Dec. 21, 1965 A. F. KAIN 3,224,567

MAGNETIC BELT GUIDE

Filed May 2, 1963

Fig. 1

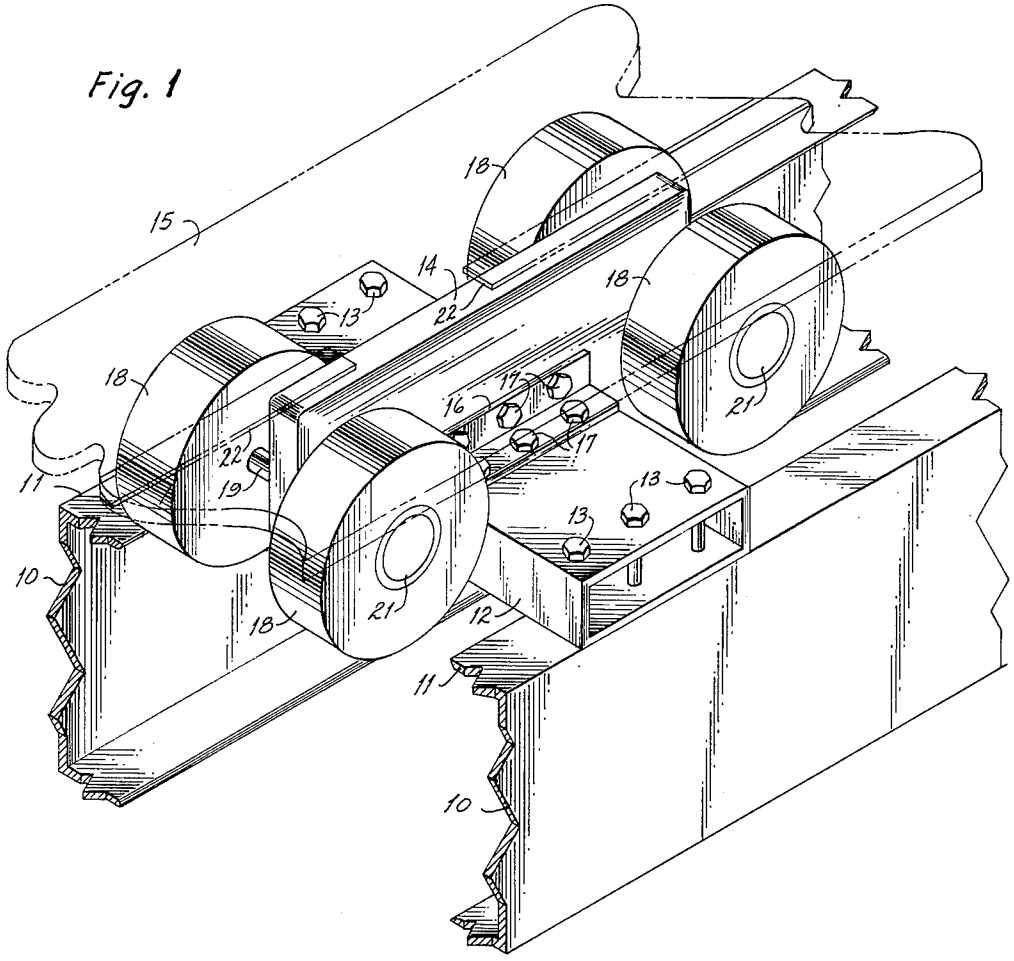


Fig. 2

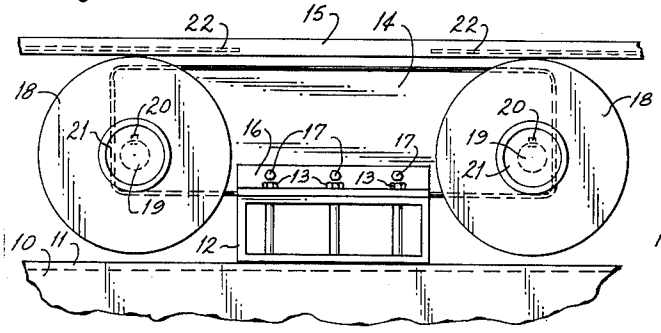


Fig. 3

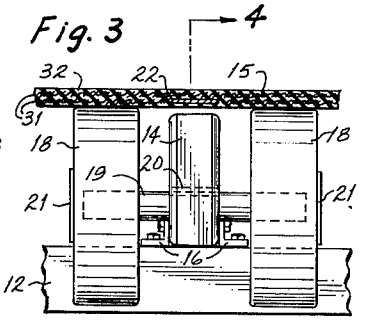
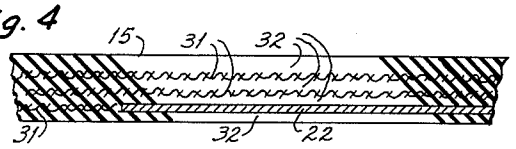


Fig. 4



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MAGNETIC BELT GUIDE

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This application is a campanion application to my prior application, Serial No. 176,386, now Patent No. 3,169,-632, entitled "Magnetic Belt and Trainer."

This invention relates to magnetic belt guides and is particularly concerned with means in association with a magnetic element which influences the path of travel of a conveyor belt for precluding undue frictional contact and hence wear and deterioration of the belt and/or abrasion of the magnetic element.

The primary inventive concept of this and my prior application may be broadly stated as providing a belt guide means, including a means for generating a magnetic flux in a relatively fixed position with respect to a traveling belt, together with magnetically responsive means associated with the belt whereby its path of travel will be delineated by the relative fixed position of the flux creating means.

In the development of commercially successful applications of the present invention, it has been found that with the magnetic means located in close proximity to the path of travel of the belt, such as to permit contact between the magnetic means and the belt, it may produce wear and deterioration of the belt and/or abrasion of the fixed magnetic element. The present invention is designed to mitigate such wear and/or abrasion by limiting possible contact between the fixed magnetic means and the belt. In fact, the invention in its preferred embodiment wholly eliminates the possibility of any such contact.

In the present form of the magnetic responsive arrangement of the present invention, guiding is accomplished by the use of one or more rotary belt contacting elements or anti-friction means disposed in such relation to the magnetic element as to maintain a clearance between the magnetic element and the belt without material reduction of the magnetic forces effective between the magnet and the belt such as to maintain the belt in a positive path of travel dictated by the location of the magnetic means. More specifically, the invention provides for the use of a spaced magnetic means delineating the path of travel of the belt in conjunction with pairs of spaced rollers mounted on or adjacent the ends of each magnetic means. The diameters of the rollers with relation to the disposition of their axes is such as to dispose the upper peripheral portions thereof in slightly upward spaced relation with respect to the upper surface of the magnetic means. Thus the arrangement is such that the upper surfaces of the rollers support the belt in slightly spaced relation above the fixed magnetic means, thus eliminating contact of the belt with such means, and without the rollers inducing friction against the belt. The present invention is further directed to a belt construction independently of any magnetic influence of the belt. This belt construction includes the use of longitudinally flexible strips, which strips resist transverse flexure. For use with the magnetic means, the strips will, of course, be of magnetic responsive material such as iron or steel. However, the presence of such strips in intimate association with the conventional belt material as by imbedment between belt plies will be effective and efficient in maintaining a straight belt flight irrespective of presence of magnetic influence and thus in use without the magnetic means the longitudinally flexible strips which tend to be transversely inflexible may be of appropriate material which is not necessarily magnetically responsive. Lateral displacement of the path of travel of the belt is thus inhibited independently of magnetic influence. However, where magnets are employed and the strips are magnetically responsive, prevention of lateral dislocation of the path of travel of the belt as delineated by the location of the fixed magnetic means is insured.

Thus, it will be seen that it is among the objects of the present invention to provide a device of the character set forth, and one compatible to the inventions of my prior application, by which the danger of frictional wear and deteriorating of the belt is eliminated as well as the possibility of abrasive deterioration of the magnetic means itself. The object of the invention also includes that of providing a novel and improved belt, including a longitudinally flexible and transversely flexible resistant means in the belt. Where magnetic means are employed, the longitudinally flexible means which tend to be transversely inflexible are, of course, of magnetically responsive material. Numerous other object features and advantages of the present invention will be apparent from the consideration of the following specifications taken in conjunction with the company drawings in which,

FIG. 1 is a fragmentary isometric view illustrating one preferred form of the present invention,

FIG. 2 is a fragmentary side elevation of that form of the invention shown in FIG. 1,

FIG. 3 is a fragmentary transverse section of the invention as disclosed in FIG. 1, and

FIG. 4 is a fragmentary sectional view through the preferred belt of the present invention.

Referring now to the details of the present form of the invention as disclosed in the drawings, the numeral 10 indicates a pair of oppositely disposed transversely spaced conveyor frame channels. Between the upper flanges 11 of the channels 10 there is mounted at suitably spaced intervals transversely disposed box beams 12 suitably secured at their outer ends to the upper flanges 11 of the beams by appropriate securing means 13 such as bolts, rivets, or the like as the structure may best be designed for. Centrally of the box beam 12 there is provided a magnetic flux delivering means 14 preferably in the form of a conventional permanent magnet here shown of generally elongate-rectangular configuration. The magnet 14 is disposed in central vertical position with respect to the belt 15 by the provision of oppositely disposed spaced angle brackets 16 secured to the box beam 12 as by rivets or equivalent securing means 17.

For contacting the under face of the belt adjacent to magnet 14 and retaining the belt 15 in slight spaced relation from the upper edge of the magnet to preclude contact between the belt and the magnet, there are provided anti-friction rollers 18, the upper peripheral surfaces of which are slightly spaced above the upper edge of the magnet. Such rollers are here shown as two pairs mounted on axles 19 passing through the ends of the magnet 14. In the structure here shown, the axles 19 are keyed to the magnet 14 by the keys 20 to retain them against rotation, while the rollers themselves are mounted for free rotation on the axles 19. Obviously, this choice of mounting is of no patentable significance, and alternative structures well within the scope of those versed in the art may be restored to. In this connection, it will be noted that the outer faces of the rollers 18 are shown as provided with enlarged bearing caps 21, indicating that roller bearings for the mounting of the rollers 18 on the axles 19 are contemplated. Further in this connection, it will be understood that the invention is not limited nor confined to the mounting of the axles on or through the magnet 14. They may, of course, be disposed in any suitable fashion free from, but preferably adjacent to, the magnet in any suitable manner by which their upper

peripheral surface extends above the magnet to provide a free rolling anti-friction support for the belt in spaced relation to the magnet to preclude contact, but to insure the magnetically attractive relation between the magnet and the belt to maintain belt guidance in the path dictated by the location of the magnets.

By reference to the drawings, it will be seen that the preferred belt of the present invention incorporates spaced flat longitudinally flexible, which tend to be transversely inflexible, bands 22. Where the belt is to be used in conjunction with magnetic band delineating means, the bands are, of course, of magnetically responsive material; however, a self-guided belt, independent of magnetic means, is provided by the bands of the character set forth. While the bands may be continuous throughout the belt, it is preferable to insure free flexibility of the total belt and for economy in manufacture to provide such bands at spaced intervals. Where magnetic means are employed the spacing of the bands preferably less than the length of the magnet so as to insure an uninterrupted magnetic flux from the magnet through the bands 22. By reference to FIG. 4 it will be noted that a preferred form of the belt includes a lower roller contacting rubber surface or ply with the band 22 superimposed thereover, and above the belt there may be alternate plies of fabric 31 and rubber 32 to such number and thickness as to the use for which the conveyor belt may be intended.

From the foregoing, it will be seen that the present invention provides a novel and improved magnetic belt guide means by which frictional contact between the belt and the magnet is precluded without material decrease in the magnetic relation by which the belt is maintained in the desired path of travel. It will, of course, be understood that the complete conveyor assembly will include supporting idlers.

The present inventive concept further emphasizes the concept of guide bands associated with the belt, preferably by insertion between belt plies of elongate longitudinally flexible and transversely flex resistant bands not necessarily of magnetic responsive material, such bands independently of any magnetic means being capable of resisting lateral displacement of the belt from a predetermined straight path of travel.

Thus, in the practice of the present invenion, numerous changes, modification and full use of equivalents may be resorted to without departure from the spirit or scope of the invention outlined in the appended claims.

What I claim is:

1. A belt guide for use with a conveyor comprising an elongated, endless belt of the type which has incorporated therein a narrow, medially positioned strip of magnetically responsive material extending lengthwise of the belt, said belt guide comprising a narrow, upstanding, elongated, block-form, permanent magnet means of limited length and having a flat upper surface, means for securing the magnet in longitudinally position below the upper run of a belt of the type described, anti-friction, belt supporting rollers arranged in close relations on each side of the magnet means and closely adjacent each end thereof, the upper, peripheral, belt-supporting surfaces of the rollers being disposed in slightly spaced relation above the flat upper surface of the magnet to support a belt out of contact with such upper surface of the magnet, said rollers being rotatable on axes disposed transversely to the length of the magnet, said block-form magnet means having axles supported thereon, extending transversely at the end portions of the magnet, said belt-supporting rollers being mounted to rotate upon said axles.

2. The invention as defined in claim 1, in which the peripheral, belt-supporting surfaces of the rollers are located inwardly within the limits of the length of the block-form magnet means.

3. A belt guide for use with a conveyor comprising an elongated, endless belt of the type which has incorporated therein a narrow, medially positioned strip of magnetically responsive material extending lengthwise of the belt, said belt guide comprising a narrow, upstanding, elongated, block-form, permanent magnet means of limited length and having a flat upper surface, means for securing the magnet in longitudinal position below the upper run of a belt of the type described, anti-friction, belt-supporting rollers arranged in close relation on each side of the magnet means and closely adjacent each end thereof, the upper, peripheral, belt-supporting surfaces of the rollers being disposed in slightly spaced relation above the flat upper surface of the magnet to support a belt out of contact with such upper surface of the magnet, said rollers being rotatable on axes disposed transversely to the length of the magnet, said block-form magnet means being formed adjacent its ends with transversely extending apertures, axles held within and extending outwardly at the ends of such apertures, said belt-supporting rollers being mounted to rotate upon the end portions of said axles.

4. A belt guide for use with a conveyor comprising an elongated endless belt of the type which has incorporated therein a narrow, medially positioned strip of magnetically responsive material, the conveyor being of the type having supporting structure including spaced, longitudinal frame members extending below and in parallelism to the upper run of the belt, said belt guide comprising a narrow, upstanding, elongated, permanent magnet means of block form, limited in length, and having a flat, upper surface, two pairs of anti-friction, belt-supporting rollers mounted in fixed relation to the block-form magnet means, a pair of such rollers being supported on said magnet means adjacent each end thereof and the opposite rollers of each pair being closely spaced laterally on each side of the blockform magnet means, the upper belt-supporting, peripheral surfaces of such rollers being in slightly spaced relation above the flat, upper surface of the magnet means and located inwardly within the limits of the length of the magnet means, whereby to support a belt out of contact with the upper surface of the magnet means, said magnet means having beam sections secured thereto between the end pairs of rollers and extending transversely outward, the extended end portions of the beam sections being attachable to the longitudinally extending conveyor frame members.

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