

June 5, 1928.

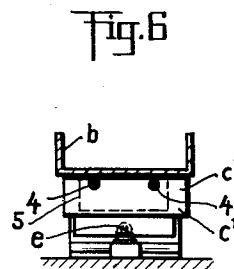
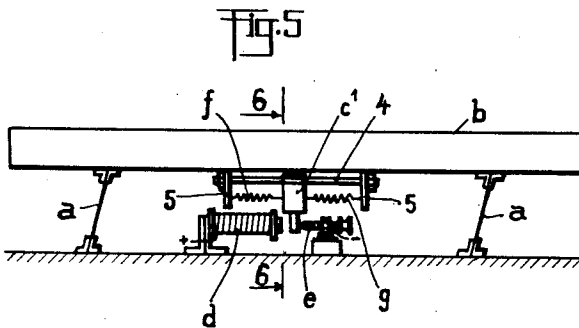
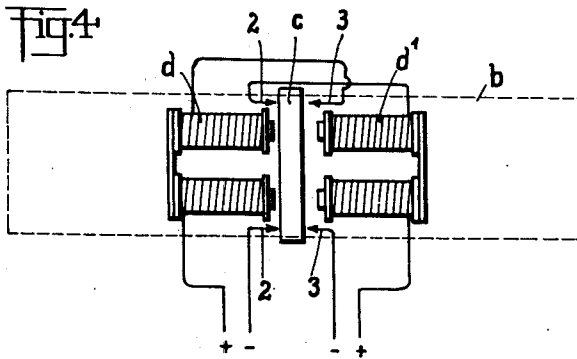
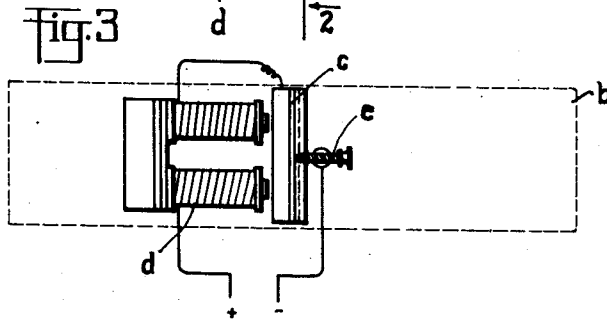
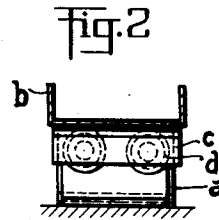
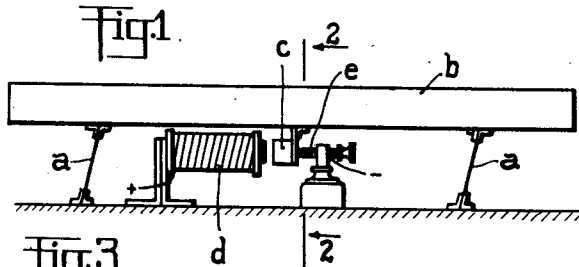
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H. ETZEL

DRIVING MECHANISM FOR OSCILLATING CONVEYERS

Filed Feb. 26, 1927

3 Sheets-Sheet 1



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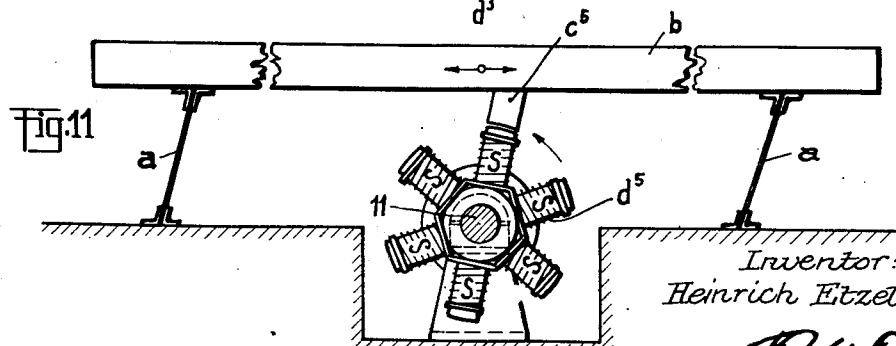
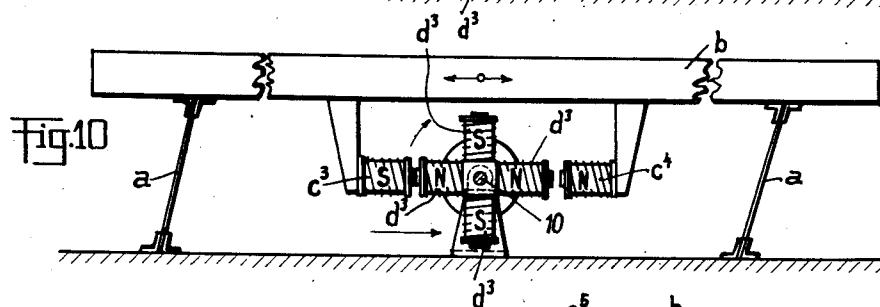
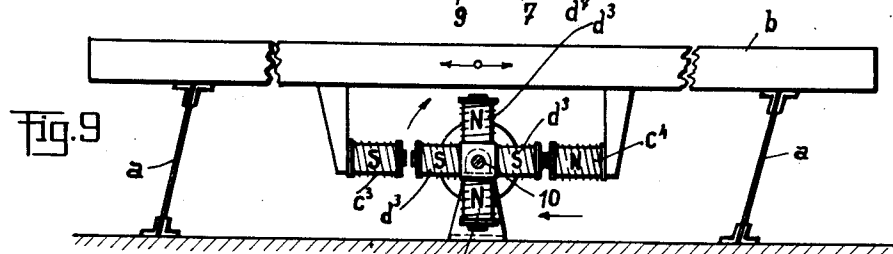
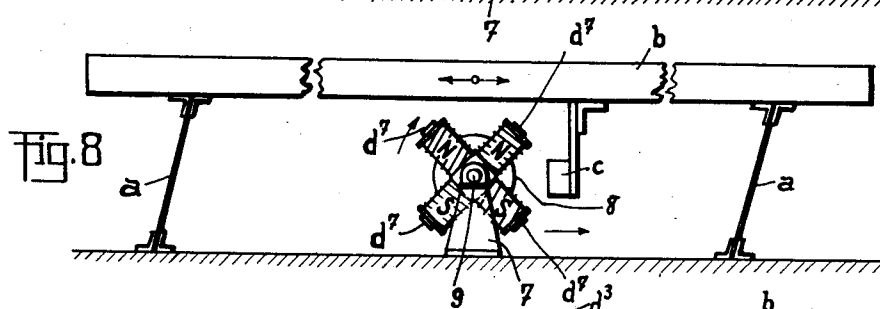
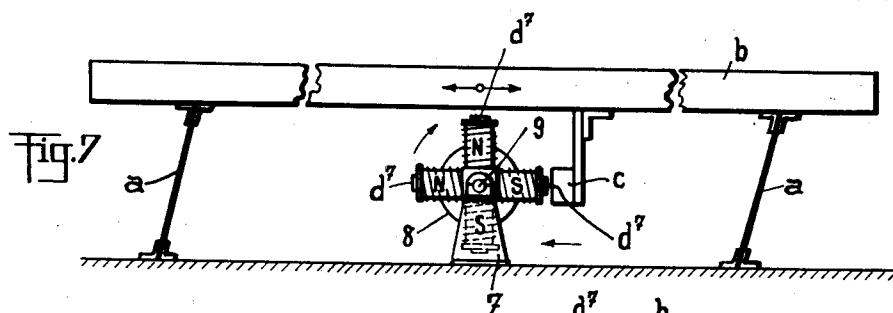
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DRIVING MECHANISM FOR OSCILLATING CONVEYERS

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3 Sheets-Sheet 2



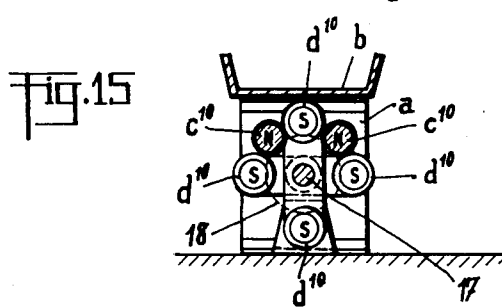
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1,672,807

DRIVING MECHANISM FOR OSCILLATING CONVEYERS

3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE.

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DRIVING MECHANISM FOR OSCILLATING CONVEYERS.

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My invention relates to improvements in driving mechanism for oscillating bodies such as conveyers for loose material comprising oscillating gutters, oscillating sieves and the like. More particularly my invention relates to driving mechanisms comprising electromagnets for intermittently imparting impulses to the body to be moved. In constructions of this type such as have heretofore been proposed, by each impulse imparted by the electromagnet the body must be accelerated from its position of rest, and it is suddenly arrested for throwing the material forwardly. The object of the improvements is to provide an apparatus of this type in which simple means are provided for smoothly feeding the material, and in which the power required for operating the apparatus is reduced to a minimum. With this object in view my invention consists in connecting an oscillating body having a very high number of natural oscillations, for example 800 or more per minute, say, a conveying gutter supported on inclined leaf springs, with one or more electromagnets adapted to impart rapid oscillating movement to the oscillating body corresponding to the natural oscillation thereof. In an apparatus of this type the power required for operating the body is comparatively small, because, after having attained the proper number of oscillations of the body, the electromagnet develops only the power needed for maintaining the natural oscillation of the body.

In one embodiment of the invention my improved apparatus comprises an electromagnet the armature of which is connected with the oscillating body of a conveying gutter, sieve or the like, and the coil of which is energized by a current which is interrupted in rapid succession according to the natural oscillation of the conveyor or sieve, the said current being either an alternating current or a direct current adapted to be interrupted by the oscillation of the body. The body may be suspended from or supported on springs which have the tendency to return the body into initial position after the said body has been attracted by the electromagnet.

Further, the oscillating body may be supported on or suspended from non-elastic members, and the return movement can be imparted to the body by means of an elec-

tromagnet the current of which is intermittently interrupted.

For the purpose of explaining the invention several examples embodying the same have been shown in the accompanying drawings, in which the same letters of reference have been used in all the views to indicate corresponding parts. In said drawings,

Fig. 1, is a partial elevation showing a conveying gutter adapted to be operated by means of a relatively fixed electromagnet having its armature connected with the gutter,

Fig. 2, is a vertical section on line 2—2 of Fig. 1,

Fig. 3, is a top plan view of the electromagnet and its armature, the gutter being shown in dotted lines,

Fig. 4, is a similar plan view showing a modification,

Fig. 5, is an elevation similar to the one shown in Fig. 1 and illustrating a modification in which the armature is elastically mounted on the gutter,

Fig. 6, is a detail sectional view taken on line 6—6 of Fig. 5,

Figs. 7 to 14, are further diagrammatical elevations showing modifications of the driving mechanism, and

Fig. 15, is a vertical section on line 15—15 of Fig. 14.

In the figures I have shown my improved driving mechanism in connection with a conveyor of the type comprising a series of oscillating gutters adapted upon each forward stroke to advance the material, but I wish it to be understood that I do not limit myself to the use of the invention in connection with a conveyor.

In the example shown in Figs. 1 to 3 the gutter *b* of the conveyor is supported on inclined leaf springs *a* rigidly fixed with their opposite ends respectively to a foundation and to the bottom of the gutter. Thus the said springs have a tendency to hold the gutter in the position shown in Fig. 1, and when oscillating the gutter there is a certain number of oscillations per minute. To the bottom of the gutter *b* an armature *c* in the form of a bar of rectangular cross-section is fixed, and the said armature cooperates with an electromagnet *d* tending, when energized, to attract the armature. When supplying direct current to the electromagnet *d* the current is automatically inter-

rupted by suitable means. To show what may be done, the circuit of the electromagnetic coils includes the armature *c* and a screw *e*, the said parts providing an automatic switch. Thus, when the armature *c* is attracted the current is automatically interrupted by the movement of the armature *c* away from the screw *e*. At the end of the oscillation of the gutter *b* to the left the springs *a* return the gutter to the right, so that the circuit of the electromagnet is again closed when the armature *c* makes contact with the screw *e*.

In lieu of the springs *a* additional electromagnets may be provided for returning the armature and the gutter into initial position. Fig. 4 shows an example the construction of which is similar to that of the example shown in Figs. 1 to 3, and the same letters of reference have been used to indicate corresponding parts. In addition to the electromagnet *d* an electromagnet *d'* is provided, the said electromagnets being alternately energized for attracting the armature *c*. The circuits of the said electromagnets are alternately closed by means of the armature *c* making contact with terminals 2 and 3. I wish it to be understood that the gutter *b* may be supported on springs in the manner shown in Fig. 1, or that it may be supported on or suspended from links having no spring action.

In Figs. 5 and 6 I have shown a modification which is similar to the one shown in Figs. 1 to 3, in which however the armature *c'* is elastically connected with the gutter. Otherwise the construction of the gutter and its operating electromagnet is the same as that described with reference to Figs. 1 to 3, and the same letters of reference have been used to indicate corresponding parts. For elastically supporting the armature *c'* two rods 4 are mounted on arms 5 depending from the gutter *b*, and the armature *c'* is longitudinally slidable on the rods 4. To opposite sides of the armature *c'* springs *f* and *g* are secured, which are connected with their other ends to the arms 5. In an apparatus of the construction shown in Figs. 5 and 6 the electromagnet acts at first on the armature *c'* by means of which the springs *f* and *g* are put under tension, the said springs transmitting similar oscillations to the gutter *b*.

In the examples so far described the electromagnet is mounted on a relatively stationary part, while the armature is fixed to the gutter. But I wish it to be understood that my invention is not limited to this feature, and that in some cases the electromagnet may be mounted on the gutter, and the armature is fixed to a relatively stationary part.

In the following figures I have shown modifications of the invention in which the

intermittent action of the electromagnet is brought about by displacing the electromagnet relatively to the armature.

In the example shown in Figs. 7 and 8, the construction of the gutter *b*, the springs *a* and the armature *c* is the same as has been described with reference to Figs. 1 to 3. In lieu of the fixed electromagnets a plurality of electromagnets *d'* arranged star-fashion are provided, which electromagnets are rotatably mounted on a suitable support 7. The polarity of the electromagnets has been indicated in the figure by the letters N and S. Suitable means are provided for rotating the electromagnets. To show what may be done, a belt pulley 8 is fixed to the shaft 9 of the electromagnets, and the said pulley is rotated from a suitable source.

In the position of the electromagnet shown in Fig. 7, the magnet S directed to the right attracts the armature *c* and the gutter *b*, and after the electromagnets have been turned into the position shown in Fig. 8, they release the armature *c*, so that the gutter *b* is moved to the right by the action of the springs *a*. Thus, upon each complete rotation of the electromagnets *d'*, the armature *c* is four times attracted and released, and the number of the reciprocating movements of the gutter *b* is four times that of the number of revolutions of the shaft 9.

In the modification shown in Figs. 9 and 10 the gutter *b* carries two magnets *c'* and *c''* having different polarities, and between the said magnets four electromagnets *d'* are provided, which are arranged star-fashion and have alternating polarity, as is indicated by the letters N and S. As shown, electromagnets *c'* and *c''* are provided, but I wish it to be understood that my invention is not limited to this feature, and that in some cases permanent magnets are used. Further, the gutter *b* is supported on leaf springs *a* rigidly secured to the gutter and the foundation. But in some cases I provide links for supporting or suspending the gutters, which links have no spring action.

In the position of the parts shown in Fig. 9, the electromagnet *d'* directed to the right and carrying the letter S attracts the co-operating electromagnet *c'* carrying the letter N, and the opposite electromagnet *d'* is repelled by the adjacent electromagnet *d'* carrying the letter S. When the electromagnets *d'* have been rotated into the position shown in Fig. 10 conditions are reversed, and the gutter *b* is shifted to the right.

It will be understood that any suitable number of electromagnets *d'* may be provided on the shaft 10.

In the modification shown in Fig. 11 the armature *c'* fixed to the gutter *b* is located above the rotary electromagnets *d'* mounted star-fashion on the shaft 11. As shown, all the electromagnets *d'* have the same polarity

S, the armature c^5 consisting of soft iron, but I wish it to be understood that my invention is not limited to this feature. In the construction shown in the figure the gap between the armature c^5 and the electromagnets can be very small, because the path of the ends of the electromagnets is substantially the same as that of the end of the armature c^5 .

In Figs. 12 and 13 I have shown modifications in which the armatures as well as the electromagnets are mounted on the gutter b . As shown in Fig. 12 a pair of electromagnets c^6 and c^7 having different polarities are mounted on a frame h slidably supported by means of rods 12 on arms i depending from the gutter b . On a bracket 13 depending from the gutter b rotary electromagnets d^8 arranged star-fashion on the shaft 14 are mounted, which electromagnets have alternating polarities, as is indicated by the letters N and S. Between the arms i and the frame h springs g^7 are interposed.

In the modification shown in Fig. 13 the rotary electromagnets d^9 are mounted on the frame h^1 slidably mounted by means of rods 15 on brackets i^1 depending from the gutter b and acted upon by springs g^8 . The armatures are provided by electromagnets c^8 and c^9 having different polarities and secured to arms 16 depending from the gutter b .

In the modification shown in Figs. 14 and 15, the axis 17 of the rotary electromagnets d^{10} is disposed parallel to the direction of the movement of the gutter b , and the electromagnets d^{10} are mounted on a disk 18 fixed to the said shaft. The armature c^{10} is fixed to an arm 19 depending from the gutter b . As shown the armature c^{10} consists of an electromagnet having the polarity N, while the rotary electromagnets d^{10} have the polarity S. The operation of the apparatus is the same as that described with reference to Fig. 11. When one of the electromagnets d^{10} approaches the electromagnet or armature c^{10} the gutter is attracted, and thereafter it is returned into initial position by the springs a , until the next electromagnet d^{10} arrives in position for attracting the armature c^{10} .

An important feature of my improved system consists in the fact that a high number of oscillations of the gutter or the like is obtained with a comparatively low number of revolutions of the rotary electromagnets.

While in describing the invention reference has been made to particular examples embodying the same I wish it to be understood that my invention is not limited to the constructions shown in the drawings, and that various changes may be made in the general arrangement of the apparatus and the construction of its parts without de-

parting from the invention, the true scope of which is shown in the appended claims.

I claim:

1. A driving mechanism for oscillating bodies such as oscillating conveyer gutters, comprising a body mounted for oscillation, an electromagnet and an armature one of which is carried by said body, and means for periodically moving said armature and said electromagnet relative to each other transversely of the lines of force, whereby the electromagnet and the armature cooperate to impart oscillating movement to said body.

2. A device as in claim 1, the part carried by said body being elastically connected thereto.

3. A driving mechanism for oscillating bodies such as oscillating conveyer gutters, comprising a body mounted for oscillation, an armature, and a plurality of electromagnets rotatably mounted for successive movement into position for cooperation with said armature to impart oscillating movement to said body, and means for rotating the electromagnets.

4. A driving mechanism for oscillating bodies such as oscillating conveyer gutters, comprising a body mounted for oscillation, an armature, a plurality of electromagnets rotatably mounted for successive movement into position for cooperation with said armature, said electromagnets and armature being mounted one on the body and the other one on a relatively stationary part, and means for rotating the electromagnets.

5. A driving mechanism for oscillating bodies such as oscillating conveyer gutters, comprising a body mounted for oscillation, an armature, a plurality of electromagnets rotatably mounted for successive movement into position for cooperation with said armature, and means for rotating the electromagnets.

6. A driving mechanism for oscillating bodies such as oscillating conveyer gutters, comprising a body mounted for oscillation, a set of revoluble electromagnets, an armature cooperating therewith, said armature and electromagnets being mounted one above the other and connected one with said body and the other one with a relatively stationary part, and means for rotating the electromagnets.

7. A driving mechanism for oscillating bodies such as oscillating conveyer gutters, comprising a body mounted for oscillation, an armature on the body, a set of electromagnets rotatable on an axis extending transversely to the direction of movement of the body, and means for rotating the electromagnets.

In testimony whereof I have hereunto set my hand.

HEINRICH ETZEL.