To all whom it may concern:

Be it known that I, DANIEL M. LUEHRS, a citizen of the United States, residing at 5 Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Carriers for Drying Ovens, of which the following is a specification.

This invention relates to improvements in drying ovens for painted or decorated sheets of magnetizable metal, whereby the plates are carried through the oven without danger of being marred by movement on or relatively to their supports. In ovens for this purpose, the plates are fed one at a time into the oven where they are picked up by arms attached to an endless conveyor and carried slowly through the oven and then discharged. In one type of oven, the conveyor travels about horizontally arranged shafts and is provided with arms which project outwardly from the conveyor chains. The plates are picked up by the arms while the latter are moving upwardly, and the arms and plates during their circuit from the inlet to the discharge end are inverted. In such structures, various mechanical devices are necessary to prevent the plates from moving on the arms and becoming marred, and even with such devices, some marring of the decorated surfaces of the plates occurs.

In order to obviate the necessity for such mechanical devices and to hold the plates securely on the conveyor arms from the inlet to the discharge point, I provide magnets upon the various arms and means for closing the circuit through the magnet on each arm while the latter is moving upwardly and after a sheet metal plate has been fed on to the arm. These circuits are maintained while the plates are being carried through the oven and are broken when the arms reach the discharge point, each arm at this latter point being in the depending position, and when the circuit through the magnets of the arm is broken the plate slides by gravity on to the delivery chute. It will be understood, of course, that the unpainted sides of the sheet metal plates lie against the carrier arms, and as they are held immovably upon the arms by the magnetic force, from the inlet to the outlet points, they cannot become marred in transit through the oven.

As it is always possible that the electric current from the power source may fail while the oven is in operation, in which event the magnets would become de-energized and the sheet metal plates would drop from the arms on the lower run of the conveyer, I provide a conveyer belt arranged a short distance below the first mentioned conveyer, and traveling at the same rate of speed, as an emergency device to support the sheet metal plates in case the current fails and the plates drop from the carrier arms. Should this occur, the plates will be supported upon the lower conveyer, resting between the arms of the upper conveyer until carried to the outlet end of the oven.

In the accompanying drawing,

Fig. 1 is a side elevation of conveying apparatus embodying my invention, the drying oven being partly shown in section;

Fig. 2 is a section on the line 2—2 of Fig. 1, showing the end of the feed chute and one of the plate carriers; and,

Fig. 3 is a side view of the same.

Referring to the drawing, A indicates a drying oven within which is arranged a suitably supported rectangular frame B. Upon horizontal shafts 1, suitably supported at the corners of the frame, are sprocket wheels 2, which carry parallel endless conveyer chains C. A series of fingered plate carriers e is attached to the chains C, these carriers being evenly spaced apart and projecting outwardly substantially at right angles to the chains. As shown in Fig. 2, each carrier e has several fingers 4 which inter-leave with the fingers 5 of a feed chute 6 while the carriers are passing said chute. The plate carriers are made wholly or partly of non-magnetic material and upon the fingers 4 are arranged electro-magnets 7. The number of magnets, as well as their location, may be varied, but for the purposes of illustration I have shown the feed plates with three fingers and a magnet arranged upon each finger. The electric current for energizing these magnets is supplied through a bare conductor or trolley wire 8, which is supported on the frame B, parallel with the chains C, and each carrier plate is provided with a suitably insulated spring contact arm 9, having a shoe 10 which engages the trolley. An insulated conductor 11, on each carrier plate connects the contact arm with the coils of the several magnets on the plate. One terminal of each coil is grounded upon the plate, as shown at 12, and the return circuit to the source of current supply is through the plates,
chains and other metal parts, the circuit connections to the source of power being omitted from the drawing. The conveyor moves in the direction of the arrows, Fig. 1, and the feed chute 6 is located near the lower end of the ascending part of the conveyor. The trolley or feed conductor 8 commences to extend parallel with the chains at a point above the feed chute, and this conductor terminates at a point slightly below the feed chute. Hence, the contact arms on the plate carriers will engage the trolley wire, while moving upward, after passing the feed plate and the magnets will be energized until the contact arms leave the end of the trolley wire. This interruption of the circuit occurs after each carrier plate has passed beyond the end of a delivery chute 13.

In operation, the metal sheets, painted or decorated on one side only, are fed automatically into the oven, by way of the chute 6, with the painted or decorated surfaces uppermost and the plain sides of the sheets lying against the feed chute. This feeding mechanism, not shown, is tuned to the movement of the conveyor and as each sheet or plate is fed into the oven, it is picked up mechanically by one of the plate carriers.

Immediately after the plate has been positioned upon the plate carrier, the electric circuit through the magnets on that carrier is closed by reason of the engagement of the contact arm on the carrier engaging the trolley or feed wire. Thereafter, the plate is held firmly by the attraction of the magnet and travels its course through the oven and is finally released by the interruption of the current through the magnets, immediately after the plate carrier has moved into position to deliver the decorated plate upon the chute 13. At this point, the contact arm on the plate carrier leaves the trolley wire, the magnet becomes de-energized and the plate slides by gravity on to the delivery chute and out of the oven. With this arrangement, each plate remains immovable upon the plate carrier throughout its course through the oven and therefore cannot become scratched or marred, and no mechanical holding or gripping devices are required to hold or handle the plates. As the decorated plates are picked up mechanically by the ascending plate carriers, it is not essential to close the circuits through the magnets until these carriers are about to swing to the vertical position; but preferably the trolley commences at a point close to the feed plate so that the magnets will be energized practically as soon as the plates are picked up.

When the plates are received on the arms of the conveyor, the decorative coating on the upper sides of the plates is in a more or less fluid state. It is therefore desirable to hold the plates in horizontal position during the first part of their movement through the oven, to permit the coating substance to become dry enough to prevent it from flowing when the plates are tilted. The ascending course of the conveyor, shown at the left in Fig. 1, has sufficient length for this purpose, and the plates are held in horizontal position by the conveyor arms on this course. After passing into the upper and hottest part of the oven, the plates may be tilted without causing the coating material to flow.

In traveling through the oven, the plates are inverted, and their decorated sides face downward on the descending course of the conveyor, at the right in Fig. 1. If they were released and discharged at this point, their decorated sides would be marred by contact with the discharge chute. They are, therefore, not released until they have turned through a further angle of more than 90 degrees, at a point on the lower course of the conveyor where the latter starts to ascend, when the release of the plates will cause them to slide off the arms on to the discharge chute with the undecorated sides of the plates next to the chute.

Should the electric current, from the current source, fail at any time while the oven is in operation, the decorated sheets on the plate carriers at the bottom of the conveyor would immediately drop off of the carriers, and in order to provide for an emergency of this kind, I arrange below the conveyor C, an endless conveyor belt D, which travels at the same rate of speed as the conveyor C. The upper part of the belt D is arranged a short distance below the plate carriers so that if the current fails and the decorated sheets are released from the depending carriers they will drop on to the belt D and stand edgewise thereon, leaning against one or the other of adjacent carriers. Upon failure of the current, the conveyors will be automatically stopped by mechanism, not shown, but such sheets as are carried on the belt D to the delivery end of the oven will be dropped upon the chute 14.

What I claim is:

1. In a drying oven for decorated sheets of magnetizable material, an endless conveyor having a series of spaced-outwardly-projecting arms, said conveyor having an ascending course, and said arms while on said ascending course adapted to carry sheets in substantially horizontal positions, means at a lower part of said course for delivering sheets on to said arms while on said course, magnets on the arms for holding the sheets against sliding movement thereon, means for energizing said magnets while the arms are on said course and until they have traversed the circuit of the conveyor to a point where
the plates may slide edgewise off of the arms by gravity, and means for then de-energizing said magnets.

2. In a drying oven for decorated sheets of magnetizable metal, an endless conveyor having a series of spaced outwardly projecting arms, said conveyor having an ascending course, and said arms, while on said ascending course adapted to carry sheets in substantially horizontal positions, means at the lower part of said course for delivering sheets on to said arms, magnets on the arms for holding the sheets against movement thereon, means for energizing said magnets while the arms are moving on said ascending course and until said arms have traversed the circuit of the conveyor to a point where the arms start to ascend, and means for then de-energizing said magnets.

3. In a drying oven for decorated sheets of magnetizable metal, an endless conveyor having its courses arranged in a vertical plane and having a series of spaced outwardly projecting arms, said conveyor having an ascending course and a lower horizontal return course, means for delivering plates on to said arms while said arms are on the ascending course, magnets on the arms for preventing sliding movement of the plates, means for energizing said magnets while the plates are being carried around from the ascending course to approximately the end of the return course and for then de-energizing said magnets, and an auxiliary conveyor below the return course movable in the same direction and at the same speed as the return course.

4. In a drying oven for decorated sheets of magnetizable material, an endless conveyor having a series of spaced outwardly projecting arms, said conveyor having an ascending course at one side of the oven and upper and lower courses extending back and forth through the oven, and said arms, while on said ascending course adapted to carry sheets in substantially horizontal positions, a chute at the lower part of said ascending course adapted to hold sheets in position to be picked up by said arms, magnets on the arms for holding the sheets against movement thereon, means for energizing said magnets while the arms are moving on said ascending course and until said arms have traversed the circuit of the conveyor to a point where the lower course starts to ascend, and means for then de-energizing said magnets.

5. In a drying oven for decorated sheets of magnetizable material, an endless conveyor having a series of spaced outwardly projecting arms, said conveyor having an ascending course and said arms, while on said course, adapted to carry the sheets in substantially horizontal positions, a chute at the lower part of said course adapted to hold sheets in position to be picked up by said arms, magnets on the arms for holding the sheets against movement thereon, means for energizing said magnets while the arms are moving on said ascending course and until said arms have traversed the circuit of the conveyor to a point below said chute, and means for then de-energizing said magnets.

In testimony whereof I affix my signature.

DANIEL M. LUEHRS.