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ARRANGEMENT TO PRODUCE ELECTRICAL SIGNALS IN
BELT CONVEYORS USING CONTAINERS

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2 Sheets-Sheet 1

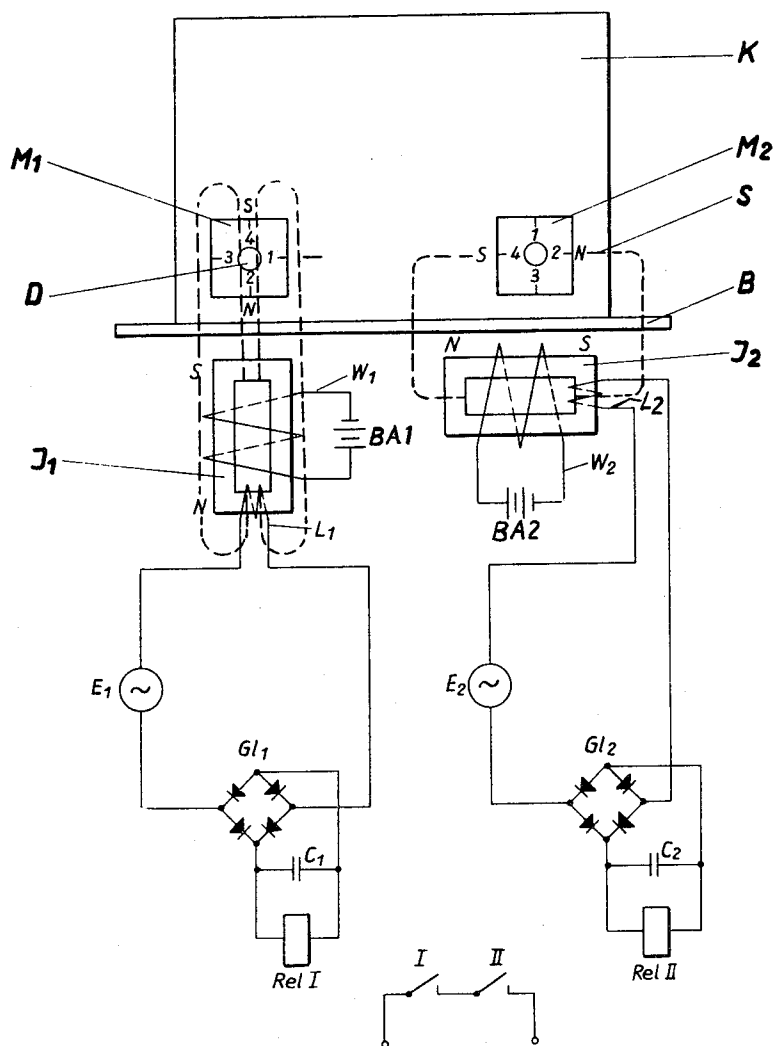


Fig. 1

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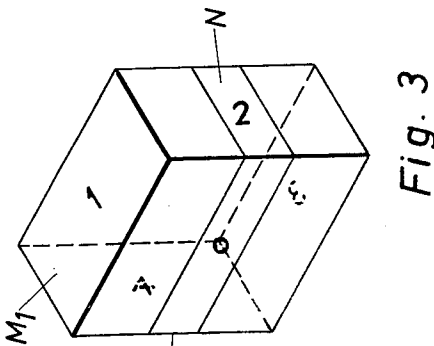


Fig. 3

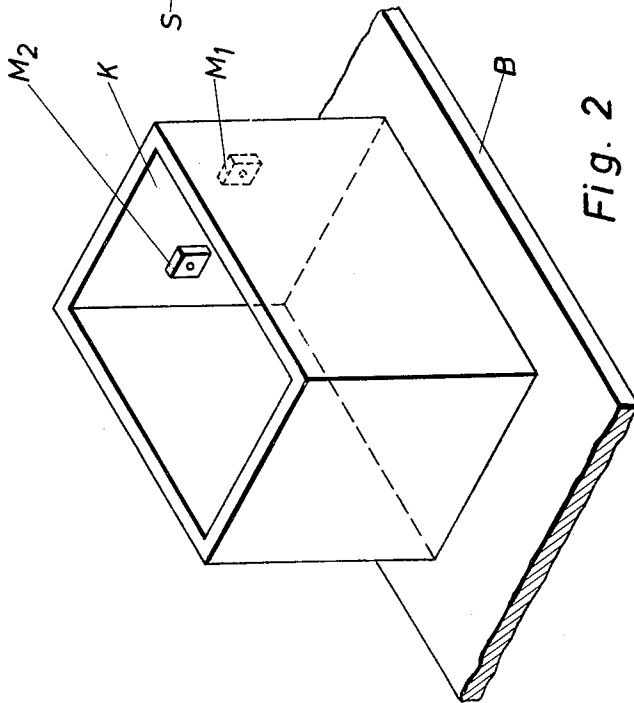


Fig. 2

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ARRANGEMENT TO PRODUCE ELECTRICAL SIGNALS IN BELT CONVEYORS USING CONTAINERS

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4 Claims. (Cl. 198—38)

This invention relates to electrical signalling, and, more particularly, to an arrangement for deriving electrical signals in a conveyor system by changing the impedance of an inductive circuit.

It is known in the prior art to produce electrical signals by means of permanent magnets being brought into proximity with saturable reactors, the mode of operation being such that the permanent magnet may aid in the saturation of the iron core of the reactor and thereby decrease its impedance to the flow of alternating current applied to one of its windings. The prior art teaches the use of pre-magnetizing windings for such reactors but the flux developed by said pre-magnetizing windings is insufficient to decrease the A.C. impedance of the reactor unless aided by the permanent magnet. It will be understood that the magnet must be poled in aiding relation to the flux in the core developed by the pre-magnetizing winding, and that if the magnet is opposed to such flux, the impedance of the reactor will remain high. By applying an alternating current to the winding and a current-responsive device in series therewith, the device may be made to operate when the reactor impedance decreases and will be inoperable when the reactor impedance remains high. The prior art utilized this practice in connection with article conveyor systems wherein switching orders, applied to articles or article-carrying containers in a conveyor system, were detected by reactors of the type above described. By the selective setting of magnets, a switching function throughout the system could be controlled and the article could be routed accordingly.

If a multi-element code is used to control the switching function there will be required a separate reactor with its cooperating magnet for each code element. These reactors are generally placed in a common plane transverse to the direction of travel of the article along the conveyor system, and means must be provided to insure that a permanent magnet will affect its associated reactor, but no other, including the reactors adjacent of said associated reactor. This invention is directed to an arrangement which precludes the spurious response of a reactor to any but its associated permanent magnet. The isolation required is achieved by positioning the reactors with their cores at right angles to the cores of their adjacent reactors.

It is a further object of the invention to provide settable permanent magnets in the article containers of the conveyor system which will selectively cooperate with their associated reactors, depending upon the set position of such magnets.

The above-mentioned and other features and objects of this invention will become apparent by reference to the following description taken in conjunction with the accompanying drawings, wherein:

Fig. 1 is a schematic drawing of a portion of a conveyor system, partly in section, showing the placement of adjacent cores and the cooperation thereof with their associated magnets;

Fig. 2 is an isometric view of a container showing the method of mounting adjustable magnets; and

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Fig. 3 is a view of a magnet with switching indicia imprinted thereon.

Referring now to Fig. 1 there is shown schematically a cross-section of a conveyor-belt B which should be assumed to be moving at right angles to the plane of the sheet of the drawing. Carried by the belt B is an article container for box K having a suitable shape for carrying articles. The shape of the box K is more clearly shown in Fig. 2. It must be understood, however, that the shape of the box chosen for the illustration is non-limitative and any suitable shape may be utilized. As will be seen from Figs. 1 and 2, there is rotatably attached to one wall of the box a pair of permanent magnets M1 and M2. These magnets are pivotally mounted on fixed pivot D which extends into the wall of the box K. In Fig. 1, these magnets are shown with indicia on one face thereof, and in Fig. 2, they are shown with indicia on the ends thereof. It will be observed from Fig. 1 that when magnet M1 is in the position wherein the numbers 2 and 4 are in the vertical plane, the North pole of the magnet will face the bottom of the container K and the South pole will face the upper portion of the container. Below the belt B there is situated a pair of saturable reactors J1, J2 having pre-magnetization windings W1, W2 energized by an appropriate source of direct current indicated by batteries BA1 and BA2, respectively. The reactors are also provided with alternating current windings L1, L2, respectively. Sources of alternating current E1, E2 are serially connected to the last-mentioned windings and to rectifier networks G11, G12, respectively, to the output of which networks are connected relays ReI and ReII, respectively. The design of the reactors J1 and J2 is such that the pre-magnetization windings W1, W2 are unable to saturate the iron cores sufficiently to lower the impedance of the windings L1 and L2, and consequently, insufficient alternating current passes there-through to operate the relays ReI, ReII. In the case of reactor J1, when the magnet M1 is brought in proximity with the core so that the flux lines indicated by the dashes aid the flux developed by the winding W1, the impedance of the winding L1 will decrease; a voltage will be applied to the rectifier network G11 and relay ReI will operate. The condenser C1 shunted across the relay tends to smooth the rectified alternating current derived from the network and will prevent the relay from chattering. The electrical arrangement associated with the reactor J2 is similar to that for the reactor J1. It will be noted however that the core of the reactor J2 lies at right angles to the core of reactor J1. Thus the North and South polarity of the core of J2 is as indicated on the drawing and the magnet M2 must have its polarity at right angles to the polarity of the magnet M1 in order to affect the core of reactor J2. The flux path of the magnet is shown by dashed line. It will be seen that the lines of force of a magnet which is not parallel to the length of its corresponding core will not affect the core and therefore not alter the impedance of the reactor. By alternately disposing the cores at right angles to each other, the cores may be placed relatively close to each other without fear that an adjacent permanent magnet will alter its saturation.

Thus, the magnet M1 when rotated so that the North and South polarity are vertical, will affect a vertically disposed core such as J1, but would have no effect on a horizontally disposed core such as J2. Conversely, a horizontally disposed magnet such as M2, will affect a horizontally situated core such as J2 but will have no effect on a vertically disposed core such as J1. It will also be understood that if the magnet M1 is rotated about the pivot D, 180°, that the flux developed thereby will oppose the flux developed by the winding W1, and no output will be derived from the rectifier network G11.

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Similarly, if the magnet M2 is rotated 180°, no output will be derived from the rectifier network G12.

It will be understood that both the belt B and the bottom of the container K must be made of diamagnetic material so that the lines of force may pass therethrough.

It will be further understood that while only two sets of magnets and reactors are shown, it is within the scope of this invention to provide additional magnets and reactors in order to afford additional switching combinations. The switching apparatus for the conveyor system may be controlled by a series network of contacts such as shown in Fig. 1; the contacts I and II, respectively, associated with relay ReII and ReIII.

In order to maintain the magnets M1 and M2 in a fixed angular position with respect to the belt B, a suitable detent (not shown) may be provided to insure the magnets will retain a quadrantal position.

While we have described above the principles of our invention in connection with specific apparatus, it is to be clearly understood that this description is made only by way of example and not as a limitation to the scope of our invention as set forth in the objects thereof and in the accompanying claims.

What is claimed is:

1. In a conveyor transport system having at least one article-carrying container associated with a movable belt conveyor, the automatic container routing system that comprises, a plurality of permanent magnet elements each rotatably mounted on said article-carrying container, a plurality of magnetically-responsive switching devices mounted adjacent said movable belt conveyor each being approximately positioned to be influenced principally by the magnetic field of a selected permanent magnet element upon passage of an article-carrying container thereacross, circuit means electrically connected to said magnetically-responsive switching devices for controlling said movable belt conveyor with respect to routing of the article-carrying container thereon, said magnetically-responsive switching devices being differentially positioned with respect to each other to effect maximum mag-

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netic decoupling between any single switching device and adjacent permanent magnet elements other than the selected element for said switching device, said permanent magnetic elements being rotatable to selectively vary their polarity to aid or oppose the flux developed by a corresponding electromagnetic element to effect predetermined different switching connections when said article-carrying container passes in magnetic field proximity to said magnetically responsive switching device.

2. The automatic container routing system as claimed in claim 1, wherein said magnetically-responsive switching devices comprise separate electromagnetic elements each including a premagnetizing winding adapted to maintain a fixed field intensity for said element and an alternating current winding of normally high impedance to current flow which is electrically connected to a current-responsive control element for said conveyor belt, each of said permanent magnet elements being adapted to trigger its associated switching device and actuate said control element under action of increased current flow in said alternating current winding induced when the flux developed by said permanent magnet element is positioned to aid the flux developed by said pre-magnetizing winding.

3. The automatic container routing system as claimed in claim 2, wherein said separate electromagnetic elements are positioned in substantially linear alignment transverse to the direction of movement of said conveyor belt.

4. The automatic container routing system as claimed in claim 3, wherein said permanent magnet elements are mounted in linear alignment on said article-carrying container with each element in substantially vertical alignment with a corresponding electromagnetic element.

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