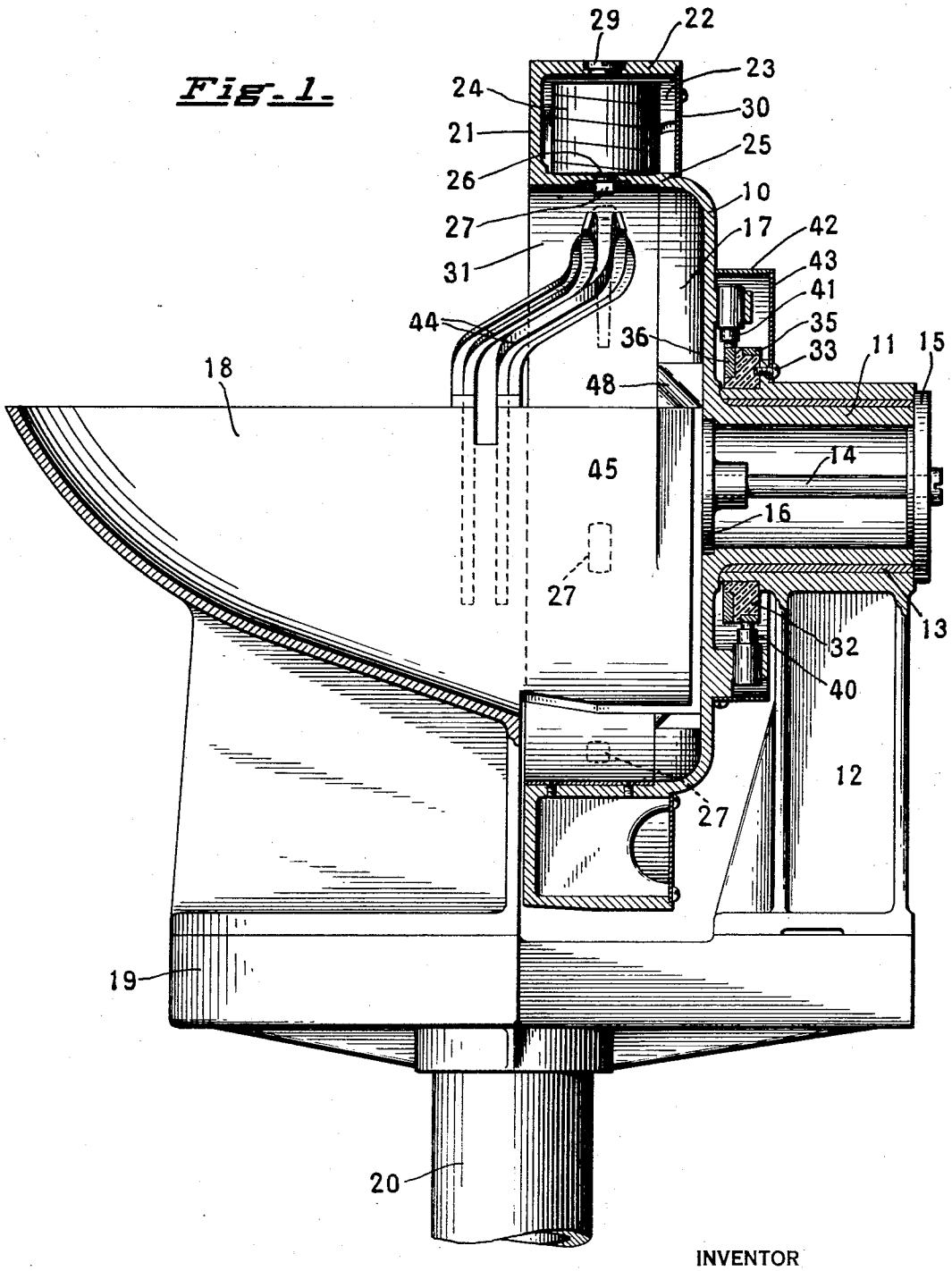
March 27, 1934. H. H. RAYMOND 1,952,777

MAGNETIC HANDLING

Filed March 23, 1931 4 Sheets-Sheet 1

Fig. 1.



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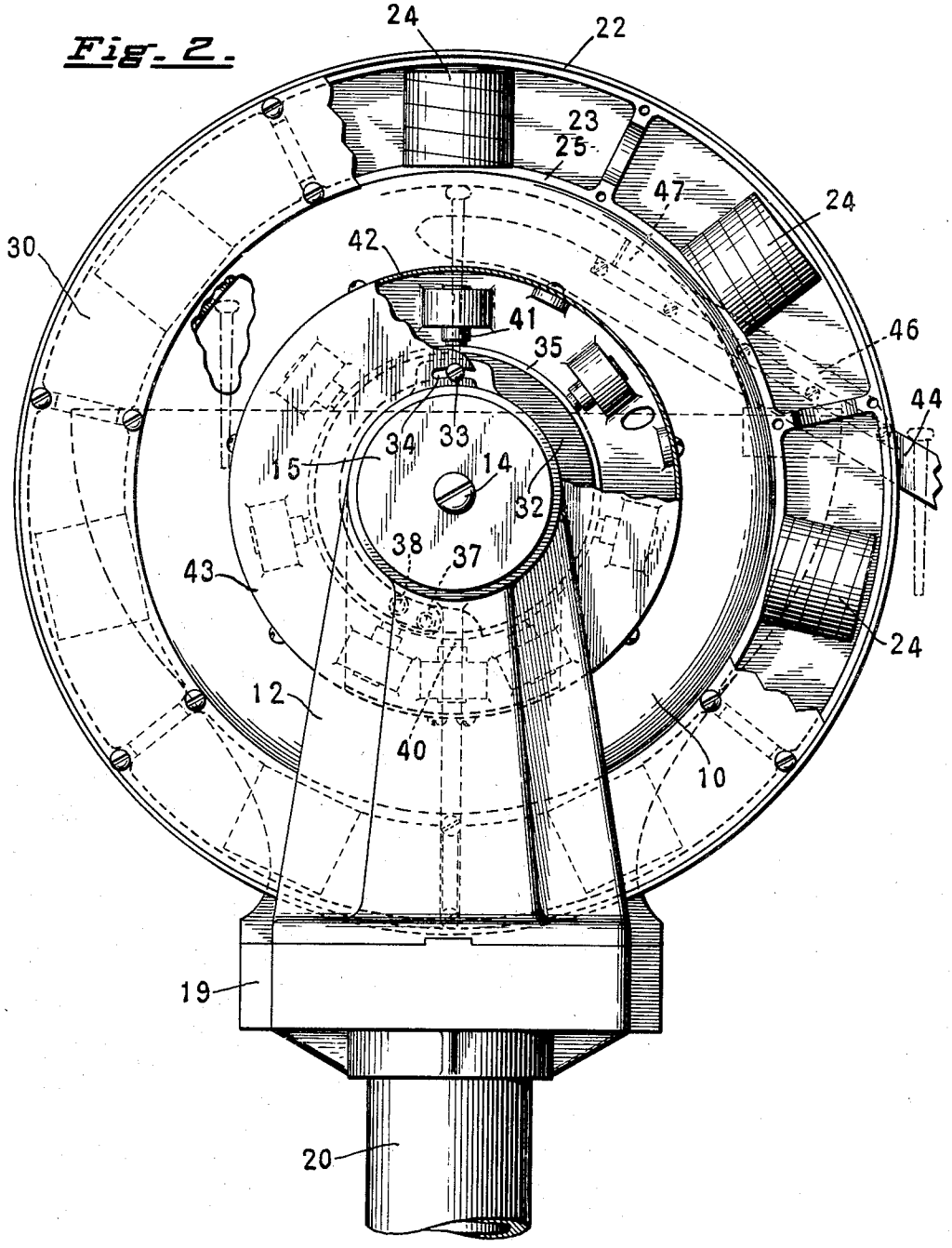
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MAGNETIC HANDLING

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Fig. 2.



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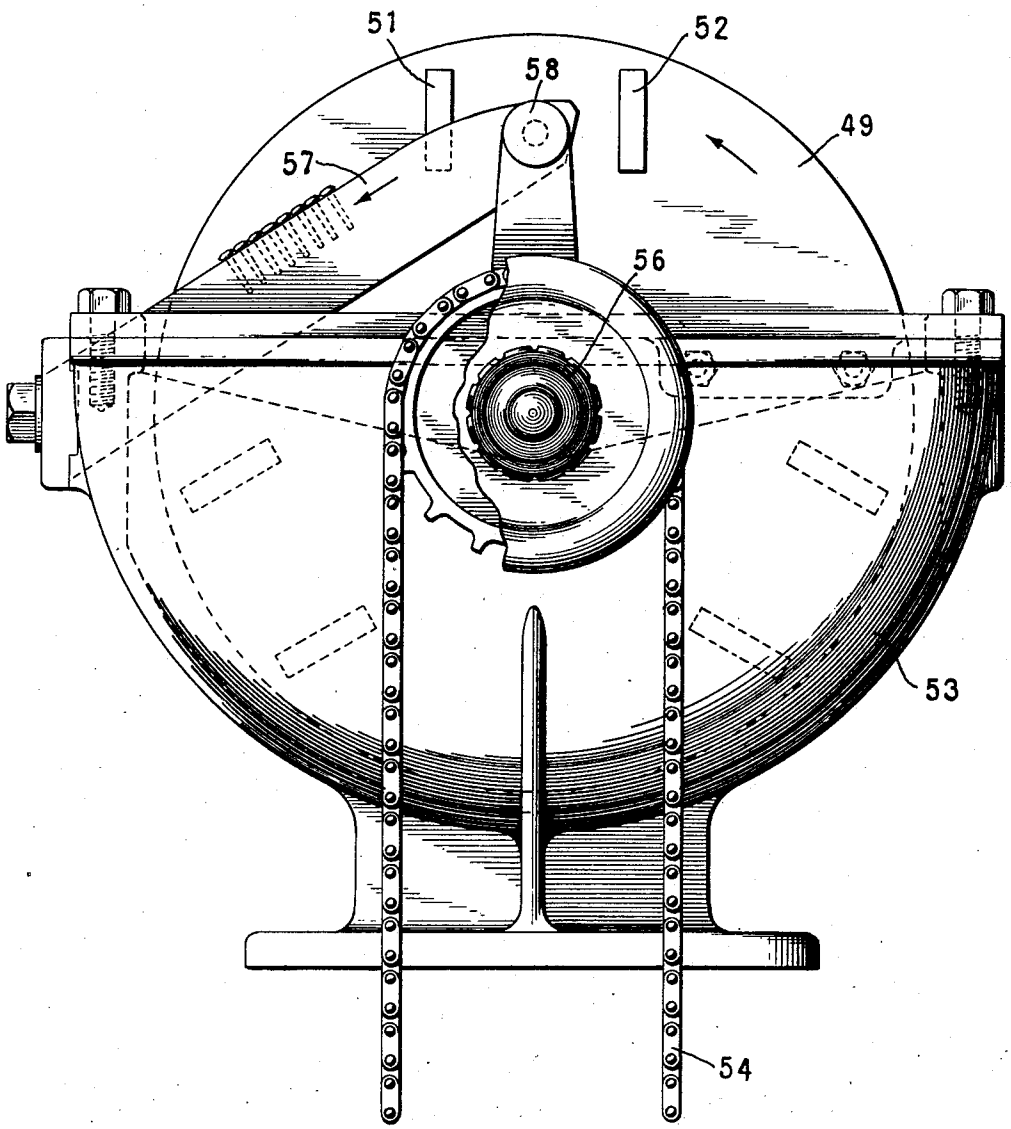
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MAGNETIC HANDLING

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Fig. 3.



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MAGNETIC HANDLING

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Fig. 4.

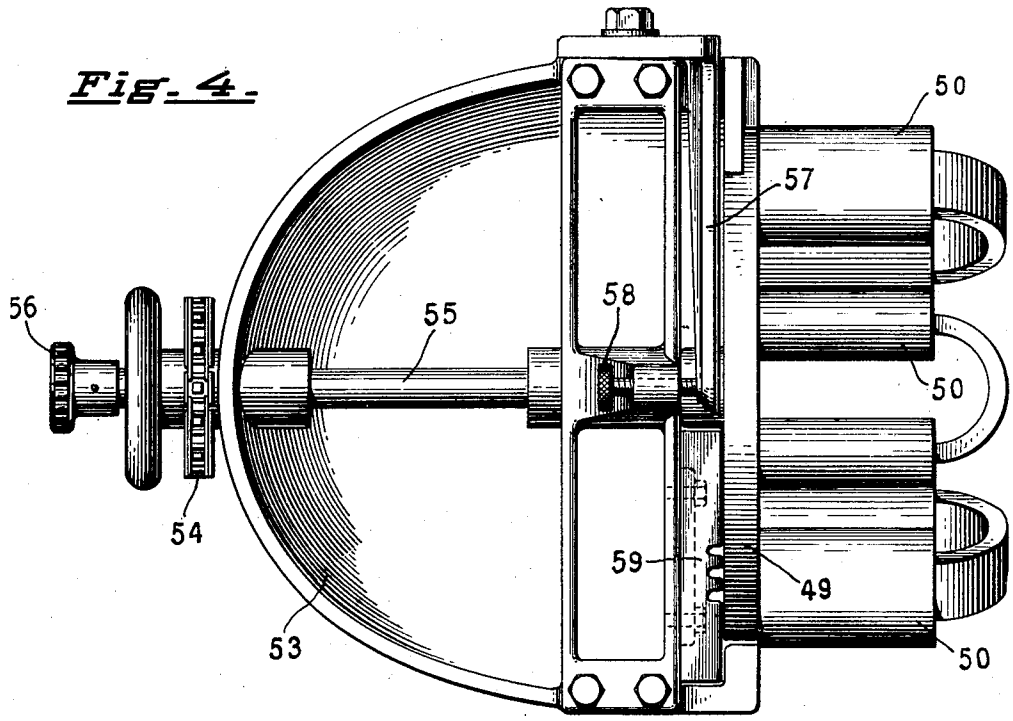
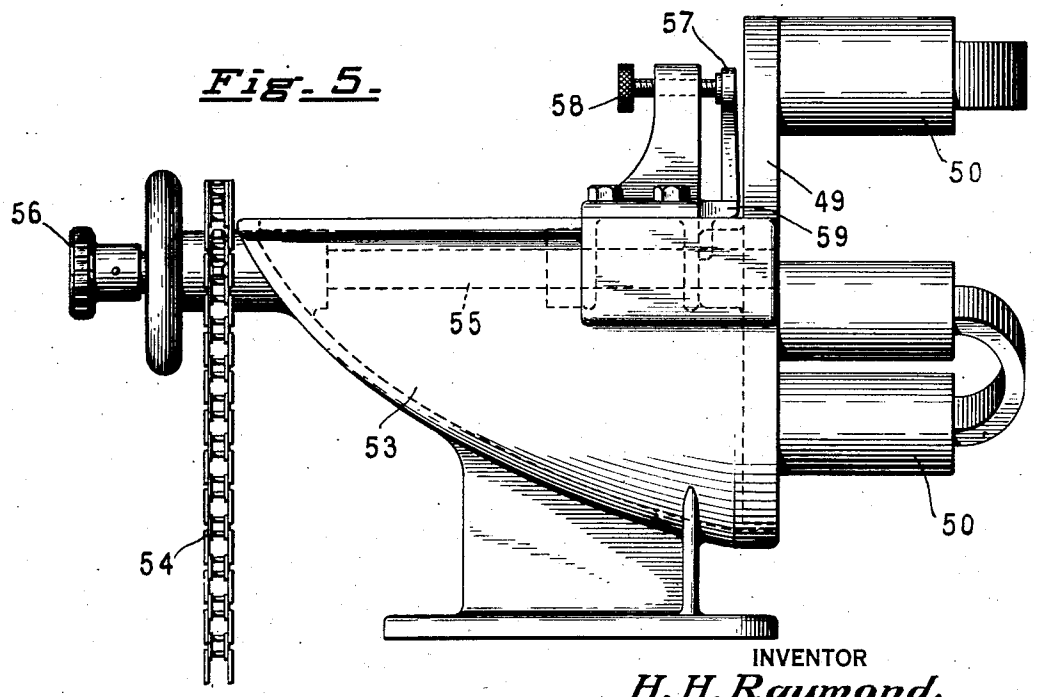


Fig. 5.



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UNITED STATES PATENT OFFICE

1,952,777

MAGNETIC HANDLING

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Application March 23, 1931, Serial No. 524,582

13 Claims. (Cl. 10—162)

This invention relates to a method and apparatus for the magnetic handling of material, such as nails, screws, nuts, washers, rollers, etc., between a hopper and packaging or treatment or other machines.

An object is to provide a simple and efficient method and apparatus for such handling.

Another object is to provide an efficient method for handling elongated objects in an orderly manner and in substantial parallelism so that a plurality may be yieldably carried ready to be presented to a selecting and guide or feeding mechanism.

Fig. 1 is a vertical section through embodiment of this invention.

Fig. 2 is a right end view of the device shown in Fig. 1 with parts being broken away to show details of construction.

Fig. 3 shows a modified construction embodying the present invention.

Fig. 4 is a top plan view of the device of Fig. 3.

Fig. 5 is a right side view of the device of Fig. 3.

The drum 10 is provided with a hub 11 supported by the standard 12, having the bearing 13. This hub may be provided with a bolt 14 which passes through an external disc 15 and screws into an interior disc 16.

The drum is preferably mounted to rotate on a horizontal axis and is provided with a recess or chamber 17 for the articles which are to be separated and arranged in order. At one side of the drum I mount a hopper 18 so that a substantial quantity of the articles may be handled at one charge of the machine. The standard 12 and hopper 18 may be conveniently supported on a base 19 and a post 20 or in any other suitable manner.

The drum 10 is preferably provided with a flange 25 constituting the walls of said recess, with a peripheral flange 21 and an outer flange 22 which may conveniently serve as a belt surface for driving the drum. The parts are so constructed as to provide a chamber 23 for a series of electro-magnets 24. Each magnet consists of a coil wound on a sleeve and provided with a core 26 of magnetic material. This core is provided with an inner head 27. The back of the recess 23 is open to permit the magnet coils to be inserted, and the drum is provided with passages for the cores 26 of the magnets. Each magnet is held in place by a screw which screws into the outer end of its core and thus clamps the magnet to the drum. The outer periphery of the drum may be provided with openings for the screws and screw caps 29 for closing the openings.

The recess 23 is preferably closed by a cover plate 30 held in place in any suitable manner. The drum is preferably formed of non-magnetic material and may be of a single aluminum casting. The recess 17 is preferably provided with a brass liner 31 through which the heads or pole pieces 27 of the magnets project.

The insulating ring 32 is mounted on the standard 12 adjacent the rear wall of the drum 10 and secured in position by one or more screws such as 33. The screw 33 passes through an elongated slot 34 in the standard so that the ring 32 may be circumferentially adjusted for the purpose hereinafter described. This insulating ring 32 may be of what is commonly termed "fibre" and carries two commutators, 35 and 36. The commutator 35 is in the form of a continuous ring, whereas the commutator 36 is in the form of a segment which extends from a point below the axis of the drum to a point which is above the axis, that is, it is substantially semi-annular. These commutators may be secured to the insulating supporting ring 32 in any suitable manner and are provided with terminals 37 and 38, respectively, for the cable which provides the electric current. Each magnet coil is connected to the brush 40 which engages the outer ring 35 and each coil has an individual brush 41 engaging the inner commutator segment 36. It will thus be seen that each magnet will be energized during that portion of each revolution in which its brush 41 engages the commutator segment 36. Preferably the brushes and commutators are protected by a cover 42 which is secured to the back of the drum and a shield 43 which is secured to the standard 12.

The discharge guide preferably consists of two members 44 spaced apart from each other a sufficient distance to permit the passage of the shank of the articles to be sorted, or arranged, and the upper end of the guide is arranged spaced apart from the upper wall of the recess 17 in the drum a sufficient distance to allow for the passage of the head of the article. The inner end of the space between the guide members is arranged in the plane of the centers of the pole-pieces 27. The width of these pole pieces is preferably narrow as indicated on the drawings. The current strength is such as to make the magnets only pick up articles and carry them around in the plane of the opening between the inner end of the guides. Of course when an object is picked up by its end as is illustrated

in Fig. 2 of the drawings the object is supported above its center of gravity. By having these pole pieces comparatively small the effect of the magnets is concentrated so that objects will be presented within the plane of the guides.

Of course if an article is picked up by the small end, no particular harm is done as it would, of course, drop through the guide when released by the magnet, but it is desirable that the articles should be picked up properly, otherwise a number of articles may be picked up and then uselessly dropped without being properly deposited in the deflecting guide. The shape and size of the guide 44 will of course depend upon the shape and size of the articles to be handled.

The commutator segment 36 is preferably so arranged or adjusted as to cause each magnet in turn to be energized as it passes above the hopper floor and de-energized just as it passes over the upper inner end of the deflecting guide. This not only saves useless expenditure of energy but insures the rapid pick-up and deposit of the articles in the guide as the drum is rotated. The guide is so constructed and arranged, however, as to tend to properly deflect and detach the articles from the drum, even in case the magnet retains some of its attractive power.

The hopper is preferably provided with an inner flange 45 which extends into the drum recess and covers the heads of the magnet throughout a part of the circumference of the drum. While this keeps the weight of the mass of articles off the drum except during the time necessary for the magnets to act, such is not necessary.

A guard plate 46 may be provided and may be secured to the inner wall of the guide 44 next to the edge of the rotating drum so as to prevent articles from dropping down between the drum and the guide 44 although this plate 46 is not necessary. The inner end 47 projects inside the drum above the guide 44 to prevent any interference with the operation at this point. The drum is also preferably provided with interior projections such as 48 which serve to agitate the mass of articles within the drum as the drum rotates. Such agitation is particularly desirable when the articles being handled are large.

These projections 48 may be hollow and serve as convenient conduits for the wires (not shown) leading from the brushes to the magnets. It is possible by apparatus of this character to automatically handle great quantities of articles at high speed at very small cost of operation. The construction is very simple and inexpensive and requires a minimum amount of supervision and repair.

In Fig. 3 the rotatable carrier 49 has the magnets 50 disposed axially instead of radially as is the case in Figs. 1 and 2. These magnets may be either permanent magnets or electro-magnets in which each is wound with a coil. If the magnets are electro-magnets a commutator device similar to that illustrated in Figs. 1 and 2 will of course be necessary although such commutator device is not shown. The pole pieces 51 and 52 of each magnet project through the carrier disc 49 since this carrier is preferably of non-magnetic material such as aluminum, for example. By having the pole pieces project through the carrier disc and be substantially flush with the inner face thereof, the flux density on this side of the disc may be much greater than if the pole pieces were not allowed to extend entirely through the disc. The articles to be sorted are placed in the hopper 53 when they will be picked up by the carrier until the objects engage the guide 57 by means of which the articles may be led through off to a packaging or treatment machine.

Some convenient mechanism for driving the carrier disc may be provided such as the chain 54 which rotates the disc 49 through the shaft 55. The clutch handle 56 is provided so that the shaft 55 and the carrier disc 49 may be stopped without stopping the chain 54. In order to vary the spacing between the disc 49 and the guide 57 the upper end portion of the guide 57 may be separately adjustable by the screw 58 illustrated although this screw 58 is intended primarily as a brace for the sake of rigidity.

Adjustment in separation between the disc 49 and the main body portion of the guide 57 is accomplished by means of the nut which is shown at the very top of Fig. 4 and located outside the hopper. Loosening this nut permits shifting the guide 57 toward and from the disc as this nut is located in a slot in the outer end portion of the guide. In order to prevent the carrier disc from picking up more articles than are desired at one time, a notched stripper plate 59 is provided, the notches allowing elongated objects to pass therethrough only in an endwise position, the illustrated arrangement for pole pieces and stripper plate insures the articles being raised in substantial parallelism between the pole pieces. Upon reaching a position over the guide 57 the articles may be mechanically withdrawn from each pole piece by the guide, or if a commutator device is used the magnets may be de-energized to automatically release the objects over the guide. With the disc type carrier a single guide member 57 has been found sufficient since it cooperates with the inner face of the disc permitting the disc to function as a guide member.

However, if desired two guide members may be used as illustrated in Fig. 1 for example. Adjusting the spacing between the carrier disc 49 and the guide permits objects of different size to be conveniently handled.

While not previously described the spaced guides 44 illustrated in Figs. 1 and 2 may also be made relatively adjustable to suit objects of different size.

In this invention it is desirable to have a rheostat in the circuit of the magnets. Especially is this desirable in the construction illustrated in Fig. 1 and Fig. 2 where if the excitation is too strong the magnetic flux will cause an excessive number of elongated objects to be carried in a heterogeneous arrangement and at various angles from each pole piece. Upon decreasing the flux density the excess articles will drop off from the pole pieces of Fig. 1 and Fig. 2, and the field may be made just a little more than strong enough to support one object, in which case an elongated object of magnetic material will be freely supported to swing by one end with its center of gravity depending, and the axes of the several objects being raised arranged in substantial parallelism. In Fig. 1 the parallel arrangement of the objects being carried is obtained by adjustment of the field strength and by gravity, whereas in the embodiment illustrated in Figs. 3 to 5 inclusive, the parallel arrangement of elongated and non-symmetrical objects between the pole pieces depends not only upon the requisite flux density but also upon the cooperation of the stripper plate 59 which facilitates such parallel arrangement.

With the drum type handling apparatus of

Figs. 1 and 2 the magnets should be spaced far enough apart so that a single object being handled is not long enough to bridge the space between the pole pieces, or in other words, the magnets should be so arranged that no one object is capable of being simultaneously under the influence of two magnets. With this drum type handler, projections fixed to the drum and extending into the recess near the periphery may if desired be provided to additionally agitate the contents, or expressed in another way, the agitating means 48 may be moved closer to the periphery. If the projections 48 tend to wear down, a hard flat plate may be placed over them to shield them against wear although such a flat plate will not provide for any agitation if such is desired. The construction illustrated in Figs. 1 and 2 is especially adapted for handling elongated headed objects although it will be understood that by providing different shaped guides, objects like nuts or balls may be handled. Also it should be understood that several elongated objects may be simultaneously picked up by each pole piece in the form illustrated in Figs. 1 and 2. The essential requirement is for these elongated objects to be close enough together so that they will be received between the diverging ends of the guide.

Where headed objects like wood screws are handled with the disc type carrier it may be found desirable to use two guides because otherwise the sharp edge on the head of wood screws would be in danger of cutting the disc. Where flat objects like ordinary nuts are handled, no stripper plate need be provided.

On the other hand where non-symmetrical objects like body-nuts are handled, a stripper plate will be needed in order to have the small projecting portion of each body-nut similarly arranged. Wherever the stripper plate is used the notches in this stripper plate serve to aline the objects. The magnetic handling apparatus of the sort illustrated electro-magnets are preferable because it is desirable for the pole pieces to project through the non-magnetic drum or disc and since these pole pieces should be smooth and flush with the surface of the non-magnetic material, and since this is generally accomplished by a grinding or other smoothing operation which might weaken a permanent magnet, the projecting pole pieces should preferably not possess residual magnetism which might be so destroyed by grinding.

Among the advantages of this invention may be mentioned the ease and simplicity of handling objects and arranging them symmetrically at small cost. The cost of operating is also small compared with the customary mechanical handlers of the rising blade type which consume a large amount of energy to force the rising blade through a bin full of objects. While no projections are provided in which the objects can become jammed within the hopper, nevertheless in case such objects become jammed it may be desirable to use extra strong excitation so that the consequent strong increase in flux may act to break up any jam if one should in some way happen.

The sorting and rejecting may be either by means of the stripper plate or the guides. With the common commercial mechanical sorting mechanisms for flat objects like nuts etc., this invention is a decided improvement since it enables the objects to be taken off the top and not from the bottom. While the loading platform illustrated in Fig. 1 may be used with Figs. 3 to 5, it should also be understood that such a platform is not necessary. Where no platform is needed the magnets should be energized adjacent the top of the material in the bin so as to avoid dragging objects attached to the pole pieces through the body of material in the bin or hopper. Also the time at which the magnets are energized may vary if desired, according to the level of the material in the bin.

This application is a continuation in part of my prior application S. N. 41,724 filed July 6, 1925, Patent Number 1,798,629, dated March 31, 1931.

I claim:

1. The method of handling elongated headed objects which comprises arranging a plurality of such objects in parallelism and then selecting those having their heads in one direction and rejecting those having their heads in the opposite direction.

2. The method of handling elongated headed objects which comprises magnetically removing and carrying such objects of magnetic material from a hopper in substantial parallelism, and then retaining and moving a substantial portion of the objects in parallelism during and after their release from the magnetic influence.

3. The method of handling objects of magnetic material which comprises magnetically extracting such objects from a hopper and then adjusting the flux density so that said objects will hang freely suspended at one end from a magnet pole piece.

4. The method of handling elongated headed objects which comprises carrying them freely suspended from one end and then selecting those objects having their heads in one direction while so suspended and rejecting those having their heads in the opposite direction.

5. The method of operating a magnetic handler which comprises passing magnets down through a hopper and rendering said magnets ineffective while doing so, and then raising said magnets and rendering them effective as they rise adjacent the top of material in the hopper whereby the magnets may extract objects from the hopper without impeding movement of said magnets by the hopper contents.

6. The method of handling elongated objects of magnetic material which comprises magnetically carrying such objects in parallelism and mechanically removing such carried objects from control of the magnetic flux supporting them.

7. The method of handling elongated headed objects which comprises magnetically carrying such objects of magnetic material, selecting some of the objects and rejecting others by passing them through the selecting means.

8. The method of handling elongated headed objects which comprises arranging and moving at least some of said objects in substantial parallelism, selecting some of the objects from a carrier and rejecting only those having their heads inverted with respect to the objects selected.

9. The method of handling elongated headed objects which comprises sequentially withdrawing objects from a collection, raising said objects by one end and while depending substantially vertically during at least a part of their movement, selecting some of the objects from a carrier and rejecting only those with their heads inverted with respect to those selected.

10. The method of handling elongated headed

objects which comprises sequentially withdrawing objects substantially endwise from one side of a collection while holding said objects by one end and selecting only those objects having their heads contiguous the holder and rejecting those not so arranged.

11. A magnetic handler comprising a rotary disc of non-magnetic material, a hopper on one side and magnets on the opposite side of said disc adapted to carry objects on the opposite side of the disc from the magnets and between magnet poles of unlike polarity arranged in pairs, and guide means for cooperating with objects carried by said disc to select and lead such objects.

12. A magnetic handler comprising a rotary disc of non-magnetic material, a hopper on one side and magnets on the opposite side of said disc adapted to carry objects on the opposite side of the disc from the magnets, and guide means for cooperating with objects carried by said disc to select and lead such objects, and said guide means comprising a single guide track spaced from said disc for supporting elongated objects by their heads between said track and disc.

13. The method of handling non-symmetrical objects which comprises, applying such objects to pole pieces of successive magnets in a similar manner, moving the magnets, separating the objects from the magnets and then directing the objects down a guide, all motion of the objects from subsequent to their engagement with the magnets and prior to their engagement with the guides being one of translation.

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