Fig. 4.

Fig. 5.

Fig. 6.
This invention relates to packaging of objects, especially elongated metallic objects, and more particularly to a batch control and packaging apparatus for nails, bolts, and similar magnetically responsive metallic objects.

This is a continuation-in-part application of my co-pending application entitled Nail Packaging Dribbler, filed February 16, 1962, Serial No. 173,740, now abandoned.

Economical packaging of nails today necessitates automatic equipment. Magnetic nail packagers, like those disclosed for example in Patents 2,899,783 and 2,916,862, have achieved excellent results in aligning nails dumped into packaging boxes. The nails are automatically preweighed before dumping, and then are dropped as a weighed batch through a gravity chute and funnel into a package container such as a box. Magnetic alignment means adjacent the bottom of the chute orients the nails to obtain neat, uniform packages.

It has been found that with batches of one pound or below, alignment of the nails is substantially complete most of the time to obtain uniform packages. However, with batches substantially larger than this, e.g. five pounds, it has been found that the magnetic heads cannot always effectively align all of the nails in the entire batch as they move between the heads. Without proper alignment, the packages cannot be closed, and the packager becomes jammed.

One way to provide gradual feed of nails past the alignment heads is to distribute the preweighed batch along a feed mechanism such as a "Syntron" feeder or the like, which in turn feeds them gradually down a chute. However, this gradual method is too costly, both in time and equipment, for batches above one pound and below about twenty-five pounds.

Therefore, it is an object of the present invention to provide a novel control means for batches of objects, especially elongated objects, to regulate the fall in a semi-dispersed fashion. The control device faithfully disperses the batches of nails and the like and yet consumes a second or so per batch. It requires no expensive Syntron conveyor equipment. It requires only a relatively small amount of space. It is readily adjustable to accommodate different sized articles and different weight batches as needed.

It is another object of this invention to provide a packaging apparatus wherein a magnetic nail aligning means is combined with a control dribbler to regulate the passage of, and dependably orient the object packaged. The packaging apparatus is capable of accommodating different sized articles, different weight batches, and different types of articles since the dribbler is readily adjustable to control the article passage through the aligner. The combination operates rapidly and simply. It achieves complete alignment of all of the elongated articles in the package container.

These and other objects will be apparent from a study of the following specification in conjunction with the drawings, in which:

FIG. 1 is a perspective view of the packaging apparatus including the control dribbler and a magnetic alignment means;

FIG. 2 is a fragmentary, partially sectional side elevational view of the control dribbler;

FIG. 3 is a fragmentary, enlarged, partly sectional side elevational view of the control dribbler;

FIG. 4 is a fragmentary elevational partially cut-away view of a modified form of this invention;

FIG. 5 is a side elevational view of the modified apparatus in FIG. 4; and

FIG. 6 is a fragmentary plan view of the drive mechanism in the apparatus in FIGS. 4 and 5.

Basically, the invention comprises an article batch control device for objects, especially in combination with a magnetic aligner on a packaging machine. The control device includes means projecting into the path of a dropped batch of articles to intercept the articles. The portions of the intercepting means are capable of being withdrawn successively to dribble the articles into the magnetic aligner in a controlled manner, after which they are positioned in a package container in a nearly oriented condition. The control means preferably comprises a plurality of spaced, elongated, substantially parallel elements projecting into the chute. The ends of the elements preferably project in progressively varied amounts across the width of the chute. They can be adjustably mounted on the opposite ends in a mounting block. A wiper bar or element is preferably mounted in the chute adjacent the elongated element to wipe the articles from the retracting element at a position spaced from the chute wall. A guide flange preferably covers the space between the projecting ends of at least a portion of the elements and the opposite chute wall to prevent premature dropping of articles between the chute wall and the ends of the elongated elements. The elements preferably project upwardly into the chute at an acute angle above the horizonal.

Referring now to FIG. 1, in the form of the invention there illustrated, the packaging apparatus includes the control dribbler means, the magnetic alignment means and a package container conveyor means.

Nails, bolts or other elongated similar objects to be packaged are preweighed in a weighing bin. This bin is preset to dump a batch of nails through a door when the weight of the nails deposited is in a time and a conveyance device receives a preset weight. Positioned beneath the weighing bin and mounted to platform is a chute 32. It may be formed of one or more chute portions and preferably includes a lower telescoping chute section which telescopes into the container 36 and directs the nails into the packaging container while the latter are intermitently moved on a suitable conveyance means.

Adjacent the bottom of the chute is a magnetic alignment means composed of two opposite electromagnet heads 40 actuated by electrical coils 42. Details of the typical electromagnets and control circuits therefore may be obtained from the patents mentioned above.

The batch of nails dumped from weighing bin 20 into chute 32 in the novel structure is intercepted by projecting means 59 of the control dribbler. Projecting means 58 is preferably composed of a plurality of elongated, rodlike elements which can be withdrawn successively from the bin to dribble the batch of nails through the chute 32. These rod elements are preferably mounted in sockets of a common external mounting block in a slidably adjustable manner. Suitable set screws may be used to retain them in the desired position. In the desired position they project through the back wall 64 of the chute 32 and extend varying amounts across the width of the chute, so that the ends thereof form a diagonal with respect to the opposite wall.

Mounting block 60 includes a braced upstanding leg 70 secured to rod 72 of fluid cylinder 74. Cylinder 74 is mounted upon bracket which is attached to and depending from platform 30. Fluid cylinder 74 is capable of extending intercepting means 50 into the chute in the
path of articles dropped therethrough, or of retracting them out of the chute. A wiper block or bar 80 is mounted within the chute 32 adjacent the bars 50 to wipe articles therefrom while the articles are still spaced from chute wall 64 as the bars are retracted through the chute wall. The outer ends of the rods are preferably slightly tapered to readily pass through the chute without jamming. The projecting rods are preferably at a slight angle above the horizontal plane, since this has been found to achieve a better retention means for the intercepted articles, thus preventing them from prematurely dribbling off the ends of the intercepting rods 50. There is also included a downwardly directed diagonal flange 82 which depends from the opposite chute wall and projects over the ends of at least a portion of the rods to prevent nails or bolts from prematurely falling past the ends of the rods. The mounting block 60 rides on tracks 61 when reciprocated.

Operation

To package nails (or bolts, etc.) with the novel apparatus of this invention, they are fed by feeder 24 into weighing bucket 20. As soon as the bucket is filled with a predetermined weight of nails or bolts, trap door 22 opens to drop the preweighed batch onto interceptor rods 50. Fluid power motor 74 is then actuated as by operation of a suitable control valve 75, either manually or automatically, to retract the rods out of the chute path. Since the rods extend varying amounts into the chute some rods are drawn past the wiper before others. This causes nails to first be wiped off the shorter rods, and to gradually and progressively be wiped off the longer rods until all of the nails are dropped. It has been found that approximately one or two seconds duration during the withdrawal is adequate to separate the ordinary batch of about five pounds sufficiently to enable the aligning magnets to orient the nails completely. This time interval can be varied with the size of the nails or bolts and the size of the batch. The time of withdrawal can be controlled by adjusting the exhaust of the cylinder 74 in a conventional manner. After the interceptor means has been completely retracted out of the chute and all of the nails have fallen, the fluid motor 74 is reversed to shift interceptors back across the chute. Meanwhile, the fallen nails in the chute are funneled through chute portion 34 between magnetic alignment heads 40. Since the nails fall or dribble into the alignment means over a period of time (i.e. 1–2 seconds), the magnetic alignment heads have sufficient time to orient all of the nails. This is because the nails are sufficiently separated to enable complete alignment. The orientation which is held suspended between the magnetic heads are within the confines of the container due to the fact that the chute 34 is telescoped into the container. This container has been held stationary while the batch is discharged therein. Thereafter, the container and chute are telescopically separated and conveyor 16 moves the next box under the chute. Another batch of nails is then placed into weighing bucket 20 for the next batch to be packaged.

It is be understood that although elongated elements such as the bars shown are the preferred form of the invention, equivalent means might be used. Also, although it is preferred to have intercepting means which project in varying amounts across the width of the chute, within the broad aspects of this invention the bars could all be of the same length and have separate actuator means to retract them one by one successively across the breadth of the chute. A dribbling effect would be achieved thereby.

Modification

In FIGS. 4 through 6 is shown a second form of the inventive regulator, illustrated in fragmentary form. The apparatus shown takes the place of elements 74, 75, 61, and 50 in the first form of the invention. The mechanism cooperates with the chute to magnetic alignment heads in a manner somewhat similar to the combination in FIG.
jects is therefore dispersed from the "lump" into a stream.

It will be realized that the most economical method of handling nails, and weighing each container of nails to be packaged is to weigh them in batches on a high speed, mass production basis. Each intertangled batch is then dumped in toto into the chute leading to the magnetic alignment heads. The magnetic alignment heads actually arrest the movement of the nails as they pass through the chute, causing them to be suspended in mid-air in the chute by the magnetic field due to its great potential. Only when this magnetic field is released are the nails allowed to move forward along said chute.

When the magnetic alignment heads arrest the movement of the nails, the nails should be aligned directly across the chute to be parallel with each other. However, ordinarily when the entire batch is dropped in toto, the nails remain intertangled when arrested by the magnetic field, rather than being in optimum alignment. If they are not accurately aligned, they will not fit neatly within the box and the box cannot be closed. This disrupts the entire automatic weighing and packaging mechanism.

With the two types of novel regulators shown however, it is not necessary to extend or elongate articles and operation that the dribbled delay of falling nails in a batch, even though the spread is only a matter of seconds, causes a sufficient spread of the nails as they fall into the magnetic field to allow each nail to rapidly swivel about and align itself with the magnetic field without remaining tangled. The second form of the invention illustrated in FIGS. 4, 5 and 6 is particularly advantageous since it does not require reciprocating action of the mechanism. Rather, it has a continuously rotating action achieving interception due to projection of the fingers across the chute, and each batch of nails with their fraction of the fingers from the chute passage. Since adjacent fingers are angularly displaced this creates a variation of amount of projection of fingers across the chute passage.

A batch of nails dropped into housing 104 hits surface 104' and slides down against the fingers. As the hub assembly is rotated, the first set of fingers, for example the outer fingers 182', move past the lower edge of surface 104'. Part of the nails are allowed to break away and fall. Then as the second set of fingers moves past, another part is allowed to break away and drop through the gaps. Since the fingers rotate rapidly, this entire action occurs in a matter of seconds or fractions of a second, but it is still sequential to cause sufficient spreading of the nails in their fall to allow each nail to rotate lengthwise. Since the nails in the batch tend to be intertangled as they rest on surface 104' for a fraction of a second, movement of each pair of fingers out of the chute passage causes a gradual break away of some nails, then others, then more and more, so that the entire batch is strung out in its fall through the chute. This enables the magnetic field at the lower end of the chute to rotate each nail into alignment with the magnetic field.

Vains within the spirit of the invention may occur to those skilled in the art upon studying the foregoing specification. Thus, the invention is not to be limited to the illustrative form depicted and described, but only by the scope of the appended claims and the reasonably equivalent structures and methods to those defined therein.

I claim:

1. A control device for batches of elongated articles dropped into a chute comprising: means forming a chute passage; interceptor means projecting into said passage at a position along its length, including a plurality of different portions simultaneously extending varying amounts across the width of said passage, while being adjacent each other across the breadth of said passage to cooperatively intercept a batch of elongated articles, and said interceptor means being shiftable to retract said portions of said projecting means from said passage in progressive stages to disperse the batch as the articles are allowed to pass said interceptor means.

2. A control device for elongated articles falling through a chute, comprising: means forming a chute passage; a plurality of spaced adjacent interceptor fingers arranged side by side across the breadth of said passage to cooperatively retain thereon a batch of articles falling in said passage by projecting in said passage in the path of articles passed therethrough; and shifting means operatively connected to said interceptor fingers to successively shift said fingers out of said path to cause the batch of articles to be progressively spilled off said fingers and dispersed in further fall through said passage.

3. Packaging apparatus for batches of elongated, magnetically responsive articles comprising: chute means forming a path for directing batches of articles into a package; magnetic alignment means adjacent the bottom of said chute to orient said elongated articles falling into said package; control means in said chute above said alignment means; said control means including interceptor means having fingers projecting in varying amounts across said path, and including actuating means operatively associated with said fingers to progressively move said fingers out of said path to disperse articles through said chute.

4. A control device for articles comprising: chute means; a plurality of spaced, generally parallel rods in said chute in the path of articles to be passed therethrough; said rods extending variable distances across said chute; one end of each of said rods being out of said path and said one end being operatively joined together; and retraction motor means operatively associated with said one end to retract said variable extending rods so that said rods are successively withdrawn from said chute to disperse said batch of articles.

5. A control device for batches of elongated articles falling through a chute, comprising: a chute; tapered interceptor means projecting into said chute in the path of articles to be passed therethrough; and retraction motor means operatively connected to said interceptor means to withdraw said interceptor means from said chute path in progressive stages causing articles to fall off said tapered means through said chute to disperse the batch.

6. Packaging apparatus for elongated, magnetically responsive articles dropped therein in batches comprising: chute means for directing said articles into a package; magnetic alignment means adjacent the bottom of said chute to orient said articles falling into said package; and control means above said alignment means; said control means including a plurality of spaced rods projecting generally horizontally and in varying amounts into the path of articles passing through said chute, and including retraction means for said plurality of rods; said retraction means and spaced rods causing to withdraw said rods successively out of said path to dribble articles through said alignment means into said package.

7. The apparatus in claim 6 wherein said rods project progressively varied amounts into said path across the breadth of said chute, and project upwardly into the chute at a small acute angle from the horizontal.

8. The apparatus in claim 6 wherein a guide flange extends diagonally downwardly and across a small portion of said chute to cover the ends of at least a portion of said projecting rods.

9. A control device for regulating the fall of elongated articles comprising: a chute, including portions forming a passage for falling articles; rotational hub means in said chute; a plurality of radially extending, article restraining fingers carried by said hub and rotatable therewith; said fingers projectable into said article path, and being angularly displaced from each other to project varying
amounts into said path during rotation; and drive means operably connected to said hub means to cause progressive dropping of articles through said chute.

10. A control device for regulating the full of elongated articles comprising: a chute, having an upper portion formed on a downward, sideward slant with a bottom slide surface for elongated articles; rotational hub means mounted in said chute; a plurality of article restraining fingers extending radially from said hub means, and being angularly displaced from each other; said fingers being rotatable with said hub means and in one position projecting closely toward said bottom slide surface to restrain the passage of elongated articles thereon; and motor means operably associated with said hub means to rotate said fingers toward and past said slide surface to regulate the passage of articles into a dispersed form.

11. A flow regulating device for elongated objects comprising: a downwardly slant support surface over which the articles can slide; a revolving rake having projecting elements revolvable therewith and extending near said support surface at one position of the revolution of said elements; drive means operably connected to said revolving rake and arranged to move said elements upwardly along said surface; and said elements being in staggered relationship to intermittently pass articles during revolution.