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MATERIAL HANDLING APPARATUS

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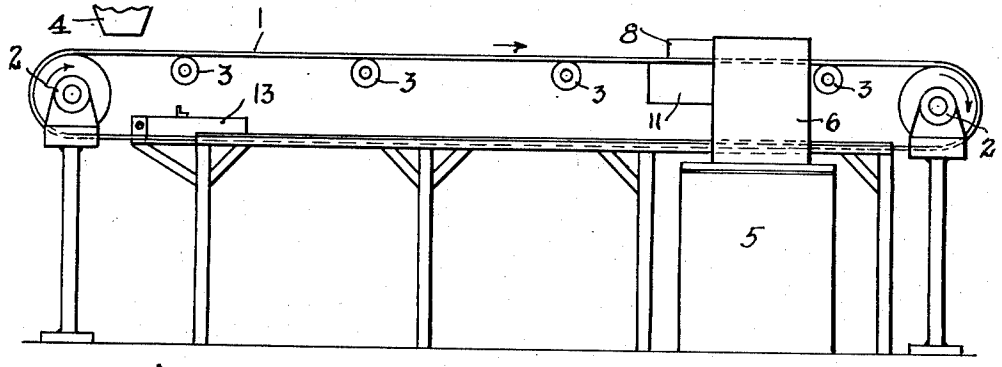


Fig. 1

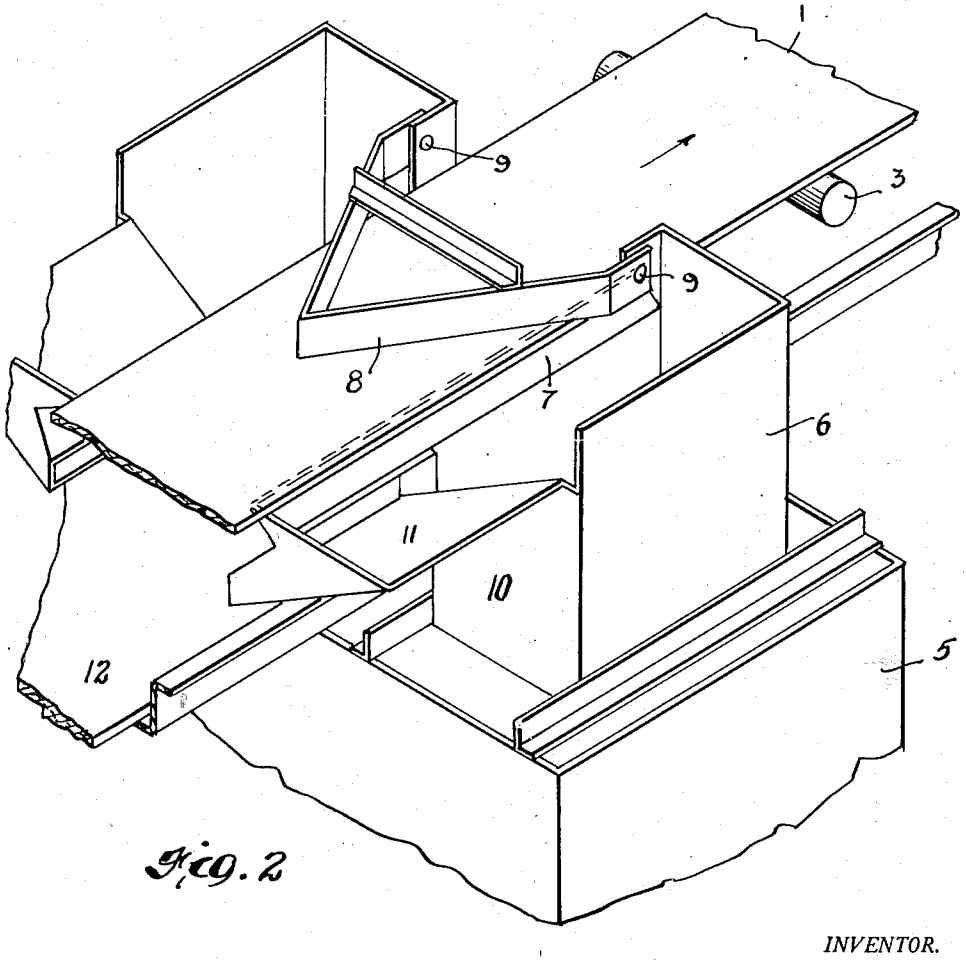


Fig. 2

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MATERIAL HANDLING APPARATUS

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1

This invention relates as indicated to material handling apparatus and more especially to the type of apparatus used for the purpose of handling sand in industrial plants, such as foundries.

In many mechanized foundries, a plurality of molding stations are arranged side by side in a line, each such station having positioned thereabove a hopper containing a supply of the sand necessary for the molding operation. The sand in such hoppers is sometimes kept replenished by arranging an endless belt conveyor alongside of the line of hopper and such hoppers may occur on either one or both sides of the conveyor belt. The reconditioned sand ready for use is supplied to the conveyor belt from a suitable source and usually in a continuous stream and as such stream of sand is moved past the hoppers, movable plows positioned above the conveyor belt adjacent each hopper intercept the stream of sand on the conveyor and divert a portion thereof into the hopper. It is with regard to mechanism of this character that my invention particularly pertains.

In this type of apparatus the amount of sand used by each hopper varies from time to time and the amount of sand required by the several hoppers may vary over wide limits. This makes necessary some control over the plows referred to above, so that the proper amount of sand is diverted to each hopper in order to keep it supplied. This control is generally effected in two ways; either by having the operator at the molding station himself and by means of a lever or pulley arrangement adjust the setting of the plow which diverts the sand to the hopper at his station or by having an operator positioned at the elevation of the conveyor and whose job it is to attend to the adjustment of the several plows feeding the respective hoppers so as to maintain the latter filled to the proper extent.

Both of these methods of controlling the sand feed have not been entirely satisfactory, since they are each dependent upon the human element and it is quite easy for either the operator or the attendant to overlook or forget the situation existing with respect to a particular hopper. When this happens the hopper either runs out of sand, delaying the operation of the molding station which it is to serve, or overflows, spilling sand onto the floor and otherwise interfering with the efficient operation of the plant.

It is a principal object of my invention to provide an apparatus by which a constant and predetermined supply of sand is fed to each hopper, sufficient to satisfy the normal requirements of that molding station with means for so controlling any overflow which may occur so that any such overflow as does occur is not spilled onto the conveyor walkway, molding machine and molder, but is directed to the return strand of the conveyor belt, and plowed off for reuse with or without reconditioning.

2

Other objects of the invention will appear as the description proceeds.

To the accomplishment of the foregoing and related ends, said invention then comprises the features hereinafter fully described and particularly pointed out in the claims, the following description and the annexed drawing setting forth in detail certain illustrative embodiments of the invention, these being indicative, however, of but a few of the various ways in which the principle of the invention may be employed.

In said annexed drawing:

Fig. 1 is a side elevational view of a sand handling installation of the character previously referred to and in conjunction with which my invention may be advantageously employed; and

Fig. 2 is a perspective drawn to an enlarged scale of a portion of the apparatus illustrated in Fig. 1 and illustrates somewhat more clearly and in more detailed fashion one embodiment of my invention.

Referring now more specifically to the drawing and more especially to Fig. 1, the apparatus here illustrated comprises an endless conveyor belt 1 trained about elevated rollers or drums 2 by which the belt is primarily supported and driven, there being provided a plurality of idler rolls 3 as one means of supporting the upper run of the belt, such rollers being spaced at intervals sufficiently close so that there is no appreciable sagging of the upper run of the belt. In this connection, it should be noted that the construction of the belt itself, the supporting and driving means therefor, as well as the means for feeding sand to the upper run of the belt including a device such as a hopper diagrammatically illustrated at 4, form no part of the present invention and since they are all of standard construction well known to those familiar with the art, a more detailed explanation thereof will not be given.

As previously indicated, my invention is concerned primarily with means for maintaining a proper and continuous supply of sand in a hopper generally indicated at 5, positioned alongside

the conveyor and from which hopper sand is withdrawn for the molding operation. The embodiment of my invention which has been selected for purposes of illustration is shown in the perspective view, Fig. 2, wherein the hopper generally indicated at 5 is shown provided with a box-like, vertically projecting extension 6 so arranged as to be closely proximate the side of the conveyor belt. The wall of the box 6, which is immediately adjacent the conveyor belt, is provided with a flange generally indicated at 7 which extends from the upper edge of such box side to a line underneath the edge of the conveyor belt to insure that any sand discharged laterally from the conveyor belt in this vicinity is properly directed into the hopper through the box 6.

In the embodiment illustrated in Fig. 2, a separate hopper is shown on each side of the belt. As will be evident from the ensuing description, the invention is applicable to constructions in which there are hoppers arranged on only one side of the belt or, in any event, in which in a particular area there is only one hopper adjacent the belt.

As likewise previously indicated, the sand which is carried on the upper surface of the movable belt 1 in the direction generally indicated by the arrow in Fig. 2 is intercepted by means of a plow 8, the illustrated form being such that one leg of the plow directs a portion of the intercepted stream into the hopper on one side of the belt and the other leg of the plow directs the remainder of the intercepted stream to the hopper on the other side of the belt. When only one hopper is located at a particular station, the plow will preferably extend entirely across the upper run of the belt 1 with a suitable means provided at the side of the belt opposite the hopper for supporting the plow in the desired adjustable relation to the belt. It is to be understood, that where there is a plurality of hoppers arranged alongside the belt, there will be a corresponding number of plows.

In the modification illustrated in Fig. 2, the plow 8 is supported at its wide ends by means of pivotal connections 9 made with an upper edge of one of the walls of the box 6. This pivotal connection may be provided with means whereby the elevation of the plow may be regulated and held at a predetermined adjustment. Means for accomplishing such result may take any of several forms and the mode of accomplishing such result will be quite apparent to those skilled in the art and accordingly, for simplification of the present description and illustration, they have been omitted.

The wall 10 of the box 6 which faces in the direction of travel of the upper run of the belt 1 is cut away to provide what amounts to an overflow weir so that as the sand builds up in the box 6, due to the hopper 5 becoming filled, the excess sand will build up against the sand in the box over the lip of the weir and such overflow or excess sand is then caught by an inclined chute 11 which projects the sand onto the lower run 12 of the conveyor belt. The overflow or excess sand thus deposited on the return run of the conveyor belt may be removed laterally therefrom by means of a plow generally indicated at 13, the construction and mode of operation of which is similar to the previously described plow 8 and the effect of which is to move the excess sand from the lower run of the belt and such sand may then be returned by

suitable conveyor means back to the upper run of the belt, since the sand thus recovered has been in no way contaminated and is in the proper condition for use. Any suitable conveyor means such as a screw conveyor may be employed for the purpose of elevating the sand discharged by the plow 13 to the upper run of the conveyor belt 1 and since such elevating conveyor may take any of several forms, specific illustration of any single form has been believed unnecessary.

From the foregoing description it will be observed that I have provided means for insuring a constant and continued supply of sand to each hopper. In general the setting of the plow 8 will be so adjusted so as to just slightly more than satisfy the requirements of the hopper with which it is associated.

Instead of forming the discharge opening in the box 6 for the excess sand in the side of the box facing the direction of travel of the sand on the conveyor belt 1, such opening may be formed in any of the other sides of the box and a suitable discharge chute provided to carry the sand back to the lower run of the conveyor belt. When operating with foundry sand which has been conditioned for use, however, it has been found that the arrangement illustrated in Fig. 2 is the only practical arrangement. Foundry sand conditioned for use has an unusually high angle of repose and its consistency is such that it does not readily flow over a body of such sand. By using the apparatus illustrated in Fig. 2, the excess sand, as it approaches the full box 6, instead of being required to flow over the sand in the top of such box, merely builds up against the forward edge of the pile of sand in the upper end of such box and then falls by gravity onto the chute 11 where it is discharged onto the lower conveyor web 12. This arrangement, therefore, is especially suited to the handling of materials such as foundry sand which have an extremely high angle of repose.

Other modes of applying the principle of the invention may be employed, change being made as regards the details described, provided the features stated in any of the following claims or the equivalent of such be employed.

I therefore particularly point out and distinctly claim as my invention:

1. In a material handling apparatus, the combination of a substantially horizontal conveyor; a hopper adjacent one side of said belt; a plow extending over said belt and positioned to intercept and direct a portion of the material on said belt into said hopper; the wall of said hopper adjacent and parallel to the edge of said conveyor belt, and the wall of said hopper closest to the approaching material and generally transverse to the path of movement of said belt each being lower than the remaining walls of the hopper which extend above the normal height of material on said belt, said lower wall of the hopper closest to the approaching material and generally transverse to the path of movement of said belt thus constituting an overflow weir for excess material fed into the hopper from said belt; and a material delivery chute extending laterally of said weir.

2. In a material handling apparatus, the combination of a substantially horizontal conveyor belt; a hopper adjacent one side of such belt, formed with a flange parallel to the edge of said belt and extending underneath said belt; an adjustable plow extending diagonally

across a portion of said belt for intercepting material on said belt and for moving such material laterally into said hopper; an overflow weir on the side of said hopper closest to the approaching material located below the top edges of said hopper so that the material flows over the top edge of said weir when said hopper is full; and a material delivery chute extending laterally of said weir.

3. In a material handling apparatus, the combination with a horizontally arranged endless conveyor belt having its upper and lower runs in substantially vertically spaced relation, a hopper adjacent one side of such belt formed with a flange parallel to the upper edge of said belt and extending underneath the upper run of said belt; a plow set to intercept material and to move a portion of such material laterally into said hopper; an overflow weir on the side of said hopper closest to said approaching material located below the top edges of said hopper so that the material will flow over the top edge of said weir rather than overflow said hopper edges; and an open chute leading from said weir to the lower run of said conveyor belt.

4. In a material handling apparatus, the combination of a substantially horizontal conveyor belt; a hopper adjacent one side of said belt; a plow extending over said belt for intercepting and directing material therefrom into said hopper, the lateral wall of said hopper closest to the approaching material and generally transverse to the path of movement of said belt being lower than the effective height of the remaining lateral walls of said hopper, said lower lateral wall constituting an overflow weir for excess material fed into said hopper; and a material delivery chute extending laterally of said weir.

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