Dec. 19, 1961 I. SZABÓ ET AL 3,013,619

MOLDBOARD PLOW

Filed Jan. 15, 1958 2 Sheets-Sheet 1

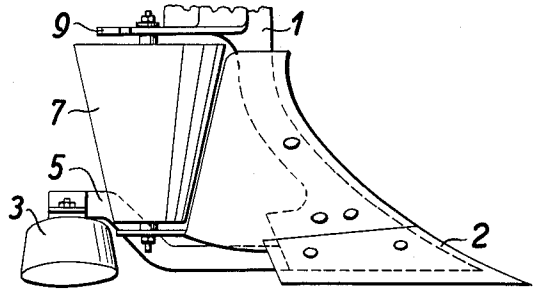

Fig. 1

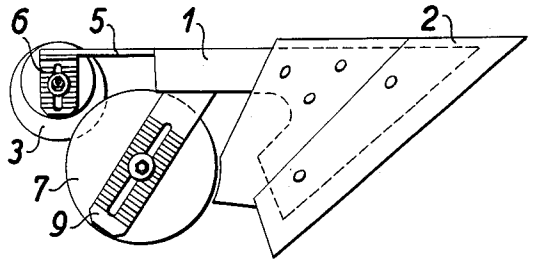

Fig. 3

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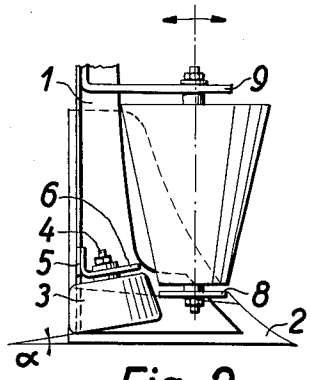

Fig. 2

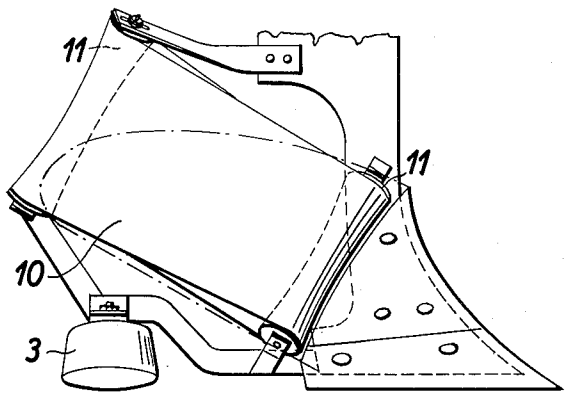

Fig. 4

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MOLDBOARD PLOW

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The present invention relates to plows or other soil tilling machines such as employed in agriculture and earthwork and its main object is to reduce the amount of power necessary for the towing of the machine.

It is known that parts of these machines that move in the ground and come in touch with the soil, are pressed to the ground with great force, thus giving rise to a heavy friction during their motion and necessitating great tractive power.

It is an object of the present invention to provide for considerable reduction of this power by transforming the greater part of the sliding friction into rolling friction.

In accordance with the invention, one or more parts of the soil tilling components which during working come in touch with moved or stationary earth and travel past it are for that purpose replaced by rotatably journalled rolling parts; in such a manner that this rolling component is caused to rotate or move by its own progressive movement. In this way, sliding friction is transformed into rolling friction.

One of the most essential embodiments of this invention is the improvement of plows whose mold board and plow sole are pressed with great force against the side and bottom of the furrow, giving rise to great sliding friction in these spots. In accordance with this invention, the plow is provided with a wheel rolling on the lower part of the side of the furrow, thus transferring the resultant forces originated by plowing to the side of the furrow. Thus this rolling part, referred to hereafter as rolling plow sole, is suitable for transforming the sliding friction originating on the side of the stationary parts of earth into a rolling friction, thus considerably reducing the necessary tractive power.

Another improvement in accordance with the invention is that also the mold board is replaced by a rotatably journalled part, i.e. one or more rollers or an endless belt which directs and turns over the split and lifted soil in the same manner as a mold board of conventional plows. This accomplishes the transformation of the sliding friction into rolling friction also in that location where the plow already passes along the lifted or moved earth and allows further reduction of the tractive power.

The invention can also be incorporated in clay cutters, machines for rooting out beetroots, trench and sewer plows, viniculture plows and in other machines working the soil; its principal use, however, is for soil tilling. The attached drawings therefore represent embodiments of the invention in plows, but other objects and uses will become apparent from the following description of the drawings in which

FIG. 1 is a side view of a plow provided with the previously mentioned rolling plow sole and with a roller replacing the rear part of the mold board.

FIG. 2 is a rear view and FIG. 3 a top view of the plow in accordance with FIG. 1.

FIG. 4 shows a plow with the mold board replaced by a continuous belt running on two rollers.

FIGS. 1 to 3 represent a plow body of conventional design the rear part of which i.e. the wing of the mold board is indicated in dotted lines. This part becomes obsolete when, in accordance with the present invention, a roller replaces a large part of the mold board wing in that area, with the plow bottom then ending at the edge indicated in dotted lines.

The drawing shows the plow head 1 to which all remaining parts are secured and the plow share 2 of conventional form for normal operation. There is no mold board or plow sole since these parts are replaced by the rolling plow sole 3. This plow sole is disposed generally horizontally, but assumes a slanting position with respect to the horizontal as shown on the drawing, since this position corresponds to the resultant of the horizontal and vertical forces pressing on the rolling plow sole. Experience has shown that this slant, i.e., the angle indicated at "a" in the drawing, should be between 15 and 30°.

In the drawing the rolling plow sole is in the form of a disc with a tire, for example with an inner tube or air chamber; for practical purposes it may be desirable to use a wheel having a tire with an air chamber or made of microporous sponge rubber. However, it is also possible to use a different type of wheel, preferably one having an elastic tire, or a roller which when pressed against the lower part of the side of the furrow is made to rotate during the movement of the plow. In this manner, the wheel absorbs in a rolling manner the forces that develop. Thus the sliding friction in the furrow is converted into rolling friction which results in a considerable reduction of tractive forces. The wheel or roller can be mounted in sliding or roller bearings, the latter being more advantageous.

The rolling plow sole 3 can be adjusted together with its axle 4, which means that it can be shifted in its plane and then tightened in its adjusted position so as to ensure freedom of lateral sliding friction of the plow bottom as a result of the position of the wheel. For this purpose the rolling snow plow is mounted by means of an extension arm 5 on the plate 6 which has an elongated slot (FIG. 3). The rolling plow sole can be displaced within this slot and then be secured in its set position by friction, denting or in any other way.

A pneumatic tire has made it possible to inflate the plow soles more strongly for the plowing of hard or loamy soil than for work in loose, sandy earth; nevertheless, a wheel with an air chamber or a faultless tire of microporous rubber sponge is the best, since in general such a wheel is absolutely reliable and does not need any maintenance.

The rolling plow sole 3 with an elastic tire continually changes its shape to a small extent because of varying resistances and it also changes its position because of the unevenness of the furow side and of small bearing surfaces, thus imparting an oscillating movement to the plow bottom in the soil, reducing the sticking and also facilitating its movement in the soil; this contributes to a further reduction of the tractive power.

The mold board on plows is intended to direct to the side, turn, mix and soften the split and lifted earth. The soil must slide past the mold board and even though this part of the plow is made of steel ground as smooth as a mirror, the friction in this area is still considerable. In accordance with this invention, one or more rollers are used in place of the moldboard or at least in place of a part of it; which are shown at 7 in FIGS. 1 to 3. In the illustrated embodiment of the invention this roller consists of a rotating body tapered (concave) toward its middle, but other types of rollers may also be used, even rollers which are not shaped like a rotating body. The roller may be solid or hollow, be made of wood, metal, plastics or any other suitable material, it can have smooth or dented surfaces or surfaces with studs and elevations, etc. The surface of these rotating parts or rotating bodies is suitably made of elastic mciroporous rubber sponge or similar material, since no soil will stick to its due to the motion. Experience will show which roller types are suited best for individual types of soil for earth turning, mixing and softening.

Roller 7 has a slanting position such that its axis of

rotation, when seen from the side, shows its top part inclined forward, while the same top part, viewed from above is slanted towards the side of the furrow, i.e. towards wheel 3 since this position is best suited for the directing, softening and turning of soil. An extension arm 8, attached to the remaining part of the mold board is provided in the lower part for mounting the roller while the roller is journalled at the upper portion in plate 9 mounted on plow head 1. Both shaft ends can be set in various positions inside the oblong slots for varying of the inclination of the roller. This arrangement permits the adaptation of the roller for carrying out of various operations and work in different types of soil; in other words, one plow can carry out work which up to now had to be done by several plows provided with mold boards of different construction. Another great advantage of the present invention resides in solving the problem of rapid plowing. A further advantage of the invention resides in that the earth is better softened and mixed with the aid of a roller than with the moldboard of plows of known design.

It is possible to use two or more rollers instead of one, along which the earth passes is mixed and becomes softened.

The embodiment described with the rolling plow sole 3 passing along the parts of earth not moved while roller 7 revolves along the lifted and moved parts of soil, permits, apart from other advantages already mentioned, a substantial reduction in the tractive force, as evidenced by tests, and this of course is of great importance in the practice.

In accordance with the invention, it is possible to use an endless belt as illustrated in FIG. 4, instead of a roller as shown in FIGS. 1 to 3, such belt suitably replaces the entire mold board. It is useful to make also the surface of this belt elastic. In FIG. 4 the conventional plow body is shown by dotted lines and only its front part, i.e. the plow share of this plow body is retained, since the mold board is replaced by the endless belt in accordance with the invention. FIG. 4 shows also rolling plow sole 3 which has already been described. Its surface is also elastic.

The continuous belt **10** runs on rollers **11** and can be made of flexible metal, leather, plastics, rubber, friction cloth or any other flexible material. Rollers **11** are suitably journalled in bearings and are of concave configuration, although they may have other forms. The rollers can be journalled on any part of the plow and are suitably constructed in a manner to be adjustable. Such adjusting permits on one hand the change in slanting or inclination of all bearings independently from all other bearings and also the mutual approach or distancing of rollers to allow the correct shaping of the belt according to the needs under all conditions. This approaches still closer to the purpose already explained with the aid of FIGS. 1 to 3, namely that a plow constructed in accordance with this invention is capable of performing the work of several plows of the conventional type, since its form can easily be adapted even to a wide range of varying soil conditions.

The earth lifted on belt **10** moves upward and sidewise without friction or sliding to fall in the preceding furrow in turned-over fashion as in the case of plows of conventional design. The belt is set into motion as a result of contact with the soil, i.e. the belt is moved along by earth in motion and is kept moving.

From the foregoing it is already clear that, whenever mention is made of rolling parts in this specification or in the claims by means of which sliding friction is avoided, these parts may consist of wheels, rollers, discs, etc. which rotate around their own axis, or of belts running on rollers which are also capable of transforming sliding friction into rolling friction.

This invention is not necessarily incorporated in new plows only; because its great advantage resides in that existing and used soil tilling machines can readily be converted in accordance with the invention, since the devices described can be mounted on existing plows and machines without any special reconstruction.

The invention also resides in the fact that, in order to reduce further the tractive power and especially to reduce the weight of the machine and thus to save a substantial quantity of steel, the traction is not effected in the usual way by means of a beam but directly from the body of the plow; in the case of gang plows the traction is effected from a rear, suitably from the rearmost plow bottom. In this way the tractive force acts on a substantially deeper level than has been the case heretofore, so that it acts upon a drag that appears nearer to the soil, thereby avoiding on one hand excessive pressing of the furrow and stubble wheel against the ground by the tractive force and on the other hand permits the approximate balancing of forces arising during plowing, and thus substantially smaller strain on the plow beam. This accomplishes not only a further reduction of the necessary tractive force but permits also making the plow beam and other parts 20% less in weight than heretofore.

During plowing the plows run on the stubble wheel, furrow wheel and stern wheel. To allow a further reduction of the tractive force these wheels are suitably provided with tires having inner tubes or air chambers and are mounted on bearings. Obviously, this applies also to soil tilling machinery other than plows where it is also of advantage to have a wheel with inner tube or air chamber and a mounting on bearings in order to reduce the tractive force.

Having now described our invention with reference to the embodiments illustrated in the drawings, we do not wish to be limited thereto but what we desire to protect by Letters Patent of the United States is set forth in the appended claims.

We claim:

1. A plow having a frame, a share portion mounted on said frame, a member on said frame rearwardly of said share portion, a generally horizontally disposed wheel defining a sole portion mounted on said member, a portion mounted on said frame between said share and wheel located above said wheel and constituting the moldboard of the plow, said wheel and said moldboard portion being made at least partly of microporous sponge rubber, said member extending substantially horizontally and transversely to the direction of travel of said plow and defining a slot extending longitudinally of said member, and said wheel being adjustably mounted in said slot.

2. A plow having a frame, a share portion mounted on said frame, a member on said frame rearwardly of said share portion, a generally horizontally disposed wheel defining a sole portion mounted on said member, a portion mounted on said frame between said share and wheel located above said wheel and constituting the moldboard of the plow, said wheel and said moldboard portion being made at least partly of microporous sponge rubber, said member extending substantially horizontally and transversely to the direction of travel of said plow.

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