July 11, 1933. N. DE WIND 1,917,508

EARTH DISCHARGING MECHANISM FOR EXCAVATORS

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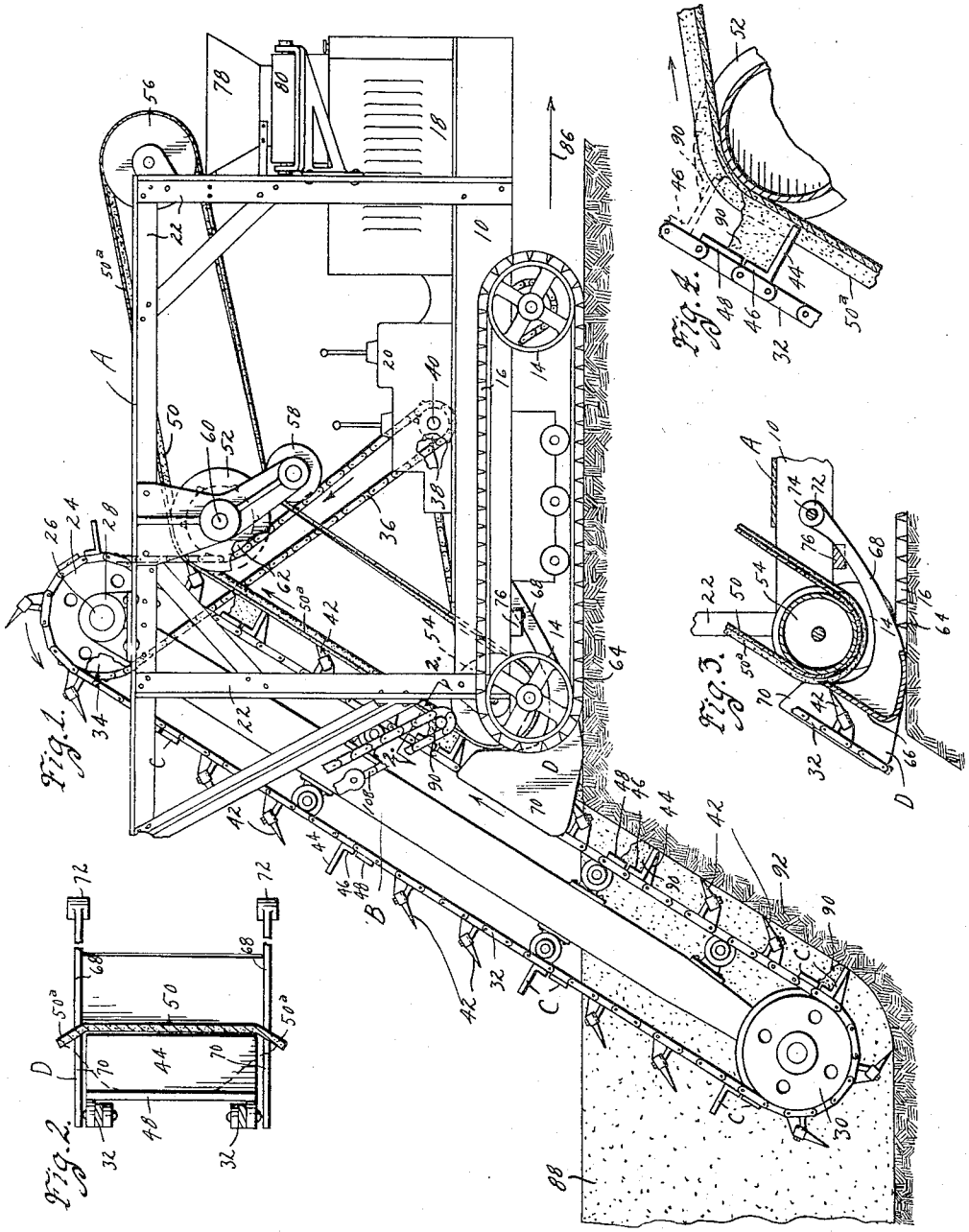


Fig. 1.

Fig. 2.

Fig. 4.

Fig. 3.

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Fig. 7.

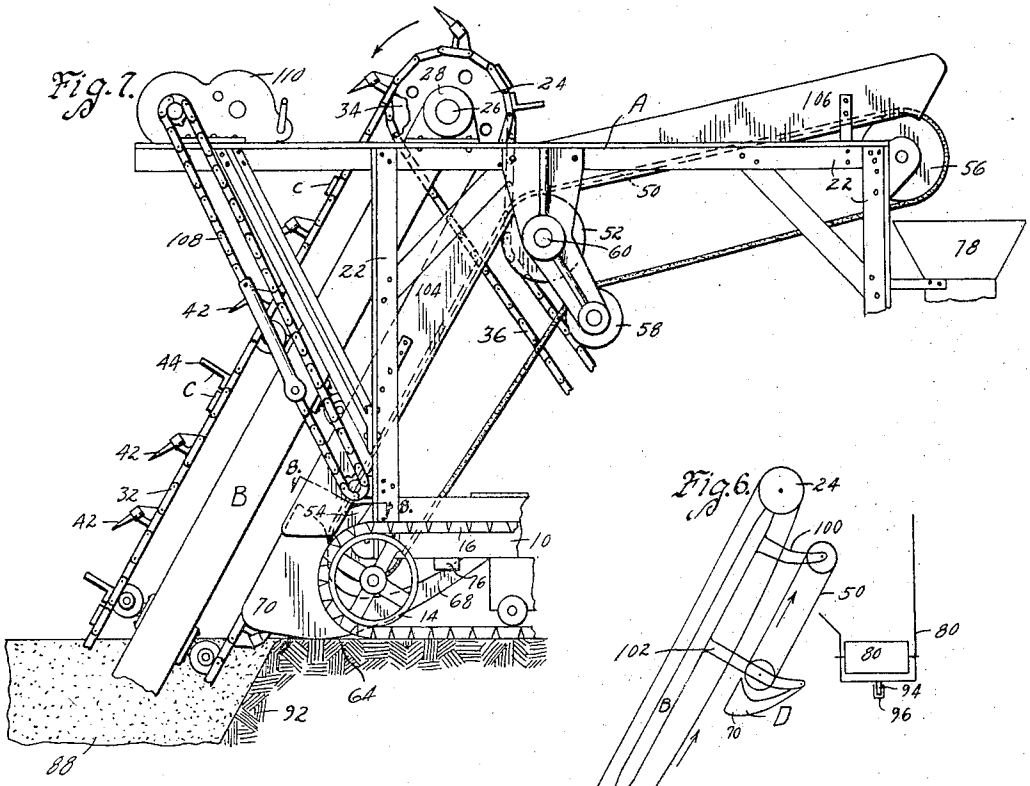


Fig. 6.

Fig. 5.

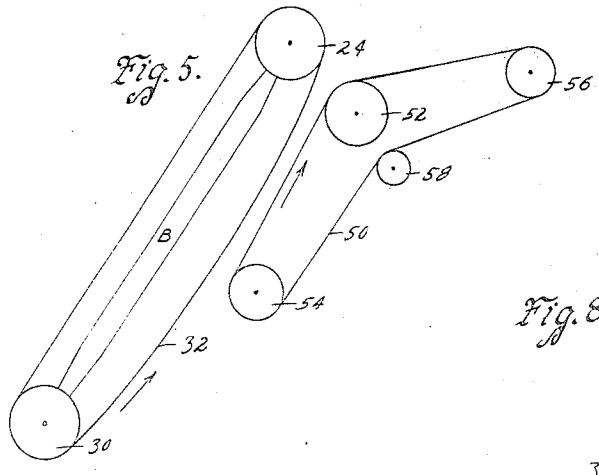
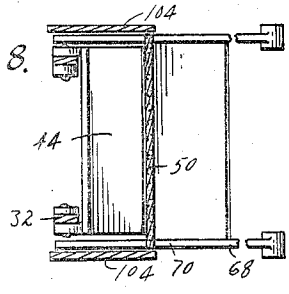


Fig. 8.



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UNITED STATES PATENT OFFICE

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EARTH DISCHARGING MECHANISM FOR EXCAVATORS

Application filed March 16, 1931. Serial No. 523,029.

An object of my invention is to provide an earth discharging mechanism for excavators which eliminates a good many objections to the present day constructions in which ditcher buckets have movable bottoms and other devices provided for cleaning the earth out of the buckets, the parts of my mechanism being comparatively simple, durable and inexpensive from a manufacturing standpoint.

A further object is to provide an earth discharging mechanism which eliminates the provision of sides on ditcher buckets, thus reducing the number of surfaces to which the earth might stick.

More particularly it is my object to provide an earth discharging mechanism consisting of a conveyor movable at the same speed as an excavator mechanism such as an excavator chain which has digging elements and earth carrying means thereon whether separate or combined, the conveyor being mounted adjacent the earth carriers and the parts being inclined so that the earth will shift by gravity from the earth carriers to the conveyor and eventually be carried by the conveyor to a discharge point.

A further object is to provide on an excavator having a digging boom and an excavator chain with earth carriers thereon, a conveyor for receiving earth from the earth carrier of the chain, the lower end of the conveyor being located adjacent the ground and a guard shoe for bridging the gap between the conveyor and the ground.

Still a further object is to provide side members on the guard shoe between which the excavator chain and the earth carrying means thereon, is movable.

With these and other objects in view my invention consists in the construction, arrangement and combination of the various parts of my device, whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in my claims, and illustrated in the accompanying drawings, in which:

Figure 1 is a side elevation of an earth discharging mechanism for excavators embodying my invention.

Figure 2 is a sectional plan view on the line 2—2 of Figure 1 illustrating the relationship of the excavator chain and earth carrying means thereon, the earth receiving conveyer and the guard shoe.

Figure 3 is a vertical, central sectional view through the earth receiving conveyer and the guard shoe.

Figure 4 is an enlarged, vertical, sectional view of a portion of Figure 1 showing the operation of the parts.

Figure 5 is a diagrammatic side elevation showing the boom adjusted slightly away from the conveyer and illustrating how sag in the excavator chain will to some extent keep the earth carriers of the excavator chain against the earth receiving conveyer.

Figure 6 is a diagrammatic side elevation showing a modified form of construction.

Figure 7 shows a modified form of construction in side elevation in which the earth receiving conveyer is provided with sides rather than being of troughed type; and

Figure 8 is a sectional view on the line 8—8 of Figure 7.

On the accompanying drawings I have used the reference numeral 10 to indicate generally a base frame of an excavator or ditcher A. The base frame 10 is supported by wheels 14 and caterpillar treads 16. A motor 18 is mounted on the frame 10 for propelling the excavator A and driving the operating mechanism thereof. A transmission casing is indicated at 20.

An upper frame 22 is provided for supporting the parts of the excavator. A boom B is mounted on the frame 10 in any suitable manner.

A pair of excavator chain drive sprockets 24 are secured to a drive shaft 26. The drive shaft 26 is journalled in bearings 28 on the upper frame 22. Excavator chain idlers 30 are journalled on the lower end of the boom B. Excavator chains 32 extend around the sprockets 24 and the idlers 30.

The sprockets 24 are driven by a drive sprocket 34 and a chain 36 from a sprocket pinion 38. The sprocket pinnion 38 is mounted on a drive shaft 40 of the transmission 20.

The excavator chains 32 support tooth-like digger elements 42 of ordinary construction

and earth carrying members C. The earth carrying members C each comprise a bottom member 44 and a pair of back members 46 and 48, but preferably do not have any side members.

An earth receiving conveyer belt 50 is provided for traveling adjacent the outer edges of the earth carrier bottom members 44 and is supported on a drive drum 52 and idler drums 54, 56 and 58. The drums 52, 54, 56 and 58 are suitably journalled with respect to the frames 10 and 22 by means of brackets as clearly shown in Figure 1 of the drawings.

The conveyer belt 50 may be driven by means of the drum 52. The drum 52 is secured to a drum shaft 60 to which a drive sprocket 62 is also secured. The chain 36 extends under the sprocket 62, after leaving the sprocket pinion 38 and before extending over the sprocket 34. The size of the sprockets 34 and 62 with respect to the excavator chain 32 and belt 50 are such as to provide for the same speed of travel of the earth carrier members C and the earth receiving conveyer belt 50.

It will be noted that there is a space between the lower idler drum 54 and the ground surface 64. For bridging this space I preferably provide a guard shoe D. The guard shoe D comprises a guard plate 66, supporting arms 68 and side plates 70. The supporting arms 68 are provided with hubs 72 journalled on a pivot shaft 74 which is supported by the frame 10. The guard shoe D, when pivoted in this manner, may swing up and down depending on the ground surface between the wheels 14 as the excavator travels. A stop bar 76 may be provided for limiting the movement of the guard shoe 66 toward the excavator chain 32.

For receiving earth from the earth receiving conveyer belt 50 and disposing of it, a chute 78 may be provided for discharging its contents onto a transverse belt 80. The conveyer belt 80 discharges the earth at the side of the excavator A. The earth receiving conveyer belt 50 will function even though the earth carriers C are not in contact therewith. Even when the boom B is adjusted slightly backward from the position shown in Figure 1 to the position shown diagrammatically in Figure 5, there will be sufficient sag in the excavator chain to cause it to bow toward the belt 50 as illustrated and earth is discharged therefrom onto the conveyer. With the boom adjusted still further rearwardly, space would be left between the earth carriers and the conveyer belt in which earth might accumulate, but would be picked up by the carriers and deposited on the belt as the excavator advances during the operation of digging a ditch.

As shown in Figure 6 of the drawings, instead of providing an inverted V formation for the conveyer belt 50, the idler drum 56 may be eliminated so that the contents from the belt 50 will discharge over the drum 52 and into a chute 82 and onto a transverse conveyer 84.

In this figure the boom B is illustrated as having extensions 100 and 102 for carrying the conveyer 50 and the guard shoe D.

Thus the earth receiving conveyer and the guard shoe may be adjusted simultaneously with the adjustment of the boom if the parts are arranged as illustrated in this figure. In Figure 7, the conveyer 50 is not cupped or troughed as in Figures 1, 2, 3 and 4, but is of flat type as best shown in Figure 8. Side members 104 are provided to form a conveyer trough in conjunction with the belt 50 when its formation is flat.

Practical operation

In the operation of my device, the digging elements or teeth 42 scarify and dig the earth as the excavator chain 32 is moved by rotation of the sprockets 34 and idlers 30. The excavator A slowly advances in the direction of the arrow 86 for progressively digging the ditch indicated at 88. The scarified and loosened earth indicated at 90 is picked up by the earth carriers C and retained thereon by the sides of the ditch 88, the bottom members 44 and the back members 46 and the front wall 92 of the ditch.

When the carriers C leave the ditch the earth 90 is retained thereon by the guard plate 66 and the side plates 70 of the guard shoe D in place of the front wall 92 and the sides of the ditch 88.

After the earth carriers C leave the guard plate 66 they contact with the earth receiving belt 50 which is moving at the same speed as the carriers. Due to the inclination of the boom B and the carrier 50, the tendency for the earth 90 is to fall onto the conveyer belt by gravity. The edges 50*a* (see Figure 2) of the conveyer belt 50 are preferably troughed as shown in Figure 2 so as to retain the earth thereon without the necessity of providing side plates on the carriers C. The drums 52, 54 and 56 are spool shaped in the conventional manner for troughing the conveyer belt 50 as shown.

As shown in Figure 4, when the bottom members 44 of the earth carriers C eventually leave the conveyer belt 50 as it travels over the drum 52, the earth is carried on the less inclined portion of the conveyer belt 50 and finally deposited on the transverse conveyer 80. Such a construction eliminates the necessity for cleaning the sides of a conveyer bucket, since the sides in the present invention are eliminated. Advantage is taken of gravity for transferring the earth from the excavator chain to the earth receiving conveyer 50.

As shown in Figure 6, the earth may be

deposited in a transverse conveyer immediately after passing over the drum 52. The conveyer 84 may be swivelly mounted if desired. A swivel pin 94 may be mounted in a stationary socket 96 provided for this purpose.

The boom B may be adjusted by any suitable mechanism such as the chain 108 and gearing 110 shown in Figure 7. The gearing 110 is actuated for swinging the boom about the drive shaft 26 as a pivot and when the connections 100 and 102 are used as shown in Figure 6, the same adjustment for the boom will adjust the conveyer belt 50 and the guard shoe D. Although I have shown the guard shoe on my drawings, it can be dispensed with since when not used earth would pile up in the place that the guard shoe assumes and would be carried away as the machine advances.

Other types of conveyers can be substituted for the belt 50 and other changes may be made in the construction and arrangement of the parts of my earth discharging mechanism for excavators without departing from the real spirit and purpose of my invention, and it is my intention to cover by my claims, any modified forms of structure or use of mechanical equivalents, which may be reasonably included within their scope.

I claim as my invention:

1. The combination with excavator mechanism including digging elements, earth carrying means and means for moving said elements and earth carrying means in a path at an angle to the vertical, of a conveyer movable with and mounted adjacent and having a portion thereof parallel with said earth carrying means and traveling in the same direction thereas to receive earth therefrom by transference of the earth from the earth carrying means to the conveyer during the parallel movement of the earth carrying means and the conveyer.

2. In a device of the character described, a frame, an inclined digger boom thereon, an excavator chain on said boom having a downwardly traveling upper stretch and an upwardly traveling lower stretch, earth carrying means on said excavator chain, a conveyer belt on said frame having an upwardly traveling upper stretch arranged below and substantially parallel to the path of travel of said lower stretch of excavator chain, and means for causing synchronous movement of said last two mentioned stretches in the same direction.

3. In a device of the character described, a frame, a digger boom thereon, an excavator on said boom, earth carrying means on said excavator, a conveyer belt on said frame having a stretch thereof arranged below and adjacent the path of travel of a stretch of said earth carrying means, means for causing synchronous movement of said stretches in the same direction, said conveyer belt having a lower end spaced from the ground surface and a guard shoe forming an extension of said conveyer belt and spanning the distance between the lower end of the belt and the ground.

4. In a device of the character described, excavator mechanism, earth carrying means supported thereon having back and bottom members, means for moving said earth carrying means and a conveyer movable with and at the same speed as said excavator mechanism and mounted there adjacent to receive earth from said earth carrying means and to form a front for said back and bottom members which are movable therewith during the operation of receiving earth therefrom.

5. In a device of the character described, excavator mechanism, earth carrying means supported thereon including bottom members, means for moving said excavator mechanism and a conveyer movable therewith and traveling in contact with said bottom members of said earth carrying means whereby to receive earth therefrom.

6. In a device of the character described, a frame, a digger boom thereon, excavating means on said boom including earth carrying means, a conveyer belt on said frame arranged adjacent the path of travel of said earth carrying means and having a lower end spaced from the ground surface and a guard shoe forming an extension of said conveyer belt and spanning the distance between the lower end of the belt and the ground, said guard shoe having a guard surface in substantial alinement with said conveyer belt and having side plates on each side of said excavating means.

7. In a device of the character disclosed, a digger boom, excavator means on said boom including earth carrying means having back and bottom members, and an earth receiving conveyer belt and a guard shoe associated with said excavator means and the earth carrying means thereon, and means for moving said earth receiving conveyer belt at the same speed as said earth carrying means whereby to form a front for said back and bottom members and movable therewith while receiving earth therefrom.

8. In a device of the character disclosed, a digger boom, excavator means on said boom including earth carrying means and an earth receiving conveyer belt associated with said excavator means and the earth carrying means thereon, said conveyer belt being troughed to provide sides for said earth carrying means.

9. In a device of the character disclosed, a digger boom, excavator means thereon including earth carrying means having back and bottom members, an earth receiving conveyer belt associated with said excavator

means and the earth carrying means thereon, said conveyer belt having side plates forming sides for said earth carrying means.

10. In a device of the character described, a frame, a digger boom thereon, an excavating chain on said boom, earth carrying means on said excavator chain, a conveyor belt on said frame arranged adjacent the path of travel of said earth carying means, said conveyer belt having flared side edges extending laterally beyond the earth carrying means.

11. In a device of the character described, a frame, a digger boom thereon, an excavating chain on said boom, earth carrying means on said excavator chain, a conveyer on said frame arranged adjacent the path of travel of said earth carrying means, said conveyer having means at its sides for retaining earth.

12. A device of the character disclosed comprising a frame, an inclined digger boom supported thereon, excavator means carried by said boom including earth carrying means, a conveyer having an inclined portion adjacent the path of travel of said earth carrying means and a portion of less incline for carrying earth away from said excavator chain.

13. In a device of the character described, a frame, a digger boom thereon, excavating means on said boom including earth carrying means, a conveyer on said frame arranged adjacent the path of travel of said earth carrying means and having a lower end spaced from the ground surface and a guard shoe forming an extension of said conveyer and spanning the distance between the lower end of the belt and the ground, said guard shoe having forwardly extending arms pivoted at their forward ends for free up and down movement of the guard shoe.

Des Moines, Iowa, December 8, 1930.

NORMAN DE WIND.