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2,795,340

MAGNETIC STACKING MECHANISM

Filed Dec. 28, 1954

2 Sheets-Sheet 1

FIG. 1

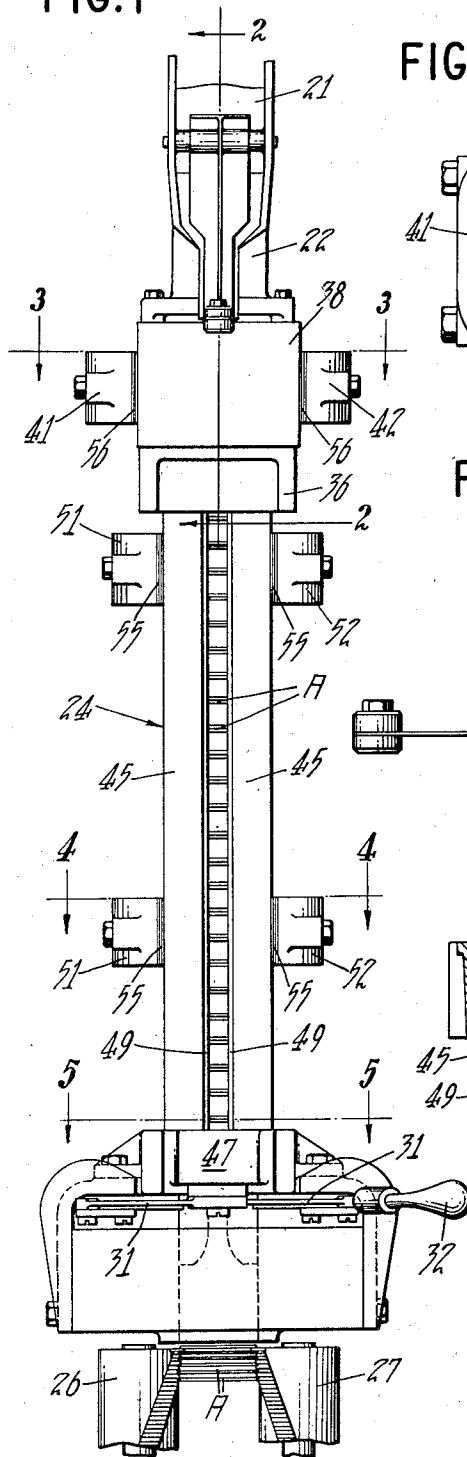


FIG. 3

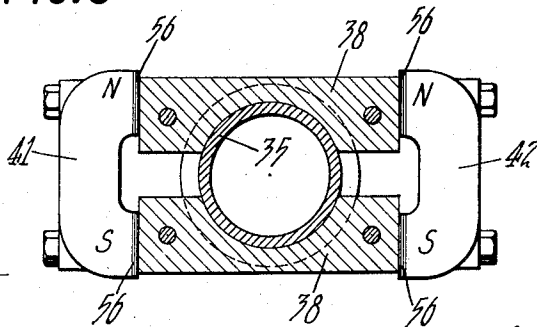
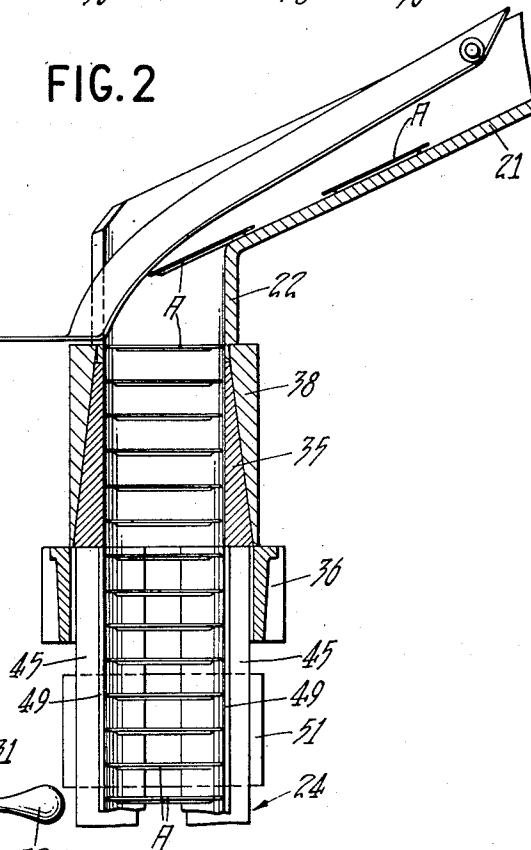


FIG. 2



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FIG. 5

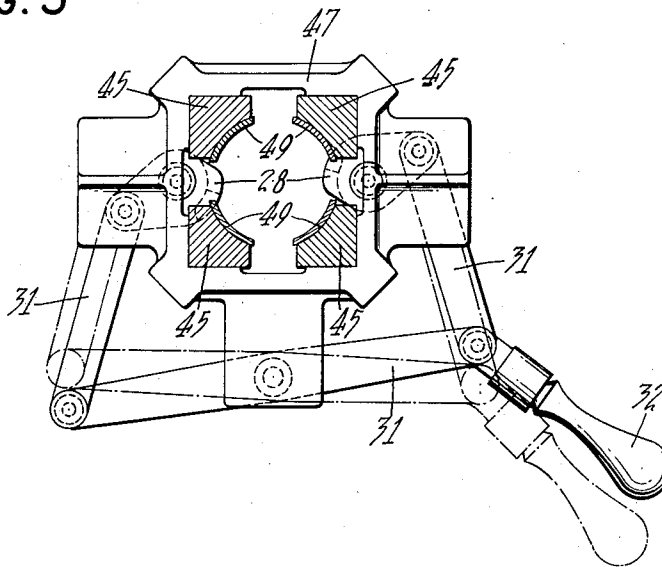
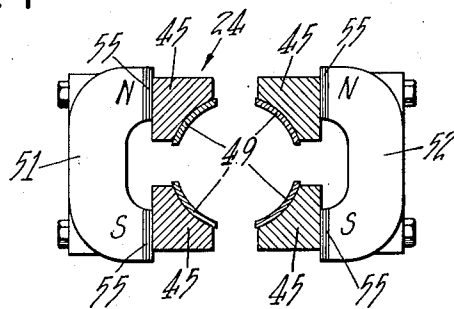


FIG. 4



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2,795,340

MAGNETIC STACKING MECHANISM

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5 Claims. (Cl. 214—6)

The present invention relates to a stacking mechanism for stacking metal articles, such as can or container end closures and has particular reference to magnetic devices for guiding the articles through comparatively long distances of travel and for collecting them in an orderly arrangement. This is an improvement over the mechanism disclosed in United States Patent 2,640,605 issued June 2, 1953 to R. T. Chatterton on a similar mechanism.

In can or container manufacturing practice the end closures after they are gasket or compound lined are usually stacked to facilitate feeding to the machine which attaches them to the can bodies. The cans are shipped to customers with the bottom closures attached and with the top end open. The top end closures are shipped separately in packages of a counted number of stacked closures. The closures making up these stacks usually are received directly from the upper end of relatively tall machines which dry the lining material in the closures and which discharge the closures into a chute from which they fall into position to form a stack. The distance the closures fall is sometimes of considerable magnitude. The instant invention provides for controlling the fall of these closures to insure proper stacking.

An object of the invention is the provision in a stacking mechanism for flat articles of devices for maintaining the articles in a predetermined position, preferably a horizontal position, as they fall through comparatively long distances to insure proper stacking of the articles at the termination of their fall.

Another object is the provision of such devices wherein the control of the falling articles is effected magnetically by substantially continuous magnetic fields which extend for the full length of the drop of the articles to maintain the articles in guided suspension while retarding their fall to an extent which results in a gentle settling of the articles into place in the stack.

Another object is the provision of such devices wherein the magnetic effect on the falling articles may be adjusted to the weight or dimensions of the articles being stacked to insure full control over the falling articles so that they will properly settle into position in the stack.

Numerous other objects and advantages of the invention will be apparent as it is better understood from the following description, which, taken in connection with the accompanying drawings, discloses a preferred embodiment thereof.

Referring to the drawings:

Figure 1 is an elevational view of a stacking mechanism embodying the instant invention, with parts broken away;

Fig. 2 is an enlarged sectional view of the upper portion of the mechanism as taken substantially along the line 2—2 in Fig. 1;

Fig. 3 is an enlarged sectional view taken substantially along the line 3—3 in Fig. 1; and

Figs. 4 and 5 are enlarged sectional views taken substantially along the respective lines 4—4, 5—5 in Fig. 1.

As a preferred or exemplary embodiment of the instant

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invention the drawings illustrate a mechanism of the character disclosed in the above mentioned Chatterton Patent 2,640,605 for arranging circular flat, metal can ends or closures A (Fig. 2) in a vertical stack for shipment or for feeding into a subsequent operation machine. The can ends A are received from any suitable source of supply in a substantially continuous procession by way of an inclined chute 21 (Figs. 1 and 2). The lower terminal end of the chute 21 is formed with a vertically disposed cylinder 22 having open top and bottom ends through which the can ends A pass in a substantially horizontal position for arrangement in stacked relation. This cylinder 22 connects with a vertically disposed elongated hopper generally indicated by the numeral 24. The hopper 24 is of considerable length depending upon the height of the chute 21 from the lower end of the hopper and is the receptacle in which the can ends A are accumulated in stacked relation at the bottom portion thereof.

A suitable feeding mechanism is disposed at the bottom of the elongated hopper 24 to discharge the stacked can ends therefrom. The type of discharge mechanism used is dependent upon requirements. Where the stacked ends A are to feed directly into a subsequent operation machine, a discharge device of the character shown in the above mentioned Chatterton Patent 2,640,605 may be used. Where the can ends are to be counted and segregated into stacks a conventional counting device may be used such as a pair of vertically disposed continuously rotating counting screws 26, 27 shown in Fig. 1 of the drawings. Where the stacked can ends are to be removed manually by lowering them from the bottom end of the hopper, a conventional cut off device comprising a pair of pivotally mounted cut off blades 28 (Fig. 5) located on opposite sides of the hopper and movable into and out of the hopper by connecting links 31 and a handle 32 as shown also in Fig. 1, may be used to cut off a portion of the stack for removal while supporting the remaining portion in the hopper.

In the stacking of the can ends they are magnetically controlled so as to insure proper guiding through the hopper 24 and positioning on top of the stack formed at the bottom end of the hopper. For this purpose the bottom end of the chute cylinder 22 rests on and is in vertical alignment with a nonmagnetic vertical guide sleeve 35 (Figs. 2 and 3) which constitutes the upper portion of the hopper 24. The lower end of the sleeve 35 is secured to a nonmagnetic square support ring or collar bracket 36.

The inner face of the guide sleeve 35 preferably is cylindrical and of a diameter slightly greater than the outside diameter of the can ends A to facilitate passage of the can ends therethrough. The outer face of the sleeve 35 preferably is tapered outwardly and downwardly from its upper end so that the sleeve is thicker at its lower end than at its upper end. This is to accommodate a pair of complementary tapered magnet pole members 38 which surround the sleeve 35 and extend the full height of the sleeve. The pole members 38 preferably are of rectangular bar configuration having a cut away cylindrical section with faces tapered outwardly and downwardly from their upper edges to coincide with the tapered faces of the sleeve. These pole members 38 are secured to the collar bracket 36. The adjacent ends of the members 38 are connected by a pair of permanent horseshoe magnets 41, 42. The north (N) and south (S) poles of the magnets 41, 42 are arranged as shown in Fig. 3.

This arrangement of the magnet poles sets up a pair of cooperating magnetic fields across the upper portion of the hopper 24 and the can ends moving therethrough, the lines of force of one magnetic field combining with the

lines of force of the other magnetic field and both fields continuously linking with the moving articles to set up an extended widely distributed pattern of supporting flux. Since the inner faces of the pole members 38 are tapered downwardly and outwardly a gradually increasing distance is provided for the lines of magnetic flux of magnetic force passing between the pole members of opposite polarity as viewed from top to bottom, and in effect this provides a plurality of layers or strata of magnetic lines of force, each layer having a different flux density. Since the shorter radial distance between the pole member faces for the conduction of the magnetic flux is at the top edges of the pole members, the greatest intensity of the field is at the top edges of the members surrounding the upper portion of the hopper 24 where the can ends enter.

When a can end A is delivered into the chute 21, it slides down the chute into the cylinder 22 and drops into the magnetic fields in the upper portion of the hopper 24. As the first can end enters these magnetic fields, the magnetic lines of force extending across the hopper act on the falling can end and bring it into a horizontal, balanced position and hold it suspended temporarily at the top edges of the magnet pole members 38 where the intensity of the fields is at its maximum.

A subsequently fed can end A as it slides down the chute 21, falls on top of the suspended can end, the suspended can end acting as a guide for the proper horizontal delivery of the subsequent can end. In this manner as each can end from the chute 21 falls into place on top of the others held in suspension in the upper portion of the hopper 24, the other can ends immediately below settle down in the hopper in substantial parallelism with the top can end. The magnets 41, 42 preferably are of sufficient strength to maintain only a predetermined number of can ends A in suspension in the upper portion of the hopper 24, substantially as shown in Fig. 2.

Under normal operation of the mechanism one can end A will drop from the bottom of the magnetic fields distributed by the tapered pole members 38, each time an entering can end is delivered from the chute 21 into the top fields at their point of maximum intensity.

As each can end A drops from the sleeve 35 at the upper portion of the hopper 24 it enters and falls through a long descending vertical path of travel to the bottom of the hopper where the falling can ends accumulate one on top of the other in stacked formation for disposal in any of the ways hereinbefore mentioned. During this fall, the can ends A are guided and magnetically controlled to maintain them in their original horizontal position and to break the fall so that their travel is relatively gradual and gentle to insure proper stacking at the termination of their fall.

This control of the can ends A as they fall through the lower portion of the hopper 24 preferably is effected by a plurality of vertically disposed magnetic guide rails 45 (Figs. 1, 4 and 5) which surround the path of travel of the can ends and which extend from the bottom edge of the sleeve 35 in the upper portion of the hopper 24 to the lower terminal end of the hopper. There preferably are four of these guide rails 45. At their upper ends, the rails 45 are secured in the nonmagnetic collar bracket 36. At their lower ends, they are secured in a similar nonmagnetic collar bracket 47 (Figs. 1 and 5) to which the discharge devices hereinbefore mentioned are attached.

The guide rails 45 preferably are square or rectangular in cross-section and each has a curved inner corner which carries a nonmagnet guide segment 49 (Figs. 4 and 5). These segments 49 extend the full length of the guide rails 45 and taken collectively provide a broken or interrupted guide sleeve of a diameter slightly greater than the outside diameter of the can ends A to facilitate passage of the can ends through the hopper while still serving as guides for the can ends.

At intervals along their lengths, two adjacent magnetic

guide rails 45 are connected together by permanent horseshoe control magnets 51. The drawing shows two such magnets 51 connected to these guide rails 45 although any number of magnets may be so used depending upon the length of the rails. In a similar manner the opposite pair of adjacent guide rails 45 are connected together by permanent horseshoe control magnets 52 which may or may not be located opposite the magnets 51. The magnetic guide rails 45 thus connected to the magnets 51, 52 serve as pole pieces for the magnets.

The control magnets 51, 52 set up within the lower portion of the hopper 24, i. e. the portion below the lower edge of the sleeve 35, pairs of magnet fields, each magnet having a field of its own and the fields of all the magnets combining and linking continuously with the can ends falling through the hopper to set up an extended widely distributed pattern of supporting flux which maintains the falling can ends A in a horizontal and substantially parallel position. The fields preferably are of lesser intensity than the fields in the upper portion of the hopper 24, i. e. adjacent the tapered poles 38, so as to retard the falling of the can ends instead of holding them in suspension and thus controlling the falling action to permit a gradual and gentle descent of the can ends. Since these magnetic fields are distributed by the guide rails 45, the supporting flux density of the fields is substantially uniform throughout the full length of the lower portion of the hopper and this results in a uniform control of the descent of the can ends.

In order to control the flux density of the magnetic fields, nonmagnet shims 55 are interposed between the magnets 51, 52 and the guide rails 45. Similar shims 56 are interposed between the magnets 41, 42 and their pole members 38 for the same purpose.

Thus with separate magnetic fields in the upper portion and the lower portion of the hopper 24, full control of entering can ends A is had in the upper portion of the hopper to properly position the can ends and control their entry into the hopper and subsequently through the control magnets 51, 52, to control the fall of the can ends through long distances to deliver the can ends in proper horizontal position for stacking one on top of the other.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description, and it will be apparent that various changes may be made in the form, construction and arrangement of the parts without departing from the spirit and scope of the invention or sacrificing all of its material advantages, the form hereinbefore described being merely a preferred embodiment thereof.

I claim:

1. In a mechanism for stacking magnetizable articles such as can ends or the like, the combination of an elongated hopper for receiving a plurality of the articles at the top portion thereof and for accumulating them in stacked position at the bottom portion thereof, means for feeding said articles into said hopper, at least a pair of magnets disposed adjacent said hopper at the top portion thereof, each magnet having a field of its own and the fields of all the magnets continuously linking with the moving articles entering said hopper thereby widely distributing the lines of force of said fields in said articles for balancing and maintaining in substantial parallelism articles entering said hopper, and a plurality of sets of control magnets disposed adjacent the intermediate portion of said hopper below said top portion, said control magnets extending continuously throughout said intermediate hopper portion and setting up therewithin uniform magnetic fields continuously linking with the articles moving through said hopper for balancing and maintaining the continuously moving articles in substantial parallelism and for controlling their uninterrupted and retarded travel through said hopper into proper position in stacked relation at the bottom of said hopper.

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2. In a mechanism for stacking magnetizable articles such as can ends or the like, the combination of an elongated hopper comprising an upper portion and a lower portion for receiving a plurality of the articles at the top of the upper portion thereof and for accumulating them in stacked position at the bottom of the lower portion thereof, means for feeding said articles into said hopper, at least a pair of magnets disposed adjacent the upper portion of said hopper, each magnet having a field of its own and the fields of all the magnets continuously linking with the moving articles entering the upper portion of said hopper thereby widely distributing the lines of force of said fields in said articles for balancing and maintaining in substantial parallelism articles entering said hopper, a plurality of vertically disposed radially spaced and parallel magnetizable pole pieces extending continuously throughout the intermediate and lower portions of said hopper, and a plurality of control magnets disposed adjacent and communicating magnetically with said pole pieces and located intermediate the top and bottom ends thereof, said control magnets through said pole pieces setting up within the intermediate and lower portions of said hopper uniform magnetic fields continuously linking with the articles moving through the intermediate and lower portions of said hopper for balancing and maintaining the continuously moving articles in substantial parallelism and for controlling their uninterrupted and retarded travel through the lower portion of said hopper into proper position in stacked relation at the bottom of said hopper.

3. In a mechanism for stacking magnetizable articles such as can ends or the like, the combination of an elongated hopper comprising an upper portion and subjacent intermediate and lower portions for receiving a plurality of the articles at the top of the upper portion thereof and for accumulating them in stacked position at the bottom of the lower portion thereof, means for feeding said articles into said hopper at least a pair of magnets disposed adjacent the upper portion of said hopper, each magnet having a field of its own and the fields of all the magnets continuously linking with the moving articles entering the upper portion of said hopper thereby widely distributing the lines of force of said fields in said articles for balancing and maintaining in substantial parallelism articles entering said hopper upper portion, a plurality of vertically disposed radially spaced and parallel magnetizable pole pieces extending continuously through the intermediate and lower portions of said hopper, said pole pieces having continuous nonmagnetic guide members attached thereto for guiding said articles through said hopper, and a plurality of control magnets disposed adjacent and communicating magnetically with

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said pole pieces and located intermediate the top and bottom ends thereof, said control magnets through said pole pieces setting up within the intermediate and lower portions of said hopper uniform magnetic fields continuously linking with the articles moving through intermediate and lower hopper portions for balancing and maintaining the continuously moving articles in substantial parallelism and for controlling their uninterrupted and retarded travel through the intermediate and lower hopper portions into proper position in stacked relation at the bottom of the hopper.

4. In a mechanism for stacking magnetizable articles such as can ends or the like, the combination of an elongated hopper comprising an upper portion and a lower portion for receiving a plurality of the articles at the top of the upper portion thereof and for accumulating them in stacked position at the bottom of the lower portion thereof, means for feeding said articles into said hopper, at least a pair of magnets disposed adjacent the upper portion of said hopper, each of said magnets having a field of its own and having faces adjacent said hopper tapering outwardly and downwardly from their upper edges, said tapered faces providing at their upper edges the maximum flux density of said fields for temporarily holding an article in suspension as a guide and temporary support for the next incoming article entering between said magnets and for suspending in spaced relation other articles adjacent said faces for gradual lowering thereof into said hopper as incoming articles enter between said magnets at their upper edges, and a plurality of control magnets disposed adjacent and extending continuously throughout the lower portion of said hopper, said control magnets having parallel faces disposed adjacent said hopper and setting up within said hopper uniform magnetic fields continuously linking with the articles moving gradually through said hopper for balancing and maintaining the continuously moving articles in substantial parallelism and for controlling their gradual and uninterrupted retarded travel through the lower portion of said hopper into proper position in stacked relation at the bottom of said hopper.

5. In a mechanism of the character disclosed in claim 2 wherein nonmagnetic shims are interposed between said magnets and said pole pieces to vary the controlled flux density of said fields.

References Cited in the file of this patent

UNITED STATES PATENTS

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2,640,605	Chatterton	June 2, 1953