Sept. 9, 1958 K. ROSETZ 2,851,143

LOADING MACHINE

Filed Sept. 29, 1953 3 Sheets-Sheet 1

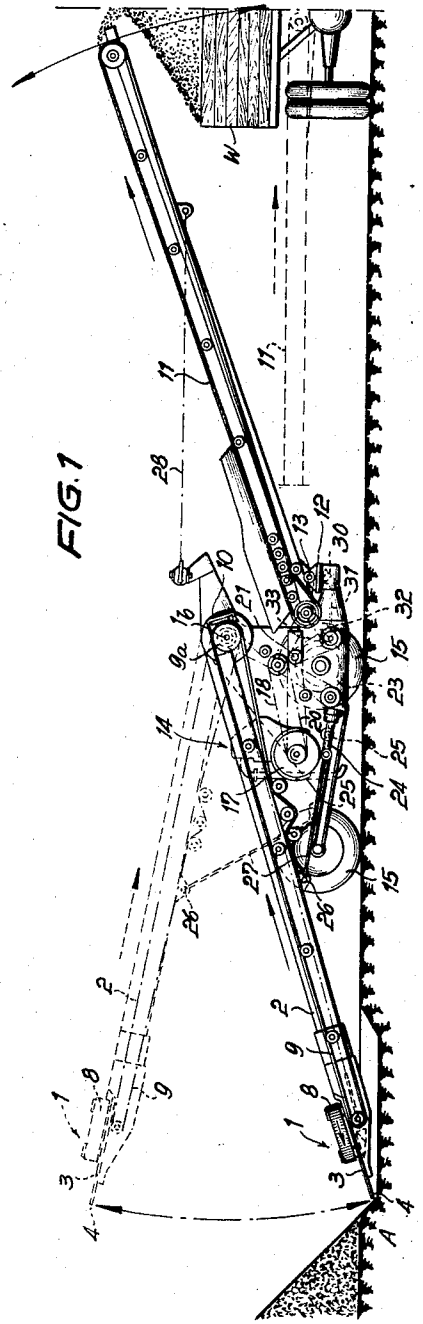


FIG. 1

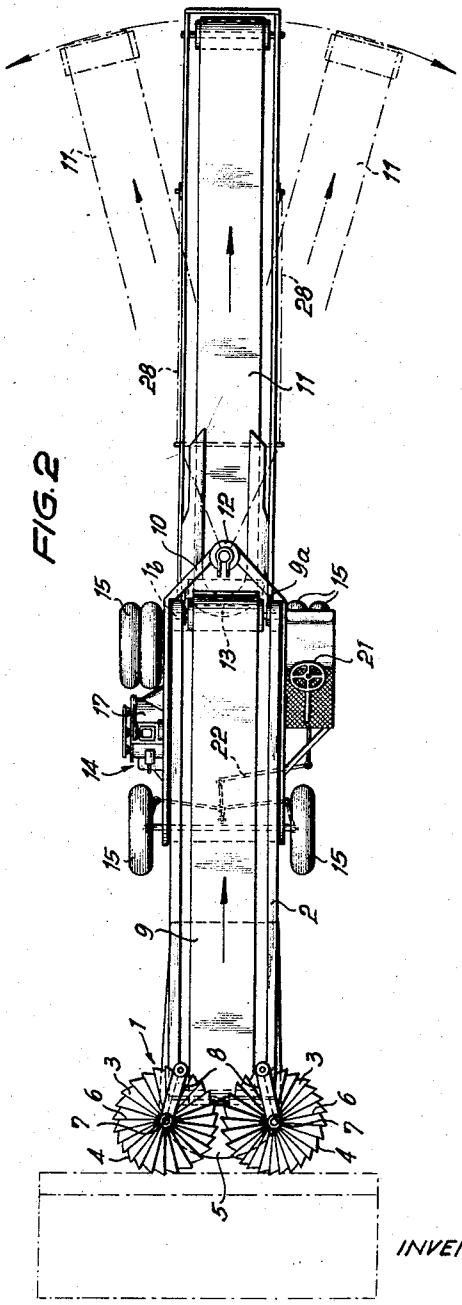


FIG. 2

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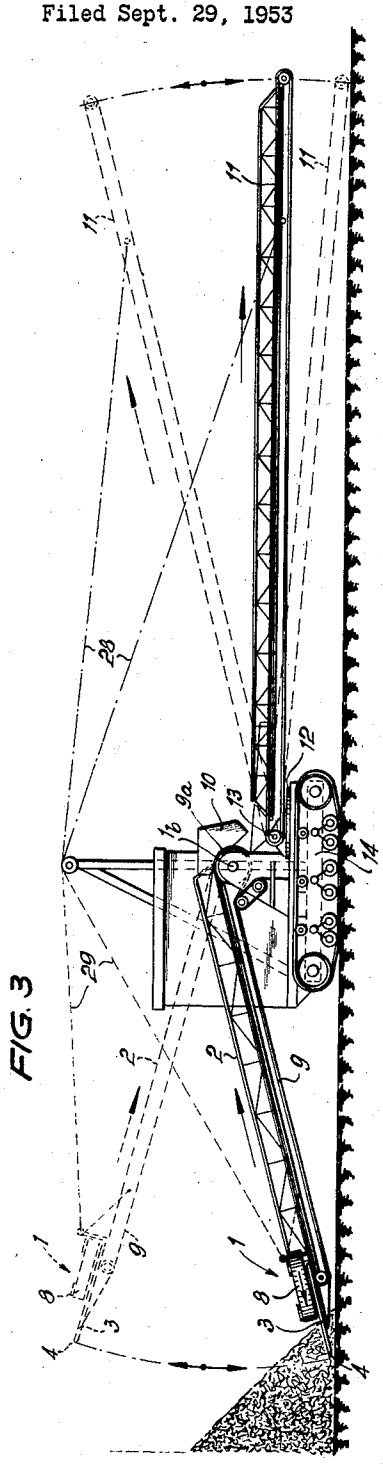


FIG. 3

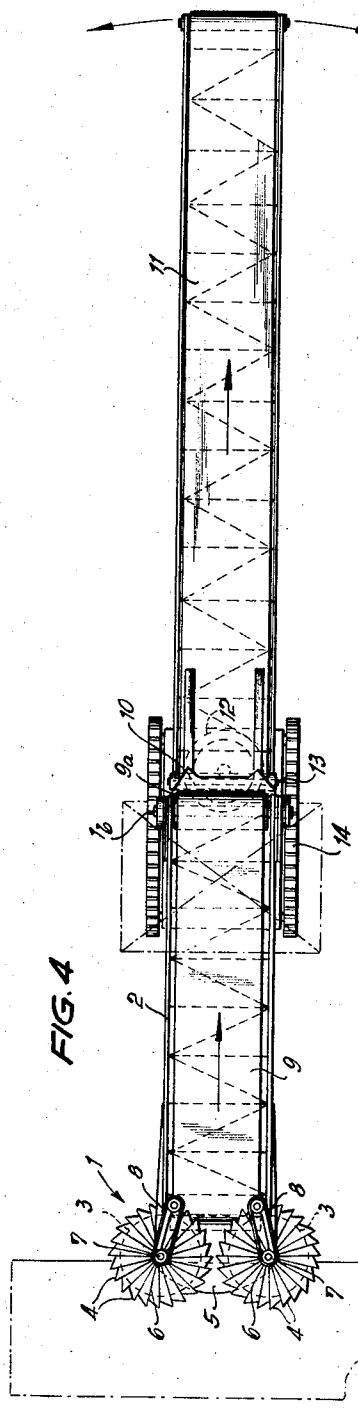


FIG. 4

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FIG. 5

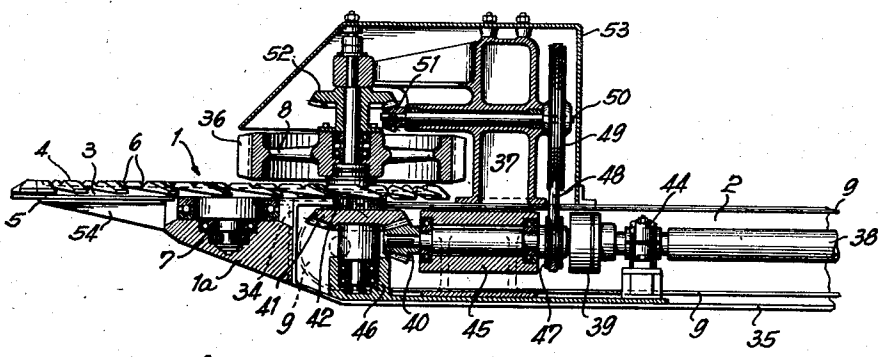
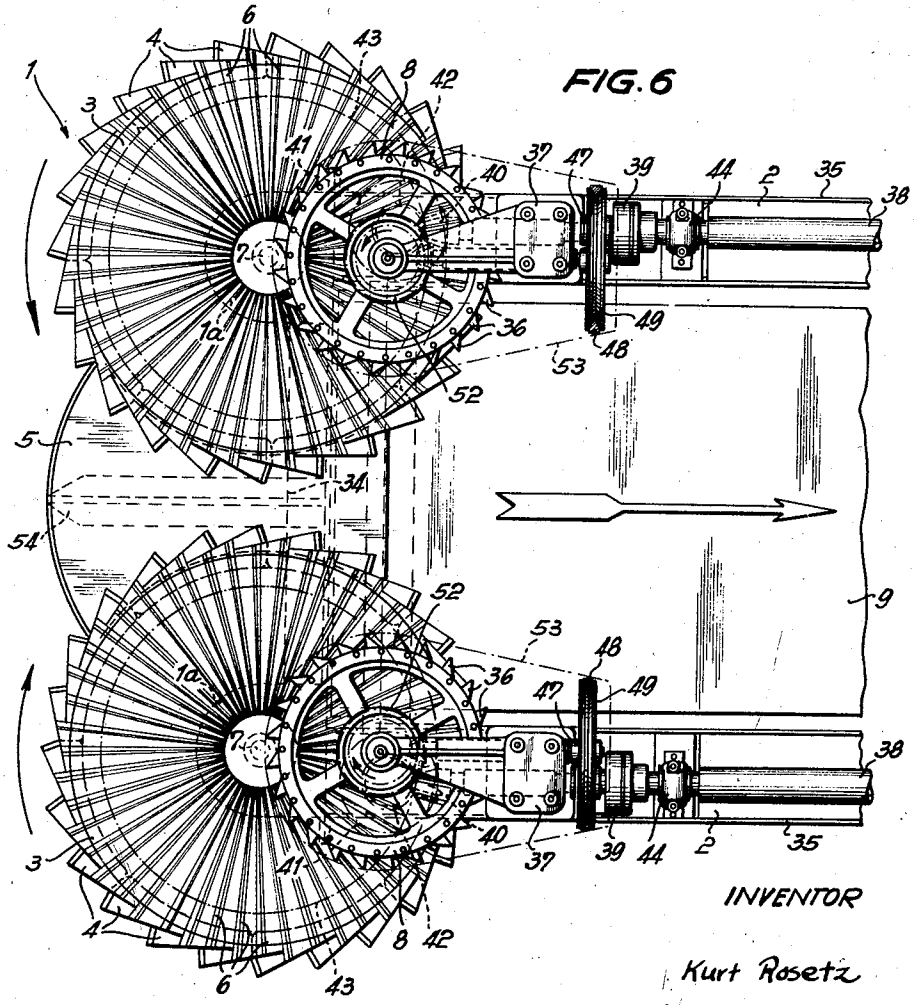


FIG. 6



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2,851,143

LOADING MACHINE

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Application September 29, 1953, Serial No. 383,021

7 Claims. (Cl. 198—9)

The present invention relates to a machine for excavating, shovelling or shifting soil, raw minerals or the like bulk material having substantially horizontal rotary cutter and conveyor discs from which a conveyor, for example an endless conveyor belt, receives the material for further conveyance for instance to a heap or for dumping in a truck. Such machines may be used, for example, for excavating raw minerals, gravel, soil and mineral seams.

The present application is a continuation-in-part of application Serial No. 328,392, filed December 29, 1952, and entitled, "Conveyor Apparatus" which is in turn a continuation-in-part of application Serial No. 180,436, filed August 19, 1950, and entitled "Conveying Device," this latter application having now matured into U. S. Patent 2,623,625.

Machines of the above type have had hitherto rotary discs which are smooth on the periphery and on the working surface. With such smooth discs, however, only comparatively soft material can be removed, as the penetrative ability of the discs is limited. With other known machines a rigid blade is disposed in front of the rotary discs. However, this blade renders penetration of the discs difficult in solid ground.

With other loading machines it has already been proposed to fit the discs with peripheral teeth. It is true that such discs penetrate well into the material to be removed, but the problem of the subsequent disposal of the taken up material has not been completely solved. An attempt has been made to mount raised portions, consisting of wedge members, studs or fan-like ledges on the working surface of the discs in order to grip the taken up material. However, penetration into the conveyed material becomes difficult with these raised portions, as does also the stripping of material from the discs. An attempt is being made to remove these difficulties with complicated cleaning devices, but these complicated machines are without approval in the industry.

Owing to these defects all presently known machines are used merely as transmission loading machines. Other work, such as excavation, working in hard soil, open-cast working of seams, is not possible with the known machines. In addition the known machines do not work continuously but only intermittently.

The machine according to the present invention avoids these disadvantages in that two such cutter and conveyor discs contra-rotating and lying parallel to the plane of the conveyor with small relative peripheral clearance and closely superposed stripper members substantially perpendicular to the plane of rotation of the discs, for example belts or drums which rotate at greater speed in the direction of conveyance. Preferably, the rotary cutter and conveyor discs have in their working faces radial cutting grooves or channels and are fitted on their periphery with exchangeable cutting tools, for example, teeth, cutters, chisels, excavating scoops or the like.

The advantage of this construction is that the rotary discs may easily penetrate into comparatively solid material, such as seams of coal. The cutter and conveyor discs cut into the material under relatively slight forward pressure to a certain extent automatically. Owing to the parallel contra-rotating disposition of the two cutter and conveyor discs, a broad area is worked in one pass and the material conveyed away evenly and quickly with the two discs towards the endless conveyor belt. The preferred radial cutting grooves or channels in the cutter and conveyor discs perform cutting work and increase further the gripping of loose material on the faces of the cutter and conveyor discs so that the material is held firmly on the discs and can no longer slip away. The cutter and conveyor discs can therefore rotate at comparatively high speed, which considerably increases the rate of removal. So that the material taken up by the cutter and conveyor discs cannot simply rotate on the cutter and conveyor discs, but is immediately removed by the conveyor belt, stripper members, for example endless belts or drums rotate above the discs. The movement of the operative faces of these stripper members is vertical to the plane of rotation of the cutter and conveyor discs. The stripper members which carry exchangeable teeth or projections, or are formed with channels or grooves, are disposed with their lower edges so closely above the cutter and conveyor discs than they clean these as also the grooves or channels formed therein continuously of the conveyed material. The stripper members urge the material carried continuously from the cutter and conveyor discs on to the endless conveyor belt rotating closely below them. As the stripper members rotate at a greater speed than the cutter and conveyor discs, acceleration of the flow of material is obtained, a fact which results in a considerable increase in output.

A cutter head comprising the two cutter and conveyor discs, the stripper members and the endless conveyor belt is carried by a boom which may be pivotable vertically and in addition be mounted on a wheeled or tracked chassis. Therefore, the cutter head may be adjusted to any desired position in height and work comparatively large surfaces with one and the same position of the chassis. The chassis enhances the mobility of the machine. With the use of wheels the machine may run on rails arranged along the seam in open-cast mining, for example. Machines which have a tracked chassis are independent of rails and can be used on any terrain.

With a machine in accordance with the invention, loamy, earthy, sandy and rough materials can be taken up, on and above the level of driving, for example, sand, loam, clay, gravel, soil, ores, pit coal, lignite, coke, briquette, loose bulk material and the like and in addition crops, such as potatoes and turnips. Likewise, the machine is suitable for excavation and levelling ground. As the working tools on the periphery of the discs are exchangeable, the machine may be adjusted by the replacement of suitable tools, such as cutting teeth, blades, cutting chisels, scoops, excavating buckets, according to the type and the texture of the material to be taken up. Cutting discs with blades on the circumference are known as such in mining. However, they are used for that purpose only as cutting members for sinking cuts into coal seams but not for loading or conveying work. In open-cast mining, machines are also known for mining coal by means of a device making two or more parallel cuts and a breaking apparatus coupled with further apparatus for the removal of the broken away material in trucks.

The drawings show various embodiments of construction of the machine, taken by way of example:

Fig. 1 shows a side elevation of the machine with two contra-rotating cutter and conveyor discs with peripheral cutting teeth.

Fig. 2 shows a plan view of the machine as shown in Fig. 1.

Fig. 3 shows a side view of a similar machine as shown in Fig. 1, but with a different construction of the boom for the endless conveyor belt and the loading belt omitting details of the mechanical drive and with a tracked chassis.

Fig. 4 shows a plan view of the machine as shown in Fig. 3.

Fig. 5 shows a vertical section through the cutter head of the machine on the axis of a cutter and conveyor disc and an associated stripper member. The cutter and conveyor discs are constructed as cutter discs with peripheral cutting blades and the conveyor and stripper members as drums with exchangeable peripheral scraping teeth and.

Fig. 6 shows a plan view of the cutter head as shown in Fig. 5.

Fundamentally, in accordance with the invention, the machine has a cutter head which is generally indicated by **1** on the free end of a boom **2**. On the cutter head **1** are disposed two cutter and conveyor discs **3** with exchangeable blades **4** on the periphery. These two cutter and conveyor discs **3** are disposed with peripheral clearance in the same plane on the cutter head **1**. Between both cutter and conveyor discs **3** an appropriate forwardly projecting incisor blade **5** is mounted inferiorly. For excavating and increasing the grip on conveyed material, cutting grooves or channels **6** are formed in the upper working faces of the cutter and conveyor discs **3**. The cutter and conveyor discs **3** rotate in the same plane about their axes **7** and may be of various sizes and constructions as required. Instead of the spindles at the axes **7**, ball joint driving connections may be employed. The cutter head **1** is pivotally mounted at **4** on a bearing **1***b* and thus is capable of working at various levels as desired, for example, as shown by either the full or broken lines in the drawing. The full lines represent the normal position in loading or excavation, while the chain dotted lines represent the possible working positions for mining or construction work which is also the position of the machine for travelling. Conveyor and stripper members **8** take up the material moved radially on the cutter and conveyor discs **3** and scrap it continuously on to a receiving endless conveyor belt **9** running below. The conveyor belt **9** delivers the conveyed material on to a loading belt **11** by a displaceable chute **10**. This loading belt **11** is mounted to be angularly adjustable on a turntable **12** in bearings **13**. From the loading belt **11** the conveyed material passes, with or without adjustable chutes, either directly into a truck, such as, for example, a railway truck, or to further receiving conveyor belts.

All parts of the machine rest on a common chassis designated generally **14**. The chassis is supported on road wheels **15** or tracks **16** and also is turnable in a horizontal plane on its wheels or tracks. These various forms of construction are shown in Figs. 1 to 4.

The drive of the cutter and conveyor discs **3**, the endless conveyor belt **9**, the loading belt **11**, the chassis **14** and the vertical and horizontal adjustment of the conveyor belts **9** and **11** is in general not the object of the invention. It is, therefore, explained in the following only in so far as it is absolutely necessary for an understanding of the operation of the machine. Powered movement members are effected by a common compressed air, internal combustion or electric motor **17** through chains, V belting, couplings, tooth and bevel wheels in known manner. Each individual drive may be engaged and disengaged relative to the common driving motor **17** by a clutch.

Figs. 1 and 2 show in this connection a somewhat more detailed example. The motor **17** drives a central shaft **19** through V-belts **18**. For travelling, the motor **17** is connected by means of the V-belt drive **20** through a stepless fluid transmission **20***a*. This transmission serves for the travelling and operational feeding of the machine at appropriate speeds. Steering is executed in known manner by means of the steering wheel **21** and the steering rods **22**.

The adjustment in height of the cutter head **1** on the boom **2** about the pivoted bearings **1***b* is effected likewise from the motor **17**, through a central shaft **19**, a V-belt **23** and a threaded spindle **24** which, on rotation, displaces a nut with a push rod **27** attached to the nut and at point **26** to the boom **2**.

The vertical adjustment of the conveyor belt **11** about the pivoted bearing **13** may be effected manually or mechanically, as desired by means of a cable **28** and winch. In the construction as shown in Figs. 3 and 4, vertical adjustment in height of the boom **2** about the bearings **1***b* is provided by cables **29**. In order to provide angular adjustment of the loading belt **11** horizontally it is mounted on the turntable **12**. The turntable is driven through a bevel gear drive **30** and an intermediate shaft **31** to a further bevel gear drive **32** which is driven by a V-belt drive **33**. The latter is connected to the centre shaft **19** and thus the horizontal angular adjustment is powered by the motor **17**.

Figs. 5 and 6 show a detailed example of construction of the drive to the cutter and conveyor discs **3** and the conveying and stripping members on the cutter head **1**. The stripping members **8** are constructed in this example as drums, and not as endless belts as in Figs. 1 to 4.

On the front of the boom **2** are disposed the two cutter and conveyor discs **3** contra-rotating about their respective centre axes **7** and which have exchangeable cutting blades **4** on their peripheries. Radial cutting channels **6** are preferably formed in the working surfaces of the cutter and conveyor discs **3**. The spindles at axes **7** are mounted in the cutter head bearing **1***a* which connects two boom struts **35** by means of a strut **34**. Closely above the cutter and conveyor discs **3** the conveyor and stripper drums **8** mounted in supports **37** rotate respectively in the same direction of rotation as the discs **3**, but at greater speed, which drums are provided on their peripheries with exchangeable scrapper members **36**, for example, scoops or teeth. In an alternative construction channels or grooves are formed into the conveyor and stripper drums.

The drive of the cutter and conveyor discs **3** is effected in known manner by means of main shaft **38** driven from the driving drum **9***a* of the endless conveyor belt **9**, flexible couplings **39**, bevel wheels **40** and **41** and pinions **42** on the ring gear **43** which is secured to the lower side of each cutter and conveyor disc **3**. The main shafts **38** are mounted in journals **44** and **45**, the pinions having their spindles in bearings **46**. The drive of the conveyor and stripper drums **8** is taken off the main shaft **38** by pulleys **47**, V-belts **48**, large diameter driven pulleys **49**, shafts **50** and small bevel gears **51** to crown wheels **52** which are rigidly connected to the conveyor and stripper drums **8**.

The protection hoods **53** allow dislodged spoil to slide on to the cutter and conveyor discs **3** and serve simultaneously as a protection against fouling of the drive parts. An incisor blade **5** of metal sheet is provided projecting forwardly below and between the discs **3**, and is reinforced with a tip **54** and the strut **34**.

In another construction of the conveyor and stripper drums **8** the entire drive is housed in their interior so that the top of the drums may be left free as an effective working surface.

For operation the machine is together with the chassis **14** brought proximate to the take up or point of excavation. Subsequently, the boom **2** is set in the required position for taking up spoil and the loading belt **11** is so pivoted that its end is disposed above the dumping point. Subsequently, the two cutter and conveyor discs **3** with the conveyor and stripper members **8**, the endless conveyor belt **9** and the loading belt **11** are set in their respec-

tive motions. When the machine is running the cutter head **1** comprising the two cutter and conveyor discs **3** and the incisor blade **5**, is urged into heaped soil, solid ground or a seam as the case may be. Penetration of the cutter head **1** into the material to be removed is facilitated by the rotating cutter and conveyor discs **3**, which deliver the excavated material immediately to the conveyor **9**. According to the requirements of the work the machine may be arranged parallel or vertical to the ground or heaped material to be worked as is already known from excavating with a chain of buckets.

The following conditions of operation have proved best; number of revolutions of the cutter and conveyor discs **3** approximately 8 to 14 revolutions per minute with a feed of 0.1 to 0.3 metre per second. The conveyor belt **9** running at a speed of 2.0 metres per second, the loading band **11** at 3.2 metres per second. The width of the two belts is preferably about 1800 mm. The entire constructional length of the machine amounts to about 20–30 m. from the cutter head **1** to the dumping end of the loading belt **11**. The weight of the machine amounts to 7 to 9 tons. The gross amount of power required is from 35 to 45 horsepower. Excavation of from 400 to 600 tons of material per hour may then be obtained.

The machine in accordance with the invention may also be adapted for travelling on rails. Finally it is also possible to provide two booms **2** equipped with a cutter head **1** on each side and directed in opposite directions on the same chassis **14**. The two cutter heads **1**, for example in canal construction, then convey the material from both sides towards the chassis where it is then transferred to a common chute or a common third conveyor belt which then meets the ends of the two booms and their endless belts at a right angle and is conveyed further. In this form of construction the machine may thus work alternately, that is to say, once a feed movement to the left with a corresponding idle movement to the right followed by a feed movement to the right with a corresponding idle movement to the left.

Further, in keeping with the invention is the provision on the machine of a conveyor belt **9** of reduced length leading to shaker trays oscillating sieves, shaking tubes, conveyor worms, normal and inclined bucket elevators, suction pipes or the like for the removal of the removed material.

Therefore, it is also possible to use the cutter head with or without an endless belt as a member for the unloading of trucks, bunkers and/or ships.

I claim:

1. In a machine for digging and/or shifting bulk material, the combination of two substantially identical rotatable disc members mounted to lie substantially in the same plane with slight peripheral clearance and with an unobstructed free space therebetween, projection portions formed on the upper surfaces of said disc members defining radial grooves thereon, exchangeable scraper tools secured to the peripheries of said disc members, an endless conveyor having one end thereof located below said disc members, means guiding the upper run of said conveyor in a path which lies substantially in the plane of said disc members, stripper members having operative surfaces perpendicular to the plane of said disc members and spaced apart to define a channel between the centres of said disc members, and motive means in driving connection with said disc members, stripper members and conveyor for driving said stripper member at a greater linear speed than said disc members and for moving the upper run of said conveyor away from said disc members, while moving adjacent opposing surfaces of said stripper and disc members are moved in the same direction as the upper run of said conveyor.

2. In a machine for digging and/or shifting bulk material, the combination of two substantially identical rotatable disc members mounted to lie substantially in the same plane with slight peripheral clearance and with

an unobstructed free space therebetween, projecting portions formed on the upper surfaces of said disc members defining radial grooves thereon, exchangeable scraper tools secured to the peripheries of said disc members, an endless conveyor having one end thereof located below said disc members, means guiding the upper run of said conveyor in a path which lies substantially in the plane of said disc members, rotary stripper drums having operative cylindrical surfaces perpendicular to the plane of said disc members and spaced apart to define a channel between the centres of said disc members, and motive means in driving connection with said disc members, stripper drums and conveyor for driving said stripper drums at a greater circumferential speed than said disc members and for moving the upper run of said conveyor away from said disc members, while moving adjacent opposing surfaces of said stripper drums and disc members in the same direction as the upper run of said conveyor.

3. In a machine for digging and/or shifting bulk material, the combination of two substantially identical rotatable disc members mounted to lie substantially in the same plane with slight peripheral clearance and with an unobstructed free space therebetween, projecting portions formed on the upper surfaces of said disc members defining radial grooves thereon, exchangeable scraper tools secured to the peripheries of said disc members, an endless conveyor having one end thereof located below said disc members, means guiding the upper run of said conveyor in a path which lies substantially in the plane of said disc members, stripper belts movable about rollers such that the operative surfaces thereof are perpendicular to the plane of said disc members and spaced apart to define a channel between the centres of said disc members, and motive means in driving connection with said disc members, stripper belts and conveyor for driving said stripper belts at a greater linear speed than said disc members and for moving the upper run of said conveyor away from said disc members, while moving adjacent opposing surfaces of said stripper belts and disc members in the same direction as the upper run of said conveyor.

4. The combination according to claim 3 further comprising exchangeable projecting members secured to said stripper belts.

5. In a machine for digging and/or shifting bulk material mounted on a displaceable chassis, a boom pivotally mounted at one end to said chassis to be adjustable to any inclination, two substantially identical disc members rotatably mounted substantially in the same plane at the other end of said boom with an unobstructed free space between said disc members, each of said disc members being formed on the upper surface thereof with radial teeth extending from the periphery of said disc member toward the center thereof and each of said disc members having cutting teeth projecting from the periphery thereof, an endless conveyor having one end thereof located below said disc members, means guiding the upper run of said conveyor in a path which lies substantially in the plane of said disc members and longitudinally of said boom, stripper members having operative surfaces perpendicular to the plane of said disc members, and motive means in driving connection with said disc members, stripper members and conveyor for driving said stripper members at a greater linear speed than said disc members and for moving the upper run of said conveyor away from said disc members, while moving adjacent opposing surfaces of said stripper and disc members are moved in the same direction as the upper run of said conveyor.

6. In a machine for digging and/or shifting bulk material mounted on a displaceable chassis, a horizontally rotatable turntable carried by said chassis, a boom pivotally mounted at one end to said turntable to be adjustable to any inclination, two substantially identical disc

members rotatably mounted substantially in the same plane at the other end of said boom with an unobstructed free space between said disc members, projecting portions formed on the upper surfaces of said disc members defining radial grooves thereon; exchangeable scraper tools secured to the peripheries of said disc members, an endless conveyor having one end thereof located below said disc members, means guiding the upper run of said conveyor in a path which lies substantially in the plane of said disc members and longitudinally of said boom, rotary stripper drums having operative cylindrical surfaces perpendicular to the plane of said disc members, and motive means in driving connection with said disc members, stripper drums and conveyor for driving said stripper drums at a greater circumferential speed than said disc members and for moving the upper run of said conveyor away from said disc members, while moving adjacent opposing surfaces of said stripper drums and disc members in the same direction as the upper run of said conveyor.

7. The combination according to claim 6 further comprising exchangeable projecting members secured to the cylindrical surfaces of said stripper drums.

References Cited in the file of this patent

UNITED STATES PATENTS

2,575,287	Myers	Nov. 13, 1951
2,595,398	Lewis	May 6, 1952
2,606,416	Bruner	Aug. 12, 1952
2,623,625	Rosetz	Dec. 30, 1952

FOREIGN PATENTS

711,616	Germany	Oct. 14, 1941