receiving the article to be wrapped and the wrapper therefor, means for driving said belt, means for supporting said belt including a pair of spaced horizontally arranged pocketing rollers between which the belt can sag to present an article receiving pocket, means for mounting one of said pocketing rollers to oscillate bodily in a plane transverse to the normal plane of travel of the belt to alternately pocket and release the article, means for so oscillating said roller, a pair of spaced rollers, the one a driven confining roller arranged above the upper span of the belt and the other a cooperating roller arranged below the upper span of said belt, means for driving said rollers in synchronism, such rollers being located in cross-alignment with the space between said pocketing rollers and spaced from each other to receive the article and said span of the belt in driving relation therebetween for cooperation in the wrapping of the article, a gate roller mounted above the upper span of said belt adjacent and axially parallel to said confining roller, means for mounting said gate roller to alternately move to cooperating position with said confining roller to cooperate therewith to support a fed article at the bight of said rollers and to move from such position to release such article to position upon said belt and operatively between said confining roller and its cooperating roller, means for so moving said gate roller, and means for synchronizing the oscillation of the oscillating pocketing roller and the movement of the gate roller to initiate formation of the pocket in timed priority to the movement of the gate roller to deliver the article to the belt from its position upon the gate roller and the confining roller.

2. In a wrapping machine for wrapping cylindrical articles, in combination, a closed driven belt for receiving the article to be wrapped and

the wrapper therefor, means for driving said belt, means for supporting said belt including a pair of spaced horizontally arranged pocketing rollers between which the belt can sag to present an article receiving pocket, means for rotatably mounting one of said rollers with its axis in fixed position, means for mounting the other of said pocketing rollers to oscillate bodily in a plane transverse to the normal plane of travel of the belt to alternately pocket the article in the roller's raised position and release the article in the roller's lowered position, the rollers being so located and related that when the oscillatable roller is in lowered position the belt is extended between the rollers to present an article runway downwardly inclined in the normal direction of the travel of the belt, means for so oscillating said oscillatable roller, a pair of spaced rollers, the one a driven confining roller arranged above the upper span of the belt and the other a cooperating roller arranged below the upper span of said belt, means for driving said rollers in synchronism, such rollers being located in cross-alignment with the space between said pocketing rollers and spaced from each other to receive the article and said span of the belt in driving relation therebetween for cooperation in the wrapping of the article, and means for synchronizing the oscillation of the oscillating pocketing roller and the rotation of said confining roller and its cooperating roller to move said oscillating roller to its belt-extending position to thereupon present the belt as the downwardly inclined article runway, after completion of the wrapping.

3. In a wrapping machine for wrapping cylindrical articles, in combination, a closed driven belt for receiving the article to be wrapped and the wrapper therefor, means for driving said belt, means for supporting said belt including a pair of spaced horizontally arranged pocketing rollers between which the belt can sag to present an article receiving pocket, means for rotatably mounting one of said rollers with its axis in fixed position, means for mounting the other of said pocketing rollers to oscillate bodily in a plane transverse to the normal plane of travel of the belt to alternately pocket the article in the roller's raised position and release the article in the roller's lowered position, the rollers being so located and related that when the oscillatable roller is in lowered position the belt is extended between the rollers to present an article runway downwardly inclined in the normal direction of the travel of the belt, means for so oscillating said oscillatable roller, a pair of spaced rollers, the one a driven confining roller arranged above the upper span of the belt and the other a cooperating roller arranged below the upper span of said belt, means for driving said rollers in synchronism, such rollers being located in cross-alignment with the space between said pocketing rollers and spaced from each other to receive the article and said span of the belt in driving relation therebetween for cooperation in the wrapping of the article, a gate roller mounted above the upper span of said belt adjacent and axially parallel to said confining roller, means for mounting said gate roller to alternately move to cooperating position with said confining roller to cooperate therewith to support a fed article at the bight of said rollers and to move from such position to release such article to position upon said belt and operatively between said confining roller and its cooperating roller, means for so moving said gate roller, and means for synchronizing the oscillation of the oscillating pocketing roller and the movement of the gate roller and the rotation of said confining roller and its cooperating roller to initiate formation of the pocket in timed priority to the movement of the gate roller to deliver the article to the belt from its position upon the gate roller and the confining roller, and to afterward move said oscillating roller to its belt-extending position to thereupon present the belt as the downwardly inclined article runway, after completion of the wrapping.

4. A method of wrapping cylinders of gelatinous blasting explosives which comprises feeding to wrapping position a cylinder of plastic explosive, and subsequently a sheet of wrapping material into position with said cylinder for wrapping, rotating the cylinder and winding the material about it while confining both in a suspended flexible support and contacting them with a support-cooperating member opposite the support, maintaining the explosive in such relation and in a rotated and non-compressed condition until the completion of the wrapping, the maintaining of such relation being by means holding the flexible support about the article, and upon completion of the wrapping releasing the wrapped article in a forward direction by displacement of such means.

ALBERTUS HENDRIK HAUPT.