Aug. 2, 1955 J. K. BRUCE ET AL 2,714,481

PACKAGING APPARATUS

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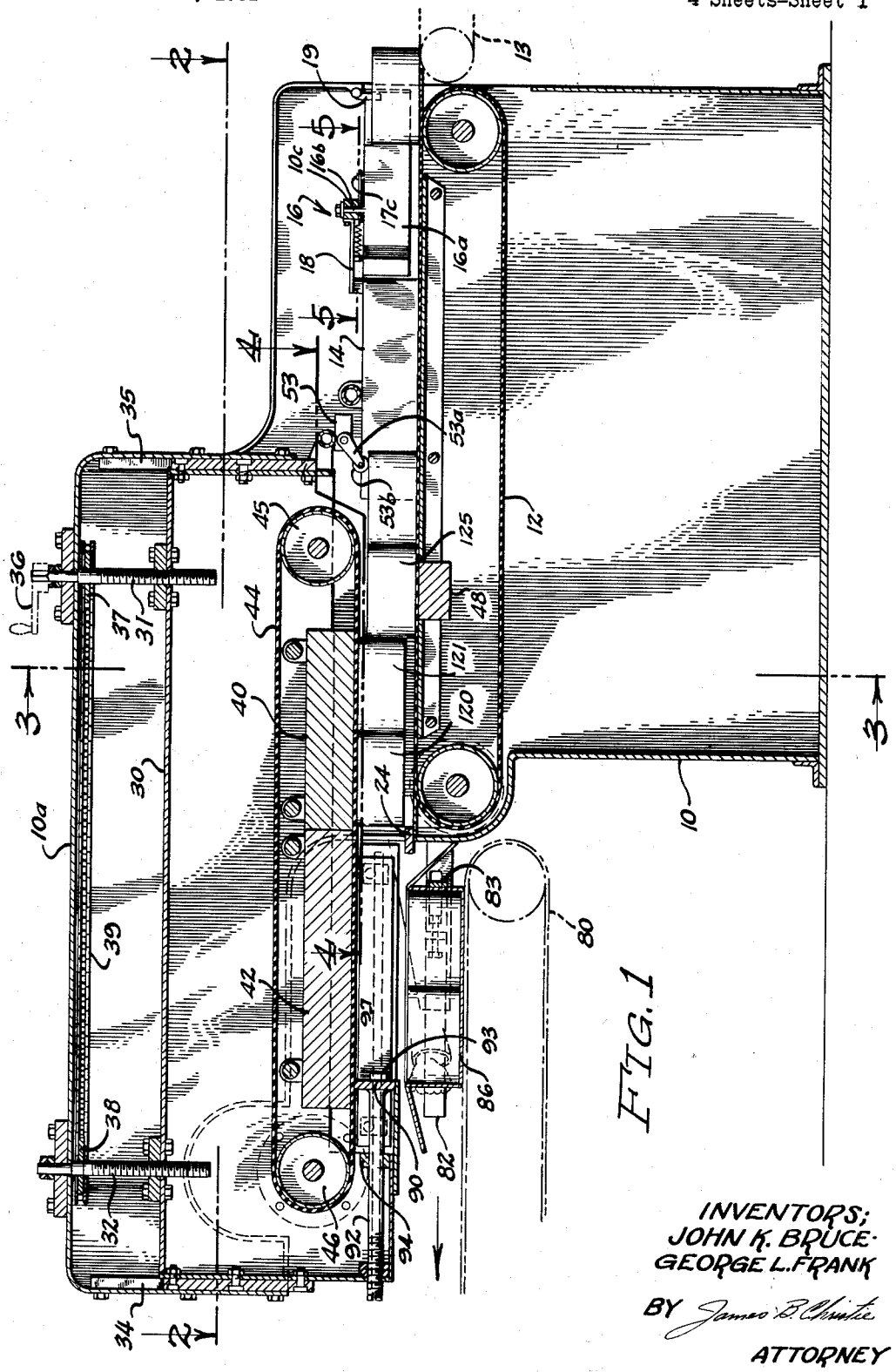


FIG. 1

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FIG. 2

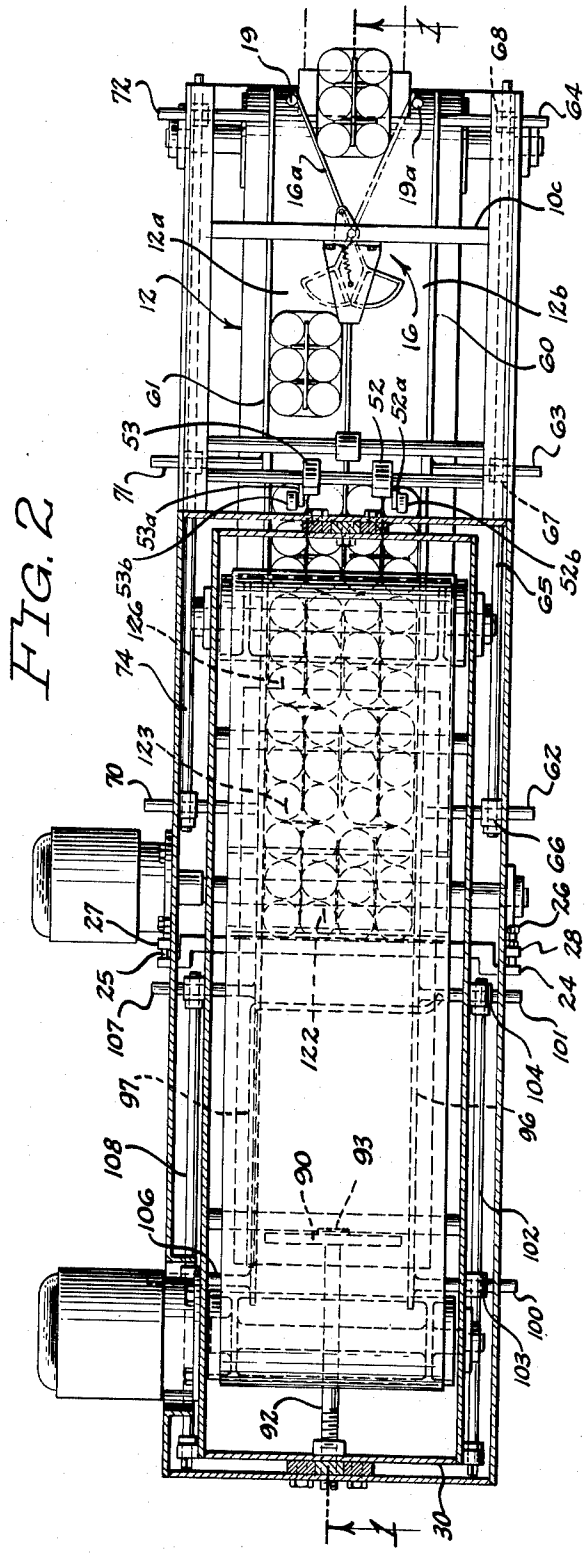


FIG. 5A

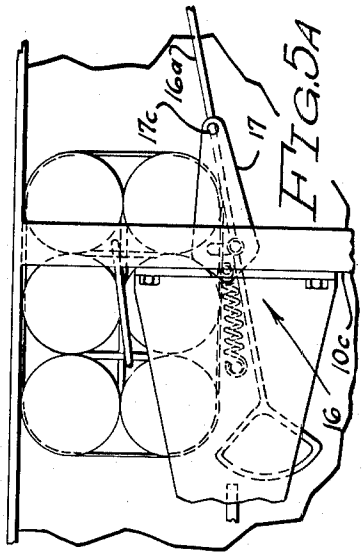
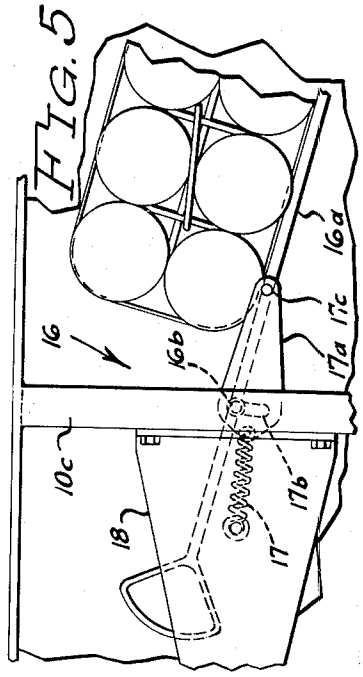


FIG. 5



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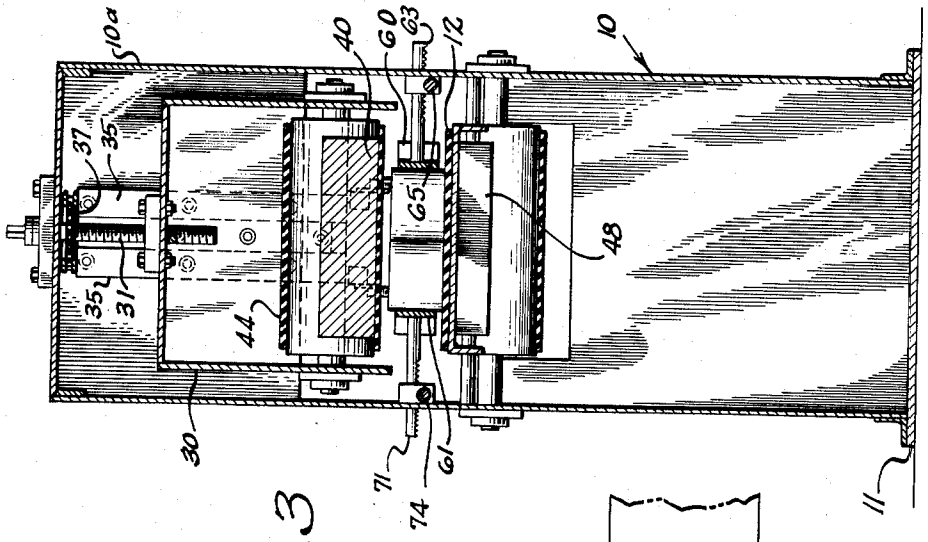


FIG. 3

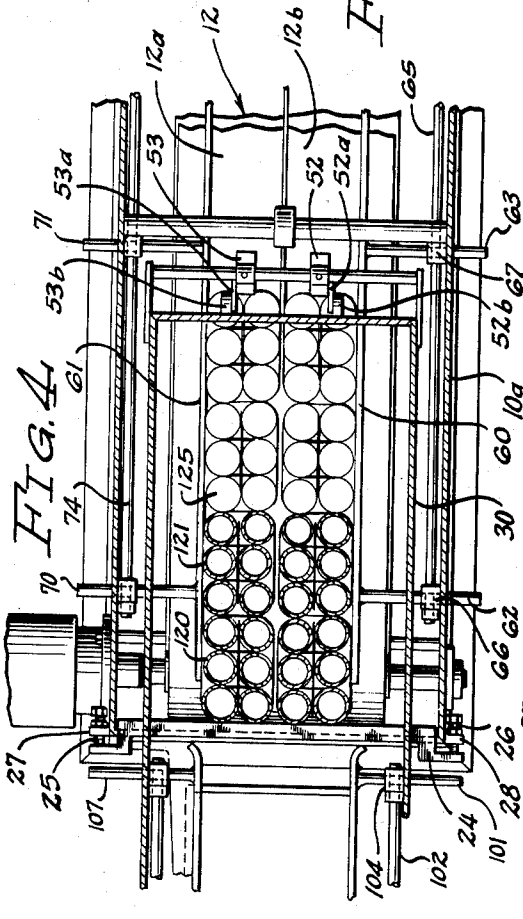


FIG. 4

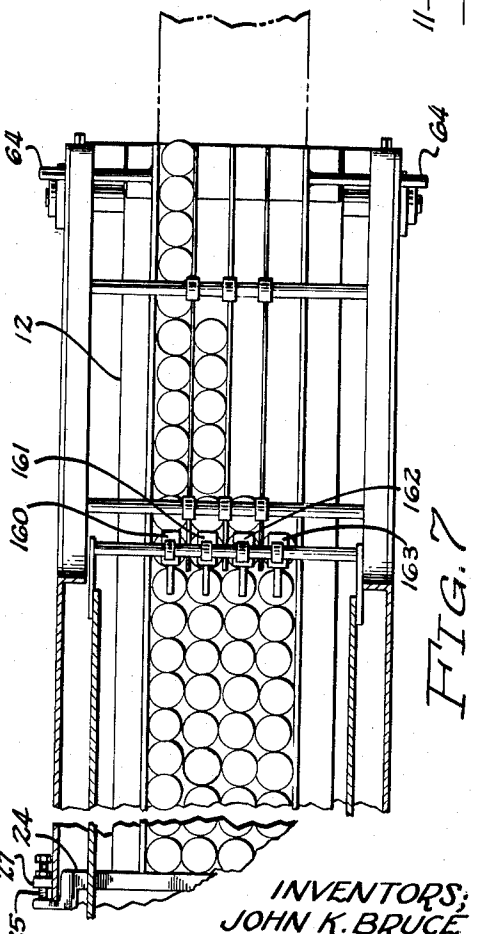


FIG. 7

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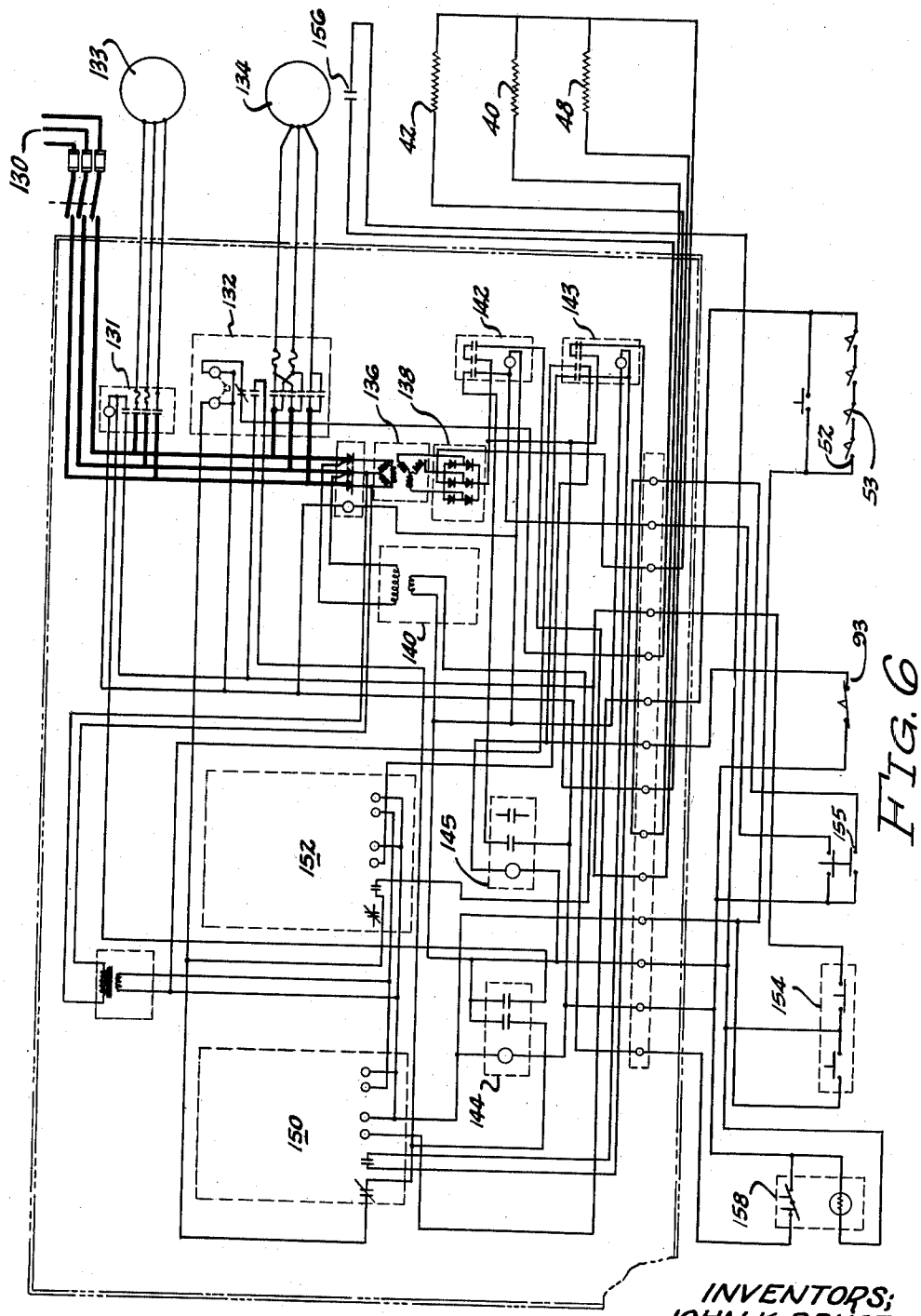


FIG. 6

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2,714,481

PACKAGING APPARATUS

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Application February 12, 1951, Serial No. 210,552

12 Claims. (Cl. 226—15)

This invention is directed to improvements in packaging and more particularly to apparatus for packaging containers in shipping cartons.

It is the general practice in the industry to distribute canned goods in boxes or cartons each containing a plurality of cans or containers. The cans are normally filled and sealed as individual units, and in accordance with present practice are packed into cartons dimensioned to receive a fixed number of cans. The same practice is generally followed by can manufacturers, i. e. new cans are packed for shipment in cartons which are, in most cases, reused by the canner for shipping filled cans.

The apparatus of the present invention greatly facilitates packing and is characterized by ready adaptability to containers and cartons of varying size and comprises, generally, means for orienting the containers in groups. Each group consists of a plurality of containers confined in an area not exceeding the area of the carton in which they are to be packed. Generally the number of containers in each group is exactly the number adapted to be inserted in the carton, and the containers are oriented in the pattern of the carton. Means are provided for suspending an entire group or pattern of containers from above and for transporting the suspended pattern over an open carton where they are dropped as a group into the carton.

In the illustrated and preferred embodiment of the invention, the means for suspending and transporting the container groups comprises a magnet having a conveyor belt traveling across its bottom face. For this reason the apparatus, as illustrated, is limited in use to empty containers fabricated at least in part of magnetically permeable material and to filled containers of the same type, or non-magnetic containers filled with magnetically permeable material. Since the commonest form of container satisfying the requirement is a tin can, the invention is described and illustrated with relation to containers of this type.

However, the invention in its broadest aspects is not limited to all metal containers such as tin cans, nor is it, in fact, limited to containers which include or contain magnetically permeable material. Means other than the illustrated magnetic means may be used to suspend the containers, although in most instances the illustrated means is well suited to accomplish the desired function and represents the most economical expedient.

In the brewing industry more and more use is being made of cans to replace bottles, the latter being considerably more expensive and at the same time more difficult to handle. Recently the industry has devised means in the form of an encircling resilient band to bind six cans together as a unit. This development has added impetus to the conversion from glass to metal containers because of the merchandising advantages of the six can unit. The apparatus of the invention is illustrated and described as operating on such units. It will be apparent, however, as the description proceeds that the same functions can be performed and the same results achieved

when containers are individually fed to the apparatus, it being necessary only to make appropriate modification in the means for orienting the containers in the proper pattern to be received by the carton.

The invention will be more clearly understood by reference to the following detailed description which is taken in conjunction with the accompanying drawing in which:

Fig. 1 is a sectional elevation through one embodiment of the invention;

Fig. 2 is a horizontal section of the apparatus taken on the line **2—2** of Fig. 1;

Fig. 3 is a transverse sectional elevation taken on the line **3—3** of Fig. 1;

Fig. 4 is a horizontal section taken on the line **4—4** of Fig. 1;

Fig. 5 and Fig. 5A are plan views taken on the line **5—5** of Fig. 1 and showing different operating positions of this portion of the apparatus;

Fig. 6 is a circuit diagram illustrating the electrical connections controlling the operation of the machine; and

Fig. 7 is a partial horizontal section of a modification of the apparatus of Fig. 1 adapted for use with individual containers instead of container units as handled by the apparatus of Figs. 1 to 5.

Referring to Figs. 1 to 5, the apparatus comprises a supporting structure **10** mounted on a base **11**. The supporting structure **10** includes a superstructure **10***a* from which a portion of the apparatus is adjustably suspended as hereinafter described. A conveyor **12** is mounted in a horizontal position and receives containers as they are fed to the apparatus from a feeder conveyor **13**, the latter forming no part of the apparatus of the invention.

The conveyor **12** is conveniently a conventional belt conveyor, as shown in Fig. 2, and is divided by a baffle **14** into longitudinal sections **12***a*, **12***b*. A diverter **16** is mounted at the leading end of the baffle **14**, i. e. at the container receiving end to direct alternate can units on opposite sides of the baffle.

The diverter **16** is shown in greater detail and in two operating positions in Figs. 5 and 5A, both of which are plan views taken on the line **5—5** of Fig. 1. Referring to these figures, the diverter comprises a vane **16***a* pivotally depending on a pivot pin **16***b* from a transverse tie beam **10***c* of the framework **10**. The vane **16***a* is spring loaded about a longitudinally aligned position by a spring **17** anchored at one end to an overhanging web **18** and at the other to a kite **17***a*, the kite having an arcuate slot **17***b* traversed by pivot pin **16***b* and being pivotally affixed at **17***c* to the vane **16***a*. The vane pivots throughout an arc centered on the longitudinal axis of the underlying conveyor and defined by stops **19**, **19***a* (Fig. 2) against which the leading end of the vane alternately abuts.

As shown in Fig. 5, a container unit traveling on the conveyor **12** is deflected by vane **16***a* onto section **12***b* of the conveyor. As this unit passes the diverter the trailing end of vane **16***a*, projecting into the path of the container unit, is deflected to the position shown in Fig. 5A. The following container unit is directed onto the conveyor section **12***a* and it in turn will deflect the vane **16***a* back to the position shown in Fig. 5 so that the next succeeding unit will again be directed onto the conveyor section **12***b*.

In this fashion, alternate container units travel along the sections **12***a*, **12***b* of conveyor **12** until they abut against a stop **24**, the stop **24** being adjustably mounted to the framework transversely with respect to the conveyor **12** by the bolts **25**, **26** threaded through opposite ends of the stop and through flanges **27**, **28**, respectively, forming a part of the framework **10** (see Fig. 4). The can units thus pile up against the stop **24** in a double longitudinal row, i. e. on both sections **12***a*, **12***b* of the

conveyor. The conventional carton is adapted to receive two dozen cans of this type or four of the six can units.

A second framework **30** is suspended from the superstructure **10***a* by means of shafts **31**, **32** journalled through the superstructure and threaded to the framework **30**. The framework **30** rides in vertical tracks formed by gib plate pairs **34**, **35** mounted at opposite ends of the superstructure **10***a* and is vertically adjustable by rotation of the shafts **31**, **32**. This rotation is accomplished by means of a hand crank **36** affixed to the upper end of shaft **31**, and by means of pulleys or sprockets **37**, **38** and a connecting chain **39** rotation of the shaft **31** is transmitted also to the shaft **32**. In this fashion, the framework **30** may be raised or lowered with respect to conveyor **12** to adapt it to containers of different sizes.

A first electromagnet **40**, hereinafter referred to as the pick-up magnet, is suspended from the adjustable framework **30** directly above the conveyor **12** a distance exceeding slightly the height of the containers carried on the conveyor. More accurately, the spacing between the conveyor and the under face of magnet **40** must be sufficient to enable containers suspended from the magnet to proceed past the stop member **24** in the manner to be described. A second electromagnet **42** is suspended from the framework **30** adjoining the magnet **40** and with the bottoms of the two magnets lying in a horizontal plane. A conveyor **44** mounted around pulleys **45**, **46** is carried across the under surface of the magnets **40**, **42**. Magnet **48** is mounted beneath the conveyor **12** rearwardly of magnet **40** and is operable to hold on the conveyor against the force of magnet **40** those containers lying directly above the so-called hold-down magnet **48**. Magnet **48** may be either an electromagnet or a permanent magnet and its function will become apparent from the following description.

A pair of position switches **52**, **53** are mounted above the conveyor **12** and are spaced toward the feed end from the magnet **40**. The switch **52** is disposed above section **12***b* of the conveyor and includes a depending pivotal arm **52***a* carrying a roller **52***b* at its outer end (see Fig. 4). Containers passing beneath the switch on the conveyor section **12***b* displace the arm **52***a* upwardly actuating the switch for the purpose hereinafter described. Switch **53** is mounted above the conveyor section **12***a* and also includes a depending pivotal arm **53***a* carrying a roller **53***b* at its outer end. The switches are connected to a time delay relay as more fully explained with reference to Fig. 6, so that brief displacement thereof responsive to passage of containers along the underlying conveyor has no operative effect.

Guide members **60**, **61** are mounted longitudinally above the conveyor **12** and adjacent opposite sides thereof for the purpose of restricting containers within a predetermined area on the conveyor. The guide member **60** is mounted on posts **62**, **63**, **64** adjustably mounted through a side wall of the framework **10** and linked to each other by a tie rod **65** and suitable gear boxes **66**, **67**, **68**, respectively, so that adjustment of all of the posts may be made simultaneously by rotation of the tie rod **65** to vary the spacing between the guide **60** and the center line of conveyor **12**. The opposite guide **61** is similarly supported from an opposite side wall of framework **10** on posts **70**, **71**, **72** which are linked together with a tie rod **74** permitting simultaneous adjustment of the several posts (see Fig. 2).

A carton carrying conveyor **80** is horizontally mounted beneath magnet **42**, the vertical spacing between the magnet **42** and the conveyor **80** as determined by adjustment of framework **30** exceeding the depth of the cartons being used plus the height of the containers to be deposited therein. Adjustable guide means **82**, **83** are mounted on the framework **10** extending longitudinally and transversely, respectively, of the conveyor **80** to facilitate positioning of a carton, as for example a carton **86** on the conveyor **80**. The guide means and their function with reference to a carton **86** are illustrated in Fig. 1.

A guide member **90** is mounted transversely of the conveyor **44** on a shaft **92** adjustably mounted on the inner adjustable framework **30**. A pillow block **94** also mounted on the framework **30** supports the shaft **92** intermediate its ends. A contact switch **93**, conveniently referred to as a drop off switch, is mounted in the face of guide **90**, or adjacent thereto, and is operable responsive to the presence of a full pattern of containers for the purpose hereinafter explained. A pair of guides **96**, **97** are mounted longitudinally along conveyor **44** and are supported from the inner framework **30**. The guide **96**, for example, is supported by posts **100**, **101** threadably mounted through the framework **30** and tied together with a tie rod **102** and gear boxes **103**, **104**, respectively, so as to be simultaneously adjustable along their longitudinal axes by rotation of the tie rod **102**. The guide **97** is similarly mounted on posts **106**, **107**, which are likewise simultaneously adjustable by rotation of a connecting tie rod **108**.

The magnet assembly, conveyor **44** and guides **90**, **96** and **97** are all mounted on the inner framework **30** which, being adjustable with respect to the superstructure **10***a*, permits vertical adjustment of all of these elements with respect to conveyors **12** and **80**. The position switches **52**, **53** are also suspended from the adjustable inner framework **30** so that all the necessary adjustments to accommodate containers of different height are accomplished by the single adjustment of the framework **30**.

The operation of the apparatus is as follows. Containers fed to the machine, as by a feeding conveyor **13**, are deposited on the conveyor **12** and are alternately channeled by diverter **16** onto adjoining longitudinal sections **12***a*, **12***b* of the conveyor. The containers travel on the conveyor **12** until they abut against stop **24** and are piled up, as shown in Fig. 2, in two columns extending back to the position switches **52**, **53**. At such time as the position switches are displaced by a stationary container, all as hereinafter explained with respect to the circuit diagram of Fig. 6, the magnets **40** and **48** are energized so that four container units, which may be identified as units **120**, **121**, **122** and **123**, are lifted off of the conveyor **12** and held against conveyor **44** traveling across the bottom face of the magnet **40**. At the same time, the magnet **48** holds the next succeeding container units **125**, **126** down against the conveyor **12**. The suspended units are carried by the conveyor **44** along the under face of magnets **40** and **42** until they abut against the end stop **90** and actuate the drop-off switch **93**. As the trailing pair of container units **121**, **123** pass out of the field of magnet **40**, the magnet is de-energized responsive to timing out of a controlling time delay relay as hereinafter described. The magnet **48** is of insufficient strength to offer any appreciable impedance to the progress of container units along the conveyor **12** and is conveniently continuously energized. As the four suspended units position themselves against the end stop **90** and between the guides **96**, **97** the operator of the apparatus manipulates a switch, conveniently a foot switch (shown in Fig. 6) to de-energize magnet **42** so that the four container units will simultaneously drop into the waiting carton **86** and at the same time energizing magnet **40** to pick up the next succeeding container pattern. Except for the momentary release of the suspended containers, the magnet **42** may be continuously energized, whereas the magnet **40** is energized only after the proper number of containers have built up behind the stop **24** and is deenergized with suitable intervening time delay after these containers have been lifted from the conveyor **12** and are carried by conveyor **44** out of the field of magnet **40**.

The wiring diagram of Fig. 6 illustrates the interconnection between the magnets, conveyor motors, position switches, etc. and suitable relays and control switches to achieve the operation as described. Referring to the drawing, a three phase 60 cycle, 220 v. or 440 v. power

source is indicated at **130**. Motors **133**, **134** driving conveyors **44** and **12**, respectively, are connected to the source through suitable relays **131**, **132**, respectively. A three phase transformer **136** and a single phase transformer **140** are connected to the power source and a rectifier **138** is connected to the output of transformer **136** to supply D. C. power to the several magnets.

The circuit also includes magnets **40**, **42** and **48**, position switches **52**, **53** and drop-off switch **93**, previously identified. In addition, the circuit inclueds quick acting relays **142**, **143**, **144**, **145**, time delay relays **150**, **152**, a start-stop switch **154**, a foot operated switch **155**, a zero speed or braking switch **156** associated with motor **134** and a master switch and indicator **158**, the latter serving to signal the energized condition of the magnets.

The various identified elements are interconnected as shown to carry out and synchronize the following sequence of operations:

With master switch **158** on, magnets **42** and **48** are energized and conveyors **12** and **44** are operable through their respective motors **134**, **133** responsive to switch **154**. With the conveyors in operation and when a full pattern of containers collects at the trailing end of conveyor **12**, abutting against the stop **24**, the detector switches **52**, **53** close for an interval significant with respect to the associated time delay relay **150**. When this time delay relay operates responsive to the position switches conveyor motor **134** is de-energized and is braked by energization of zero speed switch **156**. At the same time magnet **40** (pick up magnet) and time delay relay **150** become responsive to operation of the foot switch **155**. The conveyor **12**, diverter **16**, stop bar **24** and position switches **52**, **53** all cooperate to orient the containers in confined groups of appropriate size and shape to be handled by the pickup magnet as it is energized.

When the foot switch is depressed, magnet **40** is energized lifting the accumulated containers off of conveyor **12** and against conveyor **44** which immediately begins to carry them toward magnet **42**. Simultaneously, magnet **42** is momentarily de-energized, assuming a full pattern of containers depending therefrom and resultant actuation of the drop-off switch **93**. If the drop-off switch is not closed, magnet **42** is not de-energized by operation of the foot switch. During this stage of the cycle, hold down magnet **48**, which is continuously energized, prevents the next following container units (**125** in Fig. 1) from leaving the conveyor under the influence of the magnet **40**.

When relay **152**, energized responsive to closing the foot switch, times out, conveyor **12** resumes its travel and magnet **40** is de-energized, the delay enabling the containers picked up by the magnet to progress on conveyor **44** to magnet **42**. Upon de-energization of magnet **40**, the cycle is complete and the system is set to repeat the operation.

As previously indicated, the apparatus of the invention is not limited to the handling of container units of the type illustrated in the preceding figures. Single containers may be fed to the apparatus and channeled in the proper manner to enable a complete pattern of containers to be lifted from the conveyor as a unit. Certain modifications must be made in the apparatus to accommodate it to this different use, these modifications being shown in the partial horizontal section of Fig. 7.

Substantially the only alteration required to adopt the apparatus to handle individual containers is in the inclusion of two extra position switches in addition to the illustrated switches **52**, **53**, there being in the modified apparatus of Fig. 7 four such switches **160**, **161**, **162**, **163** mounted in transverse alignment above the feed conveyor **12** and operable responsive to containers passing beneath the switches in four rows as shown. Whether the apparatus is set up to handle packaged groups of containers, as in Figs. 1 to 6, or individual containers, as in Fig. 7, one position switch is required for each separate feed channel or container column. As shown in Fig. 4, position switches **52**, **53** are associated with the two feed channels **12*b***, **12*a*** respectively, while in Fig. 7 position switches **160**, **161**, **162** and **163** are respectively associated with the four feed channels included in the apparatus there illustrated. As the individual containers are stacked up behind stop **24** in sufficient quantity to actuate the position switches **160**, **161**, etc., the magnet **40** (not shown in Fig. 7) is energized and the cycle proceeds in the manner as described above. The circuit of Fig. 6 shows a full pattern of position switches, two of which are identified as switches **52** and **53**.

The unit may be adapted to any pattern by suitable determination of dimensions, channeling of containers into the desired number of columns and inclusion of series connected position switches of such number as to be responsive to container build up in each of the several columns.

We claim:

1. Apparatus for packaging containers in cartons comprising a feeder conveyor for the containers, automatic means for orienting the containers on the conveyor into groups with each group comprising a plurality of containers confined on the conveyor within an area not exceeding the area of the carton, stationary suspension means for lifting a group of containers off of the feeder conveyor and suspending said group from above, and separate means for carrying said suspended group over an opened carton and for dropping said group into the carton.

2. Apparatus for packaging containers in cartons comprising a feeder conveyor for the containers, automatic means for orienting the containers on the conveyor into groups with each group comprising a plurality of containers confined on the conveyor within an area not exceeding the area of the carton, stationary magnet means for lifting a group of containers off of the feeder conveyor and suspending said group from above, separate means for carrying said suspended group over an opened carton, and means for dropping said group into the carton.

3. Apparatus for packaging containers in cartons comprising a first conveyor for the containers, automatic means for orienting the containers on the conveyor into groups with each group comprising a plurality of containers confined on the conveyor within an area not exceeding the area of the carton, stationary magnetic suspension means for lifting a group of containers off of the first conveyor and suspending said group from above, a second conveyor traveling across said magnetic suspension means for carrying said suspended group over an opened carton, and means for de-energizing the magnet to drop said group into the carton.

4. Apparatus for packaging containers in cartons comprising a first conveyor for the containers, automatic means for channeling containers into a plurality of separate columns on the conveyor, means for orienting the separate columns of containers on the conveyor into groups with each group comprising a plurality of containers confined on the conveyor within an area not exceeding the area of the carton, first magnetic suspension means for lifting a group of containers off of the first conveyor and suspending said group from above, second magnetic suspension means disposed adjacent said first magnetic means and outside the area of said first conveyor, a second conveyor traveling across the under face of the first and second magnet means for carrying said suspended group from the first to the second magnetic suspension means and means for dropping said group from said second magnetic suspension means into the carton.

5. Apparatus for packaging containers in cartons comprising a first conveyor adapted to receive container units, diverter means for dividing the containers into a plurality of juxtaposed columns on said conveyor, stop means disposed above said conveyor following the diverter means to develop on the conveyor a pattern of containers corresponding to the plan of said cartons, a first electromagnet

disposed above that portion of said conveyor adjacent said stop means, a second electromagnet juxtaposed to the first, the first and second magnets having substantially co-planar bottom faces, a second conveyor carried across the bottom faces of the magnets from the first to the second magnet, support means for open cartons disposed below and in vertical alignment with said second magnet, and switch means for simultaneously energizing said first magnet and de-energizing said second magnet, the first magnet remaining energized for a period substantially equal to the travel time of said second conveyor across said first magnet.

6. Apparatus according to claim 5 wherein said diverter means comprises an elongated vane pivotally mounted above said first conveyor to sweep across said conveyor in the path of containers fed to said conveyor, means limiting the arc swept by said vane, and spring means urging said vane to the extremities of said arc.

7. Apparatus according to claim 5 wherein said means for disposing an open carton beneath said second magnet comprises a third conveyor and guide means mounted above the conveyor to align the carton with containers suspended from said second magnetic suspension means.

8. Apparatus for packaging containers in cartons comprising a first conveyor adapted to receive container units, diverter means for dividing the containers into a plurality of juxtaposed columns on said conveyor, stop means disposed above said conveyor following the diverter means to limit the progress of containers on the conveyor, first electrical switch means disposed above the conveyor and operable to stop said conveyor responsive to accumulation against said stop means of a pattern of containers corresponding to the plan of said cartons, a first electromagnet disposed above that portion of said conveyor adjacent said stop means, a second electromagnet juxtaposed to the first, the first and second magnets having substantially co-planar bottom faces, a second conveyor carried across the bottom faces of the magnets from the first to the second magnet, support means for open cartons disposed below and in vertical alignment with said second magnet, and second switch means for simultaneously energizing said first magnet and de-energizing said second magnet when said first switch means is actuated, the first magnet remaining energized for a period substantially equal to the travel time of said second conveyor across said first magnet.

9. Apparatus for packaging containers in cartons comprising a first conveyor adapted to receive container units, diverter means for dividing the containers into a plurality of juxtaposed columns on said conveyor, stop means disposed above said conveyor following the diverter means to limit the progress of containers on the conveyor, first electrical switch means disposed above the conveyor and actuated to stop said conveyor responsive to accumulation against said stop means of a pattern of containers corresponding to the plan of said cartons, a first electromagnet disposed above that portion of said conveyor adjacent said stop means, a second electromagnet juxtaposed to the first, the first and second magnets having substantially co-planar bottom faces, a second conveyor carried across the bottom faces of the magnets from the first to the second magnet, support means for open cartons disposed below and in vertical alignment with said second magnet, second switch means mounted adjacent said second conveyor and remote from said first magnet and being actuated responsive to transport of a pattern of containers from the first to the second magnet, third switch means for simultaneously energizing said first magnet de-energizing said second magnet when said first and second switch means are actuated and starting said first conveyor, and a time delay relay connected so that the first magnet remains energized after release of said third switch means for a period substantially equal to the travel time of said second conveyor across said first magnet.

10. Apparatus according to claim 9 wherein said first and second magnets, said second conveyor and said first and second switches are mounted in fixed spatial relationship in a framework vertically adjustable with respect to said first conveyor.

11. Apparatus for packaging containers in cartons comprising a first conveyor adapted to receive container units, diverter means for dividing the containers into a plurality of juxtaposed columns on said conveyor, stop means disposed above said conveyor following the diverter means to develop on the conveyor a pattern of containers corresponding to the plan of said cartons, a first electromagnet disposed above that portion of said conveyor adjacent said stop means, a second electromagnet juxtaposed to the first, the first and second magnets having substantially co-planar bottom faces, a second conveyor carried across the bottom faces of the magnets from the first to the second magnet, support means for open cartons disposed below and in vertical alignment with said second magnet, and switch means for simultaneously energizing said first magnet and de-energizing said second magnet.

12. Apparatus for packaging containers in cartons comprising a first conveyor adapted to receive container units in a single file continuous stream, diverter means for dividing the container units into a plurality of juxtaposed columns on said conveyor, stop means disposed above said conveyor following the diverter means to limit the progress of containers on the conveyor, first electrical switch means disposed above the conveyor and actuated to stop said conveyor responsive to accumulation against said stop means of a pattern of containers corresponding to the plan of said cartons, a first electromagnet disposed above that portion of said conveyor adjacent said stop means, a second electromagnet juxtaposed to the first, the first and second magnets having substantially co-planar bottom faces, a second conveyor carried across the bottom faces of the magnets from the first to the second magnet, support means for open cartons disposed below and in vertical alignment with said second magnet, second switch means mounted adjacent said second conveyor and remote from said first magnet to be actuated responsive to transport of a pattern of containers from the first to the second magnet, a third magnet disposed beneath said first conveyor displaced vertically from the first magnet and toward the diverter, third switch means for simultaneously energizing said first magnet and de-energizing said second magnet when said first and second switch means are actuated and to start said first conveyor, and a time delay relay connected so that the first magnet remains energized after release of said third switch means for a period substantially equal to the travel time of said second conveyor across said first magnet.

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