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MINE CONVEYER

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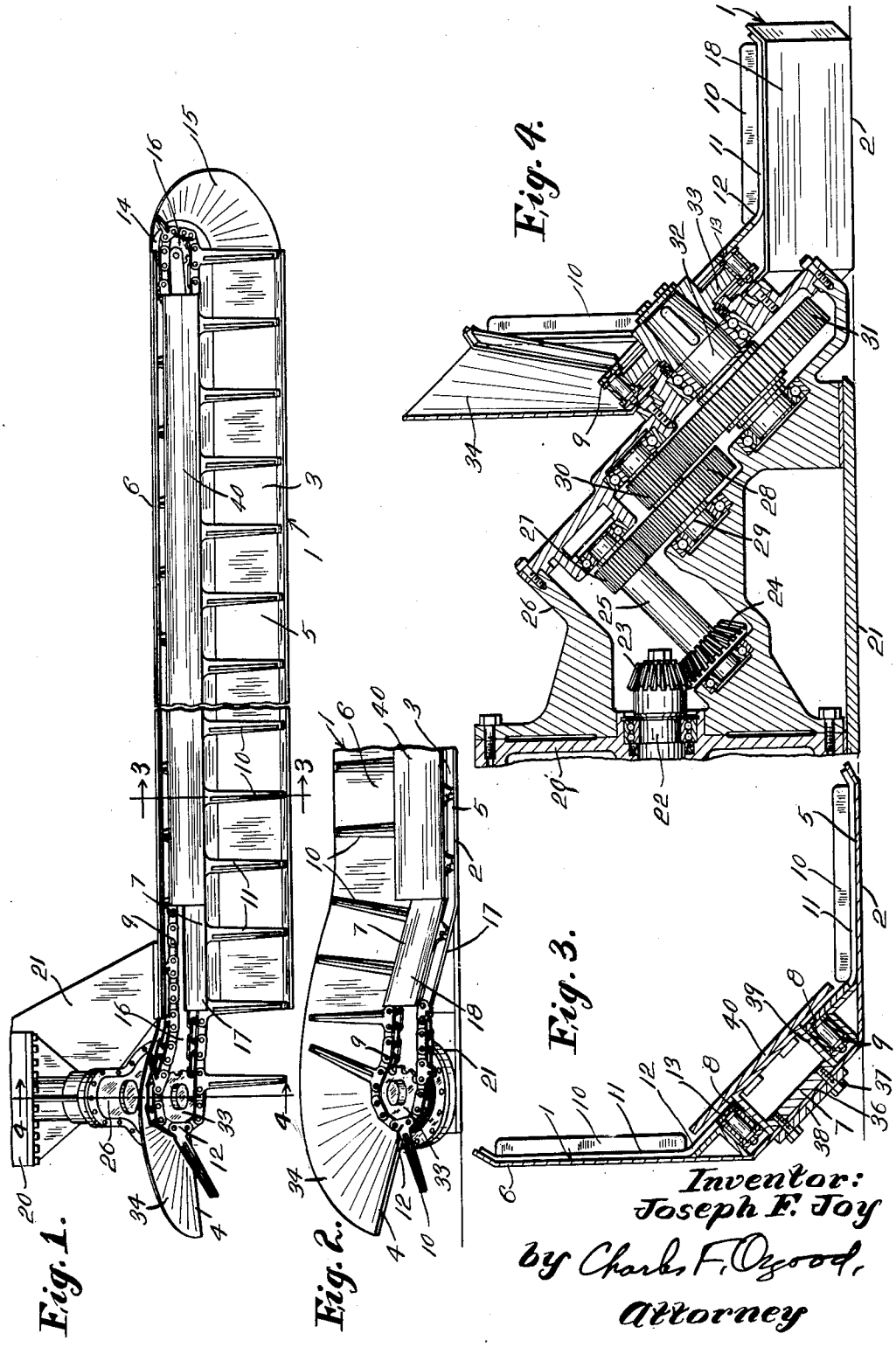


Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

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MINE CONVEYER

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17 Claims. (Cl. 198—171)

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This invention relates to conveyors and more particularly to face conveyors of the endless chain, lateral flight type especially designed for use in underground coal mines.

In face conveyors such as are used in coal mines, extreme lateral compactness is essential since the space at the coal face is relatively restricted, and this is particularly so at longwall faces or at the faces of pillars during pillar extraction or similar work. In known types of face conveyors the conveyor flights are pivotally connected to the endless conveyor chain on pivotal axes extending parallel to the path of travel of the chain and are so arranged and constructed that the flights may swing up into vertical folded positions along the return run of the chain in an extremely compact manner. Such pivoted conveyor flights are, however, relatively complicated and expensive in construction and create undesirable wear, ofttimes necessitating frequent replacement of parts. The present invention contemplates improvements over such known types of conveyors in that not only is extreme lateral compactness obtained but also all loose pivotal connections between the conveyor flights and the conveyor chain are eliminated, resulting in simplicity of construction. The conveyor, in accordance with the present invention, has a guideway for the conveyor chain arranged and constructed in a novel manner whereby the active flights of the conveyor move horizontally along a bottom frame close to the mine floor and the active flights at the return run of the chain are disposed vertically thereby resulting in extreme lateral compactness while the desired simplicity in construction is attained. The conveyor of the present invention is relatively rugged and durable in design, well adapted for its intended purpose.

An object of the present invention is to provide an improved mine conveyor. Another object is to provide an improved endless, flight type face conveyor especially designed for use in underground coal mines. A further object is to provide an improved conveyor of the endless chain, lateral flight type having an improved guiding frame structure whereby the guideways for the conveyor chain are arranged in a novel manner to obtain extreme lateral compactness. A still further object is to provide an improved conveyor frame having longitudinal frame portions arranged in right angular relation with respect to a central guide portion, with one frame portion horizontally disposed at the floor level and the other frame portion vertically disposed at a point

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spaced rearwardly from the coal face, and with such intermediate guide frame portion disposed in an inclined position symmetrically between the relatively inclined frame portions. Still another object is to provide an improved endless conveyor chain having a novel arrangement of the conveyor flights thereon. These and other objects and advantages of the invention will, however, hereinafter more fully appear in the course of the ensuing description.

In the accompanying drawing there is shown for purposes of illustration one form which the invention may assume in practice.

In this drawing:

Fig. 1 is a plan view of a mine conveyor constructed in accordance with an illustrative embodiment of the invention.

Fig. 2 is a fragmentary side view of the elevated discharge end of the conveyor.

Fig. 3 is an enlarged cross section taken on line 3—3 of Fig. 1.

Fig. 4 is an enlarged cross section taken on line 4—4 of Fig. 1, showing details of the conveyor drive.

In this illustrative embodiment of the invention, a face conveyor is provided which is especially designed for use at the coal face of an underground coal mine, but it will be evident that the features of the invention may be embodied in conveyors of other types and may be used for other purposes.

The conveyor of the present invention is adapted to extend longitudinally in parallelism with a coal face with the active run of the conveyor chain running close to the coal face horizontally near the level of the mine floor, so that coal which is dislodged from the face may be received by the conveyor and moved along the face lengthwise of the conveyor to a suitable point of discharge, all in the manner fully disclosed in my copending application, Serial No. 217,331, filed March 24, 1951.

The conveyor, as shown in the drawing, comprises an elongated frame, generally designated 1, resting upon and slidable on its plane bottom 2 over the mine floor. The conveyor frame has a front longitudinal exposed receiving portion 3 which is adapted to extend in parallelism with the coal face and an elevated discharge end 4, and the conveyor is adapted to be advanced toward the coal face as mining progresses in a direction transverse to its length by suitable feed jack devices (not shown), also in the manner disclosed in the above mentioned copending application.

The conveyor has a horizontal lateral bottom frame portion 5 and a rearward vertical frame portion 6, with the frame portions arranged in right angular relation, as shown in Fig. 3. The outer surfaces of the frame portions 5 and 6 lie in the sides of a right angle triangle and arranged intermediate the frame portions is an inclined guide frame portion 7. This central guide frame portion is arranged in planes at right angles to a plane passing through the apex of the triangle and bisecting the frame and is located within the included projection of the triangle, as shown in Fig. 3. The inclined guide portion 7 is disposed at 45° with respect to the bottom frame portion 5. This intermediate guide frame 7 provides guideways 8 in which an endless conveyor chain 9 is guided for orbital circulation, and attached to the chain are angularly disposed, lateral conveyor flights 10. These conveyor flights are suitably secured to arms 11 disposed at substantial angles with respect to the planes of the guideways and having bent portions 12 suitably fastened at 13 at their inner ends integral with the top side links of the chain. The active conveyor flights are arranged to move horizontally along the top surface of the bottom frame portion 5 and the flights at the return run of the conveyor chain move in a vertical position along the inner surface of the vertical rearward frame portion 6. The conveyor frame has an end section 14 which is laterally flared at 15 and curves downwardly, and journaled on this intersection is a guide sprocket 16 about which the conveyor chain passes, and the flared portion 15 permits the conveyor flights to move arcuately downwardly from their vertical inactive position into horizontal active position. The conveyor frame also has at its opposite discharge end 4 an end frame section 17 provided with an elevated portion 18 so that the conveyor chain inclines upwardly to bring its active flights above the floor surface into a position to effect discharge of the material being conveyed. There may be embodied in the conveyor structure a conventional means (not shown) for varying the tension of the conveyor chain.

As shown in Figs. 1 and 4, a motor 20 is mounted on a horizontal support 21 which rests on the mine floor and this motor has its power shaft 22 horizontally disposed and extending transversely of the conveyor frame. Secured to the motor shaft is a bevel pinion 23 which meshes with a bevel gear 24 fixed to an upwardly inclined shaft 25 suitably journaled in bearings supported within a gear housing 26. Secured to the shaft 25 near its upper end is a spur pinion 27 which meshes with and drives a spur gear 28 secured to a parallel inclined shaft 29 likewise suitably journaled in bearings supported within the gear housing. Secured to the shaft 29 is a spur pinion 30 meshing with a spur gear 31 secured to an inclined shaft 32 arranged parallel with the shafts 25 and 29 and likewise suitably journaled in bearings supported within the gear housing. Fixed to the upper end of the shaft 32, exteriorly of the gear housing, is a chain sprocket 33 which engages and drives the conveyor chain 9. The conveyor frame of the end discharge section 16 is outwardly and downwardly flared at 34 so that the conveyor flights as they pass around the drive sprocket 33 may move upwardly from their active horizontal position to their inactive vertical position as shown. By elevating the discharge end of the conveyor frame as shown in Fig. 2 a conventional cooperating conveyor may be located on the mine floor beneath the elevated discharge end of the face conveyor to receive the material discharged therefrom, in a manner also disclosed in the copending application above referred to.

It will be noted that as the conveyor chain travels about the guide sprocket 16 and the drive sprocket 33, the conveyor flights move in paths lying in the surfaces of inverted cones whose inclined axes are in alignment with inclined axes of rotation of the sprockets, and the flared portions 15 and 34 of the conveyor frame permit such movement of the flights as the latter move arcuately between horizontal and vertical positions.

The conveyor frame is desirably of a fabricated construction, either bolted or welded, and its main body is formed of a metal plate properly bent into shape to provide the right angle frame portions 5 and 6, and the intermediate portion 36 of the body is secured as by screws 37, engaging an outer plate 38, to the central guide frame portion 7. The guide portion 7 has a rectangular boxlike body 39 and an upper plate 40 is suitably secured to the top of the body 39 in a position wherein it overlies the conveyor chain in a manner tending to keep out dirt from the chain guideways.

As a result of this invention, an improved endless mine conveyor is provided which is relatively laterally compact. By the provision of the frame structure having longitudinal right angle portions, one of which is horizontal and the other vertical, and by locating the intermediate guide frame for the conveyor chain at a 45° angle in the manner disclosed, the lateral flights of the active run of the conveyor may move horizontally near the floor level in a position to receive and convey the material to be loaded and the flights of the return run of the conveyor chain assume a vertical compact inactive position at the rearward side of the frame. The particular frame structure and the novel arrangement of the chain guideways and the conveyor flights, enable extreme lateral compactness while elimination of all loose pivotal connections of the flights with the chain, such as have been embodied in previous devices, is effected. The conveyor is not only extremely laterally compact but is also rugged and simple in design, well adapted to meet the severe demands of service in a mine. Other advantages of the invention will be clearly apparent to those skilled in the art.

While there is in this application specifically described one form which the invention may assume in practice, it will be understood that this form of the same is shown for purposes of illustration and that the invention may be modified and embodied in various other forms without departing from its spirit or the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent is:

1. A conveyor comprising an elongated conveyor frame adapted to rest upon a floor surface and having rectangularly related, longitudinally extending frame portions lying in the sides of a right dihedral angle with their longitudinal axes in parallelism with the longitudinal median line of said conveyor frame, one portion horizontally disposed at the floor level and the other vertically disposed, an inclined intermediate guide portion disposed symmetrically between said frame portions and arranged within the inclusion of the dihedral angle in planes perpendicular to a line

of bisection passing through the edge of the dihedral angle, said inclined guide portion providing guideways, and an endless conveyor chain guided for orbital circulation along said guideways and having angularly disposed lateral flights secured at spaced points therealong, said flights as they travel along the active run of the chain moving horizontally over and longitudinally along the top surface of said horizontal frame portion close to the floor level, and said flights at the return run of the chain moving in a vertical position close to and longitudinally along the inner surface of said vertical frame portion.

2. A conveyor of the character set forth in claim 1 wherein said lateral flights are secured to arms disposed at substantial angles with respect to said planes of said intermediate guide portion and having bent ends attached to the upper links of said conveyor chain.

3. A conveyor of the character set forth in claim 1 wherein said conveyor frame at its discharge end has an elevated portion whereby said conveyor chain moves upwardly to bring its active flights into a discharging position above the floor surface.

4. A conveyor comprising an elongated conveyor frame having longitudinally extending frame portions arranged in right angular relation with their longitudinal axes parallel with the major axis of the conveyor, with one frame portion horizontal and the other vertical, and an inclined intermediate guide frame portion arranged centrally and symmetrically between said frame portions and which lies in planes disposed at equal angles with respect to the adjacent plane surfaces of said right angled frame portions, said guide frame portion providing guideways, and an endless conveyor guided for orbital circulation along said guideways and having lateral flights disposed at substantial angles with respect to the planes of said guide frame portion and which move longitudinally along the inner surfaces of both said horizontal and said vertical frame portions with the flights of the return run of the chain vertically disposed in laterally compact relation.

5. A conveyor of the character set forth in claim 4 wherein said conveyor frame has an elevated discharge end along which the discharge portion of said endless conveyor moves, and a motor for driving said endless conveyor at said elevated discharge end and an upwardly inclined shaft driven by said motor and to which a drive sprocket is secured, said sprocket drivingly engaging said endless conveyor.

6. A conveyor comprising an elongated horizontal frame having a horizontal longitudinally extending frame portion disposed at the floor level and having a plane upper surface, and said conveyor frame also including an inclined guide portion extending longitudinally in parallelism with the longitudinal center line of said frame portion, and lying in longitudinal planes disposed at 45° with respect to said horizontal frame portion, said inclined guide portion providing guideways, and an endless conveyor chain guided for circulation in an orbital path along said guideways and having lateral flights which are moved by the active run of said chain horizontally above and longitudinally along said upper surface of said horizontal frame portion, and said flights extending in upright positions as they are moved along said guideway by the return run of said chain.

7. A conveyor of the character set forth in claim 6 wherein said active flights which move horizontally are disposed at right angles to the upright flights of the return run of said chain.

8. A conveyor of the character set forth in claim 6 wherein rotary sprockets are disposed at the opposite ends of said conveyor frame and about which said endless chain passes, and said flights trace a path lying in the surface of a cone as they travel about either of said sprockets, with the axial center of each cone surface disposed in coincidence with the axis of rotation of the sprocket.

9. A conveyor adapted to rest on its own bottom directly on the floor of a mine and having a frame including an inclined longitudinal guide having its longitudinal axis horizontally disposed and which in transverse section is disposed at 45° with respect to the supporting surface for said conveyor and provides guideways, an endless conveyor chain guided for orbital circulation along said guideways, guides at the opposite ends of said inclined guide for guiding said chain through substantially semicircular paths, and conveyor flights secured to said conveyor chain at spaced points along its length, the flights of the active run of said chain moving in a horizontal path close to said supporting surface and the flights of the return run of the chain extending vertically at right angles to said horizontally moving flights, and said flights tracing a path lying in the surface of a cone as they pass about either of said end-guides along said substantially semicircular path.

10. A conveyor of the character set forth in claim 9 wherein said conveyor frame has flared end portions lying in said cone-surfaces and along which said flights move as they trace said substantially semicircular paths.

11. A mine conveyor comprising an elongated conveyor frame adapted to rest on the floor of a mine and having frame portions arranged in right angular relation with their longitudinal axes in parallelism with the longitudinal median line of said conveyor frame, said frame portions provided with plane inner surfaces, one of said frame portions being horizontally disposed and resting on the mine floor and the other portion being vertically disposed and extending upwardly with respect to said horizontal portion, an inclined intermediate guide portion secured to said frame portions and disposed in planes at right angles to a line passing through the edge of a dihedral angle within the sides of which said frame portions lie and said line bisecting said conveyor frame, said guide portion providing a guideway, and an endless conveyor chain guided for orbital circulation along said guideway and in transverse section having lateral conveyor flights disposed at angles of 135° with respect to said planes in which said intermediate guide portion lies and said flights movable along said plane inner surfaces of said frame portions in close adjacency thereto, the horizontal flights on the active run of said chain moving over the upper plane surface of said horizontal frame portion close to the mine floor and the flights on the return of said conveyor chain moving in upright position along the inner plane surface of said vertical frame portion.

12. A mine conveyor as set forth in claim 11 wherein rotary guides are provided at the opposite ends of said conveyor frame about which said conveyor chain passes, and said conveyor frame having end frame portions provided with

inner surfaces lying in the surfaces of cones whose axial centers are in the same straight lines with the axes of said rotary guides respectively, and said flights moving along such conical surfaces as said chain passes around said guides.

13. A mine conveyor as set forth in claim 12 wherein the lower portion of the conical surface of one of said end frame portions is recessed to provide a bottom discharge opening beneath said conveyor at the discharge end for the discharge of material from said conveyor.

14. A mine conveyor as set forth in claim 12 wherein said end frame portion at the discharge end of said conveyor is elevated above the mine floor to permit free gravity discharge of the material being conveyed from the conveyor, and said rotary guide at said elevated end disposed at a higher level than the rotary guide at the opposite end of said frame, and said frame having upwardly inclined guide portions for directing the conveyor chain to and from said elevated rotary guide.

15. A converter adapted to rest on its own bottom directly on the floor of a mine and having a frame including an inclined longitudinal guide having its longitudinal axis horizontally disposed and which in transverse section is disposed at 45° with respect to the supporting surface for said conveyor, said inclined guide providing guideways, an endless conveyor element guided for orbital circulation along said guideways, guides at the opposite ends of said inclined guide for guiding said endless element through substantially semicircular paths, and conveyor flights projecting laterally from said conveyor element at spaced points along its length, the flights of the active run of said conveyor element moving in a horizontal path over said supporting surface and the flights of the return run of said conveyor element extending vertically at right angles to said horizontally moving flights, and said flights tracing a path lying in the surface of a cone as they pass about either of said end-guides along said substantially semicircular path.

16. An elongated mine conveyor adapted to rest on its own bottom directly on the floor of a mine and having a frame including a laterally inclined, longitudinal guide disposed with respect to the frame-supporting surface at a substantial dihedral angle of which the edge extends longitudinally of the conveyor, said frame providing relatively upper and lower guideways, an endless conveyor element guided for orbital circulation along said guideways and including active and return runs, and guides at the opposite ends of said inclined guide for guiding said conveyor element through substantially semicircular paths, said conveyor element having lateral conveyor flights projecting therefrom at spaced points along its length, said lateral conveyor flights of the active and return runs having like but respectively opposite inclinations with respect to the lateral slope of said longitudinal guide, and the flights of the active run of said conveyor element disposed substantially horizontally and the flights of the return run of said conveyor element extending upwardly, and said flights tracing a path lying in the surface of a cone as they pass about either of said end guides along said substantially semicircular paths.

17. A conveyor comprising an elongated frame having a horizontal longitudinally extending frame portion and having a plane upper surface, said conveyor frame also including a laterally upwardly inclined guide portion extending longitudinally of and making with said horizontal frame portion an obtuse dihedral angle of which the edge is parallel to the median longitudinal line of said longitudinally extending frame portion, said inclined guide portion providing guideways, and an endless conveyor chain guided for circulation in an orbital path along said guideways and having lateral flights moved by the active run of said chain horizontally along the upper surface of said horizontal frame portion and moved by the return run of said chain in positions in which they lie above and make an acute angle with a plane which bisects said obtuse dihedral angle.

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