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VIBRATOR FOR CARD DOFFERS

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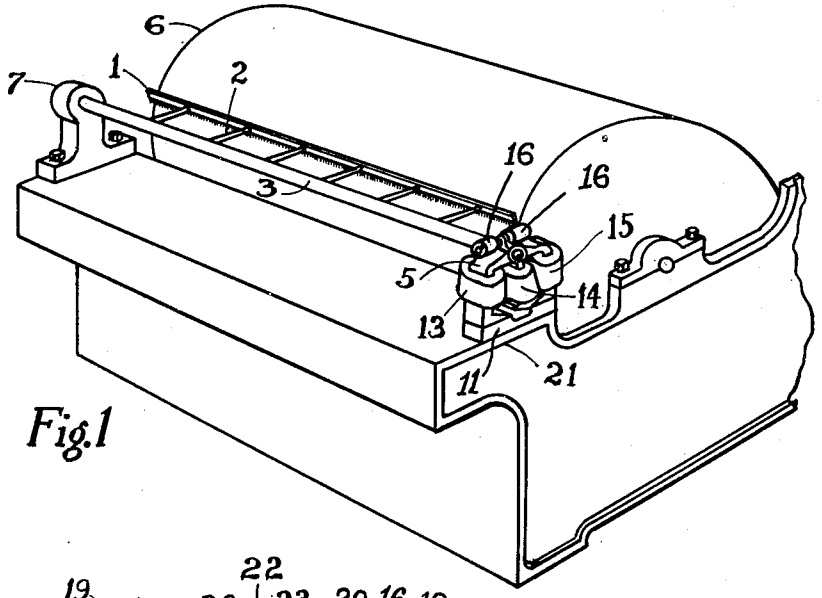


Fig.1

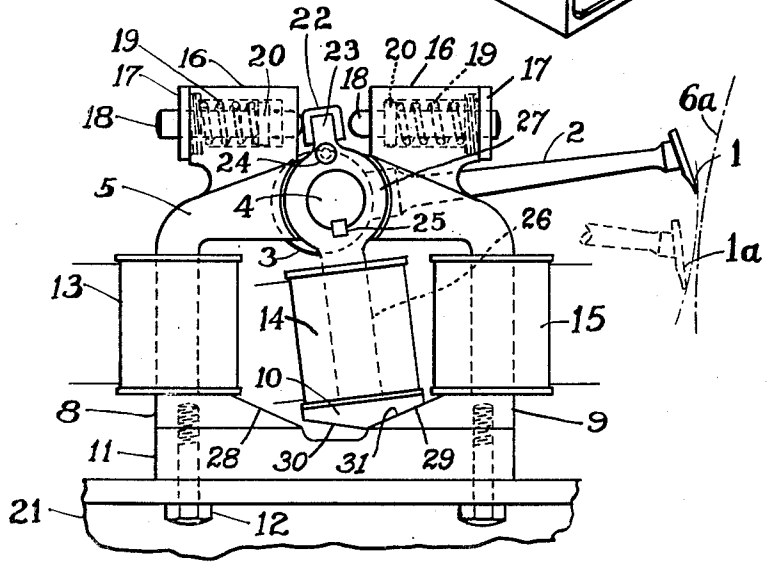


Fig.2

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VIBRATOR FOR CARD DOFFERS.

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This invention relates to cards such as are used in processing cotton, wool or other fibres, and particularly to the means for operating or vibrating the doffing comb.

In the operation of a card the vibration of the doffing comb strips the fibres from the card clothing on the periphery of the cylinder, said fibres when stripped being formed into a web which is gathered up into a strand called the "sliver".

The doffing comb is carried by a rock shaft and the means now commonly employed for oscillating the rock shaft to give the doffing comb its vibrating movement is a yoke fixed to the rock shaft, and acted upon by a rotating eccentric cam. The required vibration rate of the doffing comb is usually in the neighborhood of thirty complete excursions per second and it has been found necessary to submerge the cam and the yoke in a bath of oil to avoid excessive friction. This oil bath is generally enclosed in what is termed a "comb box" and difficulty has always been experienced in confining the oil so that it would not work out and stain the material in process. The cost of replenishing the oil has also been a considerable item.

It is one of the objects of the present invention to provide an improved mechanism for operating the doffing comb which is free from the objectionable features inherent in the known mechanism above described.

In accordance with the present invention the oscillatory movement of the rock shaft and the consequent vibratory movement of the doffing comb is secured by electromagnetic means thus enabling the yoke and cam and comb box to be entirely dispensed with.

In the illustrated embodiment of the invention such electromagnetic means comprises a direct current magnet and an alternating current magnet, one of which is connected to the rock shaft, said magnets being so associated that the reaction between them will maintain a continual oscillation of the magnet attached to the rock shaft and thus the vibratory movement of the doffer comb. With this construction the only friction which is developed in the actuating mechanism for the doffer comb is that of the bearings for the rock shaft, and these bearings if of proper design do not offer any serious lubrication problem.

In order to give an understanding of the invention we have illustrated in the drawings a selected embodiment thereof which will now be described after which the novel features will be pointed out in the appended claims.

In the drawings:

Fig. 1 is a fragmentary perspective view of the front of the card stripped of certain parts which have no connection with the present invention;

Fig. 2 shows an end elevation of the means for vibrating the doffing comb.

We shall now describe in detail the construction of the doffing comb, which of itself is not novel, and of the vibrator therefor which forms the subject of the present invention.

The doffing comb is indicated at 1 and is of the usual construction. It consists of a strip of metal, one edge of which is formed into sharp teeth for catching the fibres to strip them away from the card clothing on the cylinder 6. The comb is carried by the usual supporting arms 2 which are rigid with a rock shaft 3, the latter being journalled in suitable bearings 5 and 7. The end portions 4 of the rock shaft which are journalled in the bearings are made eccentric to the body of the shaft itself in order that the center of oscillation and the center of gravity may coincide, all as usual in doffing comb construction. The amplitude of oscillation of the comb 1 is indicated by the full and dotted lines in Fig. 2 and in said Fig. 2 the periphery of the card clothing or the outer extremity of the wires therein is indicated by the dot and dash lines 6^a.

The parts thus far described are or may be all as usual in cards and form no part of the present invention which relates to the means for oscillating the shaft 4 to give the doffing comb its vibrating movement.

In accordance with the present invention such oscillation of the shaft is derived from the co-operation of two electromagnetic elements, one of which operates with a direct current and the other of which operates with a regularly varying current such for instance as an alternating current. One of these magnetic elements is attached to the rock shaft 3 as indicated at 14, this element having a pole piece 10. The other electromagnetic element is stationarily mounted and has the two windings 13 and 15 and the

two pole pieces 8 and 9. These electromagnetic elements are so arranged that the pole piece 10 is situated between and is adapted to vibrate between the pole pieces 8 and 9. The construction of the stationarily mounted electromagnetic element is such that the frame 5 forms the cores for the windings 13 and 15 and this element is supported on a non-ferrous block 11 which in turn is secured to the card frame 21 by means of suitable bolts 12.

The electromagnetic element 14 may be secured to the rock shaft 3 in any approved way. As herein shown the core 26 thereof is provided with the enlarged portion 27 which is bored to receive one end 4 of the rock shaft 3, said core being keyed to the rock shaft by the key 25. One of these electromagnetic elements is excited by a direct current and the other by an alternating current. The direct current element will obviously have poles of fixed polarity while the polarity of the alternating current element will change with the oscillations of the current.

Owing to the relation between the electromagnetic elements the change in polarity of the portions of the alternating current element will cause the pole piece 10 to be attracted first to the pole piece 9 and then to the pole piece 8 thus causing an oscillation of the shaft 3 and a vibration of the doffer comb.

In one of the arrangements of the magnets it has been found possible to obtain the desired oscillation by introducing a direct current into the magnet 14 and an alternating current into the windings 13 and 15. The leads of the magnet windings are so connected that the pole piece 10 may be continuously of "north"-polarization while the pole pieces 8 and 9 are caused to reverse their polarity with each semi-cycle of the alternating current, the pole 8 always being of opposite polarity to that of pole 9. It is evident that the magnetizing reaction of these currents will be an attraction of the pole 10 toward the pole 8 when the latter has "south" polarity, and with the next semi-cycle of the alternating current the attraction will be toward the pole piece 9 which then takes on "south" polarity. Thus, with the polarity of the pole pieces 8 and 9 continually changing and the polarity of the pole piece 10 fixed, an oscillation is maintained of the same frequency as that of the alternating current. If the alternating current is derived from a 30-cycle generator, then the frequency of the oscillations will be consistent with common practice in respect to the vibrating of the doffer comb mechanically.

As an alternative arrangement of the magnets, it is equally possible to obtain the desired oscillation by use of an alternating current in the winding 14 and a direct current in the windings 13 and 15. In this case, the pole pieces 8 and 9 would be of fixed but opposite polarity, while the pole piece 10 would change polarity with each reversal of the alternating current. The pole 10 would then be attracted toward the poles 8 and 9 alternately according to its own attraction for a pole opposite to itself.

It will be understood, of course, that which ever arrangement is employed the core of the alternating current magnet will have a laminated structure as is the usual practice. In case the core of the magnet 14 has a laminated structure these laminations may be held together at their upper end by a stud or rivet indicated at 24.

It is a well known fact that magnetic lines of force are very much reduced in density by increasing the air gap between the pole pieces and the armature of a magnet. Bearing this in mind the pole pieces 8, 9 and 10 have been specially shaped to provide at all times a minimum air gap between them. The pole pieces 8 and 9 are formed with the inclined faces 28, 29 and the pole piece 10 has the two inclined faces 30, 31, these several faces being so arranged that when the magnets are in the relative position shown in Fig. 1 the faces 29, 31 are in engagement while when the magnet 14 swings to the left Fig. 2 the faces 28 and 30 will be in engagement. Owing to the inclination of the faces, however, there is a relatively small air gap between any two pole pieces even when they are separated to their greatest extent.

While the air gap has been minimized as far as possible as between the pole pieces 10 and either of the poles 8 or 9, the power consumption necessary to maintain a continuous oscillation of the comb can be reduced in another way, namely by the application of springs to assist in starting the stroke and to make up for the loss of efficiency of the magnets at the time the air gap is greatest.

There are two springs 19 which are provided for this purpose. They are coiled about plungers 18 which are supported in housings 16, the springs at one end bearing against the screw caps 17 of the housings and at the other end bearing against collars 20 on the plungers. The core of the magnet 14 is provided with an extension 23 which is shown as enclosed by a saddle 22, said saddle being situated between the inner ends of the plungers 18. These plungers 18 thus constitute suitable bumpers or cushion devices for the oscillating rock shaft and during the final movement of the rock shaft in either direction one of the springs is compressed. The energy thus stored up in the spring reacts to reverse the direction of motion of the oscillating unit at the time when the polarity of the magnet is changed by the alternating current.

The construction above described is simple and comprises a minimum of mechanical parts and may be operated with extreme accuracy.

We claim:

1. The combination with the doffer comb of a card and the rock shaft on which it is mounted, of two electromagnetic elements, one of which is carried by the rock shaft, one of said elements being a direct current element and the other arranged to operate with a regularly varying current, and said elements being so coordinated that the reaction between them will maintain a continuous oscillation of the element carried by the rock shaft.

2. In a device of the class described, the combination with a doffer comb of a card and a rock shaft on which it is mounted, of a stationarily mounted electromagnetic element, a second electromagnetic element carried by the rock shaft, one of said elements being a direct current element and the other an alternating current element and said elements being so co-ordinated that the reaction between them maintains a continuous vibration of the comb at the same frequency as that of the alternating current used.

3. In a device of the class described, the combination with a doffer comb of a card and a rock shaft on which it is mounted, of a stationarily mounted electromagnetic element, a second electromagnetic element carried by the rock shaft, one of said elements being a direct current element and the other an alternating current element and said elements being so co-ordinated that the reaction between them maintains a continuous vibration of the comb at the same frequency as that of the alternating current used, and springs by which the initial movement of the rock shaft in each direction is accelerated.

In testimony whereof we have signed our names to this specification.

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ROBERT S. ROBERTSON.