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APPARATUS PARTICULARLY ADAPTED FOR CHARGING ORIENTATED
ARTICLES OF RELATIVELY GREATER LENGTH THAN WIDTH

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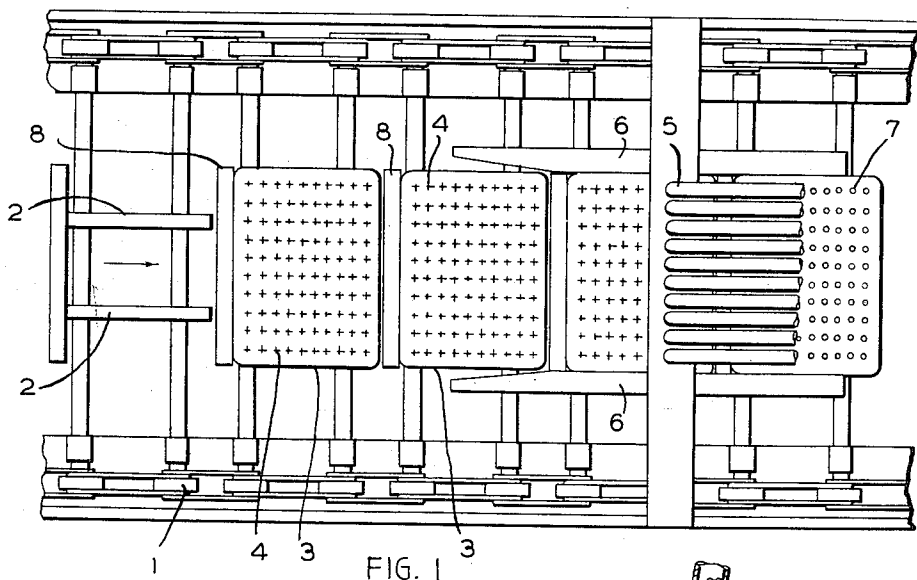


FIG. 1

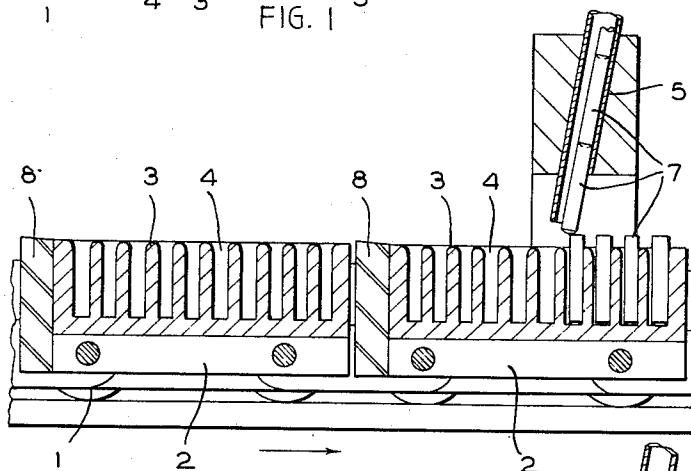


FIG. 2

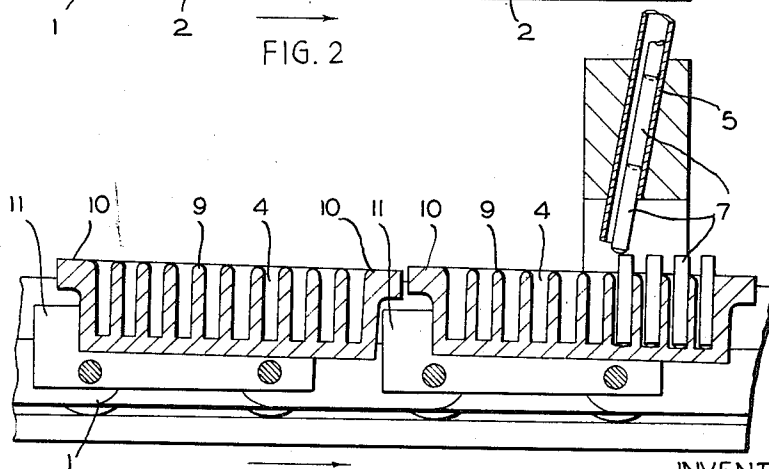


FIG. 3

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APPARATUS PARTICULARLY ADAPTED FOR CHARGING ORIENTATED ARTICLES OF RELATIVELY GREATER LENGTH THAN WIDTH

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3 Claims. (Cl. 226—14)

The present invention is concerned with apparatus particularly adapted for charging orientated articles of relatively greater length than width and of substantially straight longitudinal axis and having one end terminating in an edge and the other end at least substantially closed by a convex surface into a solid carrying-plate of the kind having sockets at least the entries of which are wider than the widest part of said articles.

Said articles can be in the form of tubes, cylindrical rods, and articles of other cross sectional form, as well as articles the cross section of which varies along their length.

The invention is particularly concerned with apparatus adapted for charging empty detonator tubes into a solid detonator carrying-plate of the kind having sockets at least the entries of which are wider than the diameter of the detonators.

The aforesaid solid carrying-plates may be constructed of one or more pieces as for instance a carrying-plate provided with a false base.

British Patent No. 622,527, and the corresponding U. S. Patent No. 2,615,363, describes and claims inter alia a machine for charging a detonator carrying-plate with empty detonator tubes comprising in combination means for holding a removable detonator carrying-plate in position, a slidable feed plate adapted to rest on the detonator carrying-plate held in said position and having holes which taper towards the bottom face thereof and correspond in position to those in the carrying-plate, a row of detonator tube guide-tubes positioned above the feed plate and adapted to be inclined at a variable angle to the vertical, e. g. 10° to the vertical, and means permitting the slidable feed plate and carrying-plate when their respective holes are out of alignment to move together below the row of guide-tubes, in which machine the slidable feed plate is adapted to slide laterally across the carrying-plate between two limits so that in one extreme position the holes of the plates coincide and in the other position they do not coincide and in which the row of guide-tubes when inclined at a suitable angle to the vertical is at such a distance from the slidable feed-plate as to permit the detonator tubes projecting from below them to slide over those that have fallen into the holes of the feed plate on to the top of the carrying-plate.

The object of the present invention is to provide an apparatus which permits a continuous succession of said solid carrying-plates to be mechanically and preferably automatically filled with said articles and particularly a continuous succession of said solid detonator carrying-plates to be mechanically and preferably automatically filled with empty detonator tubes.

According to the present invention apparatus particularly adapted for charging orientated articles of relatively greater length than width and of substantially straight longitudinal axis and having one end terminating in an edge and the other end at least substantially closed by

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a convex surface into a solid carrying-plate of the kind having sockets at least the entries of which are wider than the widest part of said articles comprises in combination at least one row of delivery pipes inclined at such an angle to the vertical and having their bottom ends at such a distance from the carrying-plate that they can deliver under gravity said articles, similarly orientated for any one pipe, into the sockets of said carry-plate when in the receiving position with respect to said delivery pipes while permitting slippage of an outgoing article over one which has already entered a socket of a carrying-plate, means for conveying a succession of empty carrying-plates so as to bring each of said carrying-plates in turn beneath said delivery pipes, and side guides exactly to locate each carrying-plate as it approaches said delivery pipes so that at least one approaching row of sockets of the carrying-plate as they pass below the delivery pipes can receive said articles from said delivery pipes, and the said succession of empty carrying-plates being so arranged that in the distance between the rear edge of the top surface of a carrying-plate just filled and the leading edge of the top surface of a carrying-plate to which articles are about to be delivered there is no free space greater than the transverse section at the end of said articles nearer to the carrying-plate.

The said free space which is not to be greater than the transverse section at the end of said articles can be diminished for example by the provision of a distance piece between adjacent carrying-plates.

A carrying-plate to be filled in the apparatus according to the invention has to have the centre lines of its rows of sockets in the direction of its motion through the apparatus spaced apart at least a distance equal to the greatest width of said articles.

The said articles are preferably similarly orientated in all the delivery pipes.

For a solid detonator carrying-plate preferably only the entries of the sockets are appreciably wider than the diameter of the detonators to be inserted in said sockets.

Preferably the said delivery pipes are adapted to be inclined at a variable angle to the vertical, for example from 5° to 20° to the vertical.

The said means for conveying a continuous succession of empty carrying-plates may be for example a chain conveyor having a succession of chairs shaped to support said carrying-plates; an endless belt having strips fixed across its width to push a continuous succession of carrying-plates; a system of interacting thrusters. The said chairs or belt are preferably so arranged that each carrying-plate is supported at a slight inclination to its direction of motion such that its leading edge will pass beneath the delivery pipes at a greater distance from them than its rear edge. This provision is a preferred way of ensuring that the bottom of the lowermost article in a delivery pipe which is resting on the receding surface of the carrying-plate which has just been filled will be at a distance above the level of the leading edge of the oncoming carrying-plate.

If desired the required number of delivery pipes can be separated into more than one set in such a way that the carrying-plates are filled in stages as they pass beneath the sets of delivery pipes. The delivery pipes of any one set have to be suitably placed so that a pair of side guides can bring a carrying-plate into position for filling the rows of sockets corresponding to the delivery pipes of the particular set. Each set of delivery pipes will require its own side guides.

Two embodiments of the invention particularly suitable for the filling of empty detonator tubes into a solid detonator carrying-plate are illustrated by way of example with reference to the diagrammatic drawing accompany-

ing the specification whereof Fig. 1 is a plan view of one embodiment of the invention and Fig. 2 is a sectional elevation of this embodiment showing a detonator carrying-plate being charged and Fig. 3 is a sectional elevation of another embodiment of the invention also showing a detonator carrying-plate being charged. The same reference numerals refer to like parts throughout.

Referring to Figs. 1 and 2, 1 is a chain conveyor, 2 are chairs with carrying surfaces parallel to the direction of movement, 3 are solid carrying-plates, 4 are sockets in the carrying-plates, 5 are delivery pipes, 6 are side guides for locating the carrying-plate 3 with respect to the pipes 5, 7 are detonator tubes and 8 are distance pieces located between adjacent carrying-plates 3 so that there is no space greater than the transverse section of the detonator tubes 7. The top surfaces of the distance pieces 8 have leading edges further from the mouths of the delivery pipes 5 than the top surfaces of the carrying-plates 3 and rear edges nearer to said mouths of said delivery pipes 5 than the top surfaces of the carrying-plates 3.

An empty detonator carrying-plate 3 on the chairs 2 of the chain conveyor 1 is laterally displaced into alignment with respect to the delivery pipes 5 as it enters the space between the side guides 6. The delivery pipes 5 are kept supplied with orientated detonator tubes 7 by a mechanism (not shown). The delivery pipes 5 are inclined at an angle of 10° to the vertical. As the carrying-plate 3 continues its motion between the side guides 6, the first row of sockets 4 is brought beneath the columns of detonator tubes 7 and the lowermost detonator tubes in these columns fall into these first sockets 4. The relative inclination of the detonator tube 7 which has just entered the socket 4 to the inclination of the detonator tube 7 above it, the latter being still partly within the delivery pipe 5, is such that the mouth of the detonator tube 7 in the socket 4 slides under the rounded bottom of the detonator tube 7 above without tending to catch on it. When the detonator tube 7 which has entered the socket 4 has passed beyond the detonator tube above, the latter has merely to fall into the next socket 4 as this socket passes beneath the delivery pipe 5. The falling of the detonator tubes 7 into the sockets 4 continues until the rearmost sockets 4 are filled when the next detonator tubes 7 delivered fall on to the distance piece 8, and are supported by it until the leading edge of the succeeding carrying-plate 3 comes below the delivery pipes 5.

Referring to Fig. 3, 9 are carrying-plates having extensions 10 to the leading and rear edges of the top surface so that when the plates 9 are positioned on chairs 11 there is no space between adjacent plates 9 greater than the transverse section of the detonator tubes 7. The chairs 11 have carrying surfaces inclined to the direction of movement so that the rearward extension 10 of a carrying-plate 9 is nearer to the mouths of the delivery pipes 5 than the leading extension 10 of the succeeding plate 9.

In contradistinction to the embodiment illustrated in Figs. 1 and 2 in accordance with the embodiment illustrated in Fig. 3 after the rearmost sockets 4 in a carrying-plate 9 have been filled, the next detonator tubes 7 delivered are supported first by the rearward extension 10 of the top surface of this plate and then by the

leading extension 10 of the top surface of the succeeding plate until the leading sockets 4 of this succeeding plate 9 are in position to receive them.

What I claim is:

1. Apparatus for charging oriented articles, of greater length than width and of substantially straight longitudinal axis having one end terminating in an edge and the other end at least substantially closed by a convex surface, into carrying-plates having at least one row of article-receiving sockets, at least the entries of which are wider than the widest part of the articles, the combination comprising: at least one upstanding delivery pipe adapted to be filled with a stack of the oriented articles; means for continuously conveying a succession of the plates so as to bring each of the latter in turn into receiving position beneath said pipe with the upper surface of the plates spaced below said pipe a distance less than the length of the articles and with no free space between the following edge of the top surface of each plate and the leading edge of the top surface of a following plate having a dimension in the direction of motion of the plates greater than the corresponding dimension of the lower end of the articles; guide means for aligning each plate with respect to said pipe as the former approaches the latter so that all the sockets in each plate will pass beneath said pipe, said pipe having an open lower end so that when the lowermost article in said pipe drops into a plate socket, the stack above said dropped article descends therewith and rests on the upper end thereof, and said pipe being inclined to permit slippage of a said dropped article from beneath the article next above in said pipe upon horizontal movement of the plate being filled, whereby the sockets in the row of each plate are successively filled as the plates are conveyed horizontally beneath said pipe and the lower end of the lowermost article in the pipe slides without hang-up across the space between adjacent filled and empty plates as a filled plate moves from beneath said pipe and is followed by an empty plate.

2. The structure defined in claim 1 wherein the distance between adjacent plates is greater than the said corresponding dimension of the articles and including a distance piece between adjacent plates diminishing the said space therebetween, the leading edge of the top surface of said piece being no higher than the following edge of the top surface of the leading plate and the following edge of the top surface of said piece no lower than the leading edge of the top surface of the following plate.

3. The structure defined in claim 1 wherein the distance between adjacent plates is less than the said corresponding dimension of the articles and the following edge of the top surface of each plate is higher than the leading edge of the top surface of the following plate to avoid hang-up of the lowermost article in the pipe on said leading edge.

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