Dec. 6, 1960 R. D. MacDONALD 2,962,947

ROAD BASE SPREADING APPARATUS

Filed Jan. 9, 1959 5 Sheets-Sheet 1

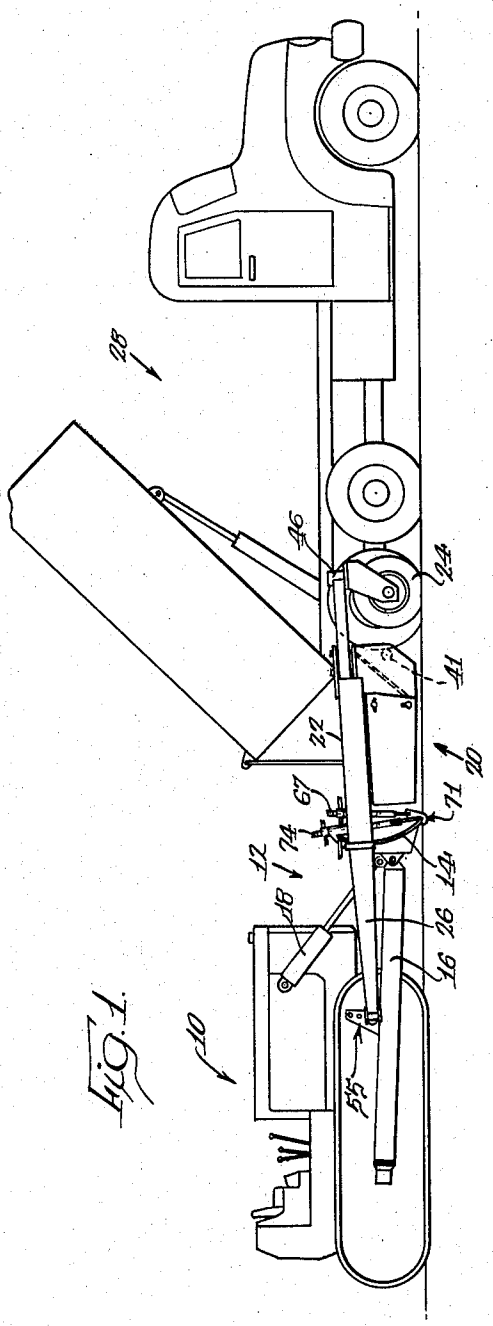


Fig. 1.

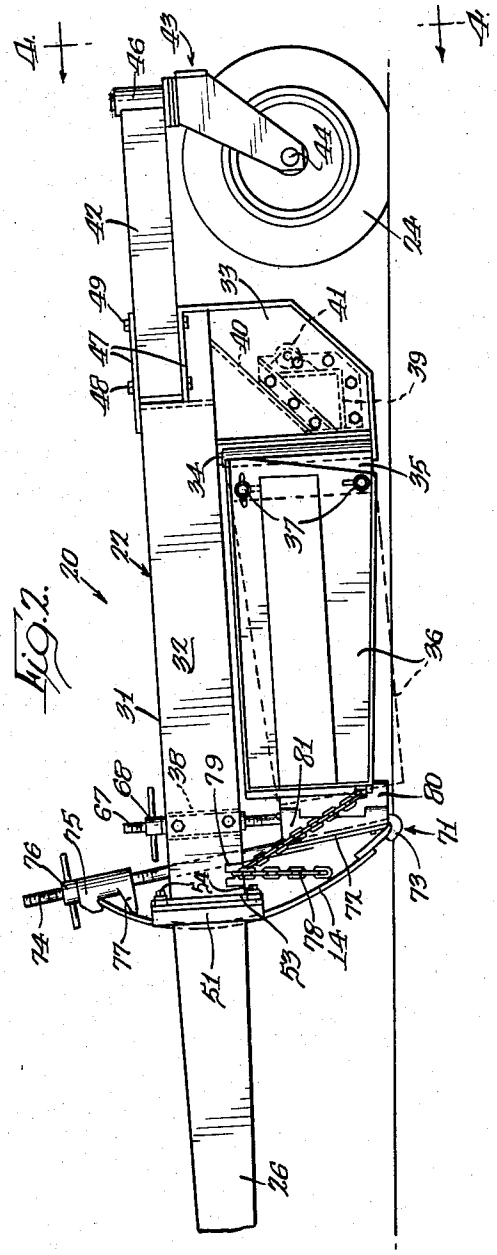


Fig. 2.

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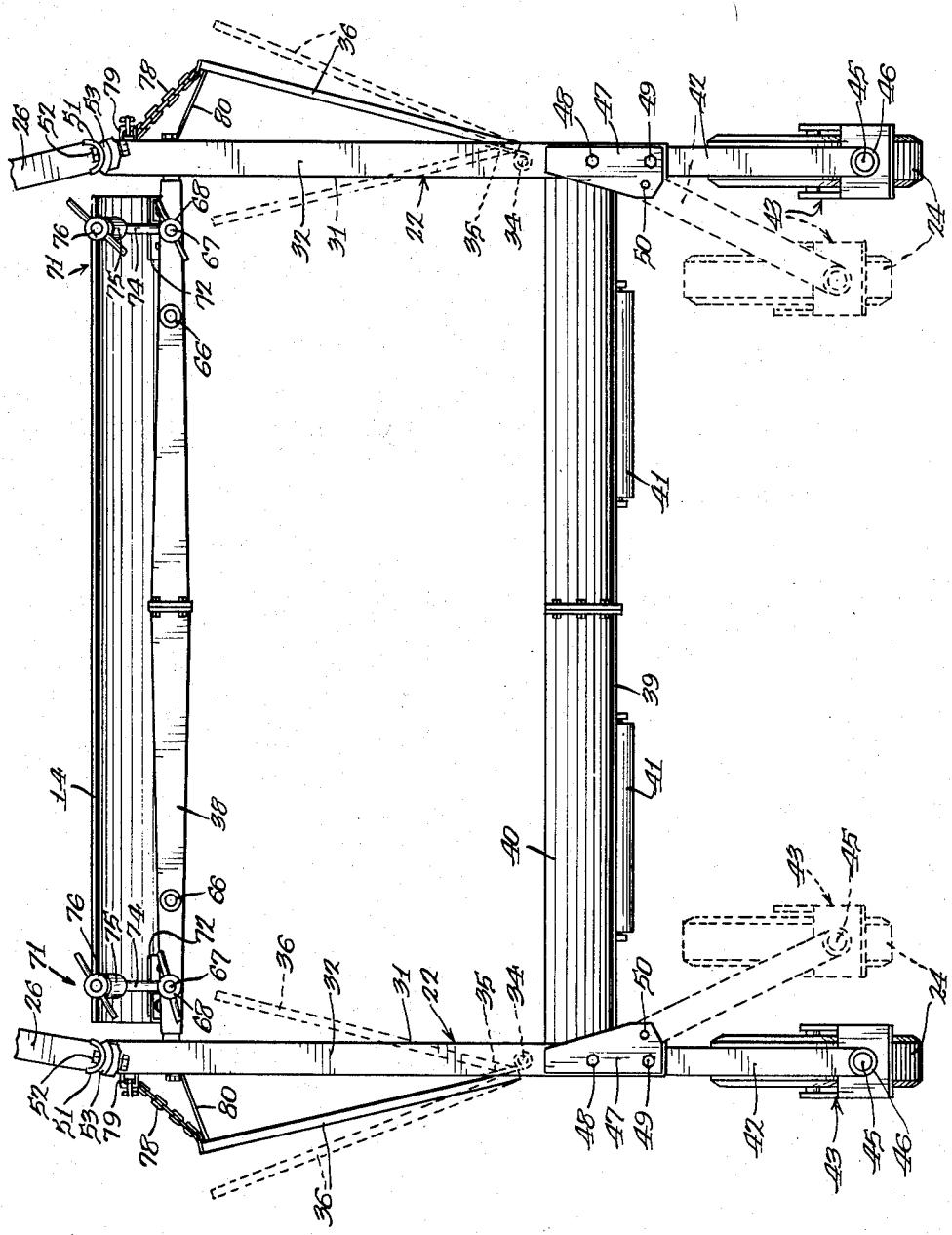


FIG. 3.

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ROAD BASE SPREADING APPARATUS

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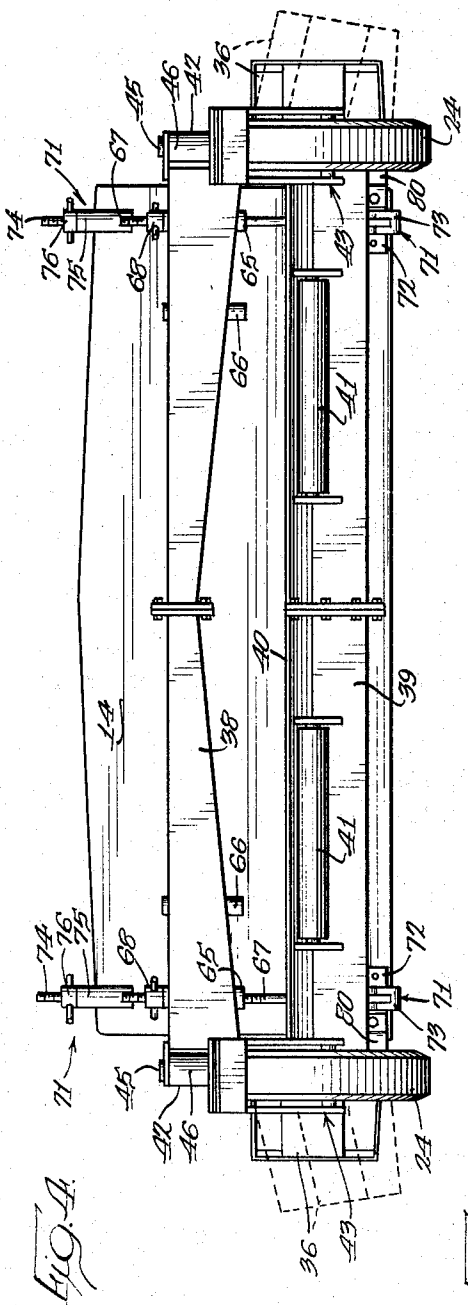


Fig. 4.

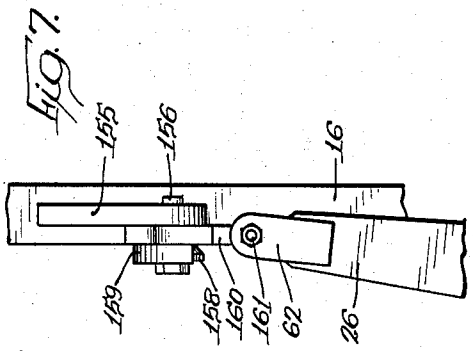


Fig. 7.

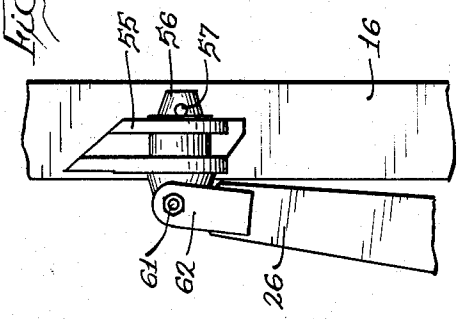


Fig. 6.

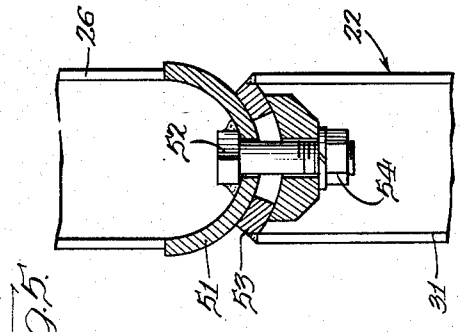


Fig. 5.

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ROAD BASE SPREADING APPARATUS

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Fig. 8.

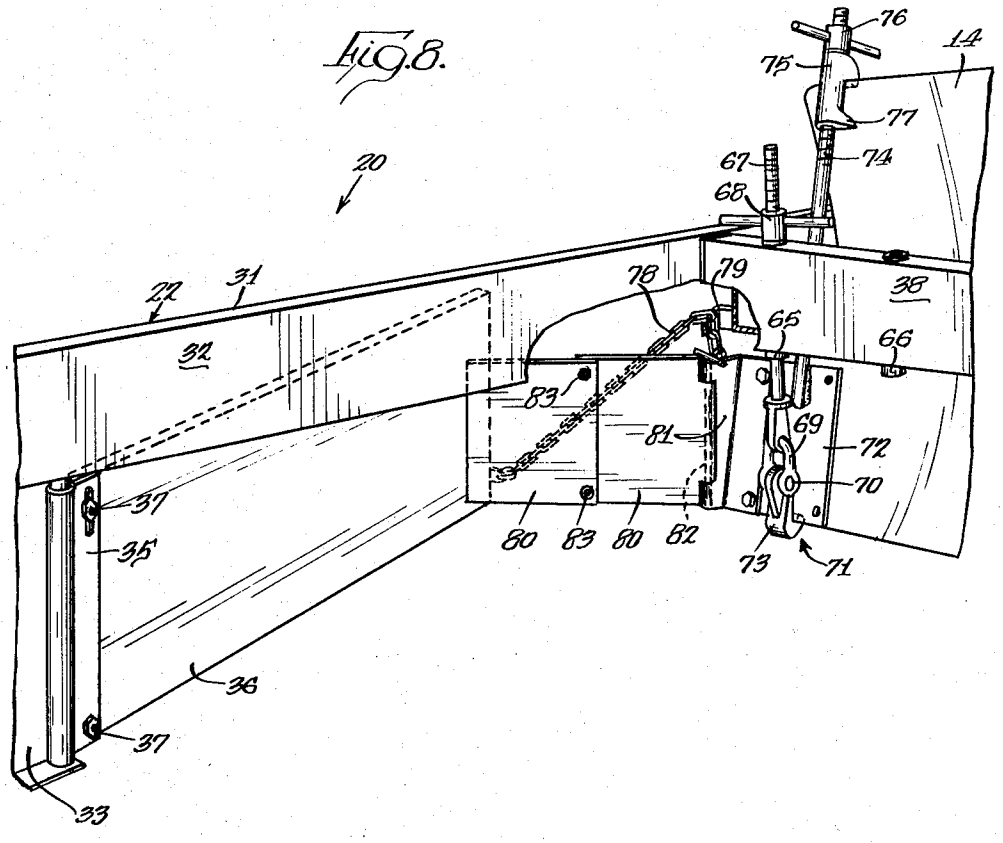
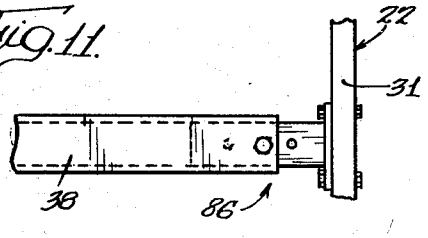


Fig. 11.



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ROAD BASE SPREADING APPARATUS

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Fig. 9.

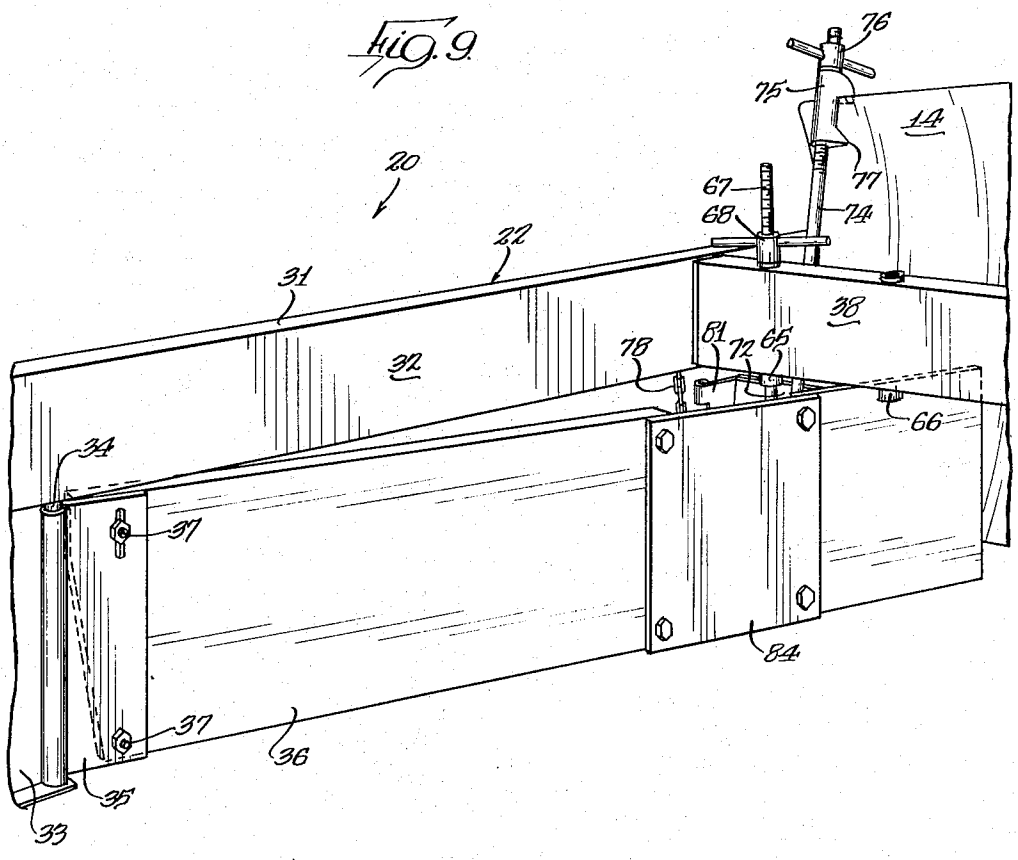
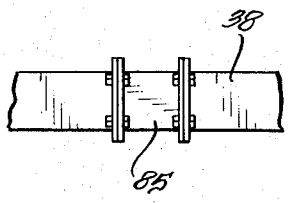


Fig. 10.



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Patented Dec. 6, 1960

2,962,947

ROAD BASE SPREADING APPARATUS

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Filed Jan. 9, 1959, Ser. No. 789,764

14 Claims. (Cl. 94—44)

The present invention relates to apparatus for spreading earth, gravel, crushed stone, rock and similar materials employed as the base for roads and the like, and particularly, to improved base spreading apparatus of the type adapted to be pushed by a standard tractor.

In the art of building roads and the like, one extremely important step in the process is the distribution over a specified area of an even layer of the construction material to be employed as the base for the road. This material, such as rock, crushed stone, gravel, loose earth, and/or sand, is generally delivered to the site in large dump trucks and it is desirable to effect the even distribution of the material promptly, with a minimum amount of handling and without waste. To this end, it has been proposed to dump the material directly from the trucks into a spreading device equipped with a hopper for receiving the material from the trucks. Such spreading devices as have been proposed may be entirely self-contained, or may be adapted to be pushed or pulled by a multiple purpose vehicle, such as a tractor.

In particular, in the building of roads, tractors of the endless track type are employed quite extensively for clearing and leveling the right-of-way, the tractors being provided at their forward ends with bulldozing blades for performing the stated functions. After clearing and leveling, at least some of these tractors would normally be idled, especially during spreading of base materials. If the base spreading apparatus is entirely self-contained, the expensive bulldozer equipment is completely idled and the spreader, representing a duplication in equipment expense, is used to its exclusion. In view of the fact that the tractors of the bull dozing equipment would thus be idled during base spreading, and in view further of their tremendous power and ability to travel over crushed stone, gravel and the like without displacing the same, it was proposed that these idled, endless track type of tractors be employed as prime movers for pushing base spreaders, thereby to eliminate the need for a separate power plant on the spreader and afford a marked reduction in equipment cost and maintenance.

Basically, the known tractor pushed type of spreader is comprised of a simple, three-sided vehicle that is adapted to be attached at the front of a tractor and that is adapted in turn to engage and push in front of it a dump truck, the spreader being open at its forward end and the truck dumping its load into the spreader, the three sides of the spreader confining the dumped material to a strip of predetermined width and striking the material off at a predetermined surface level as the three vehicles simultaneously advance along the roadway. For accomplishing the latter function, the rear wall of the spreader includes a vertically adjustable strike-off means extending transversely of the spreader. To support the spreader, ground engaging wheels are provided at least at the forward end thereof, and the rearward end of the spreader is mounted on and supported by the tractor.

To accommodate mounting of the spreader on the tractor, it is necessary that the conventional bulldozing

blade structure or attachment, i.e., the massive moldboard blade and the push arms or carriage that mount the same on the tractor, be first removed from the tractor, and subsequently, when it is again desired to use the blade, that the spreader be removed from the tractor to permit reattachment of the blade structure. Necessity for complete substitution of the spreader for the blade structure or attachment, and vice versa, creates many problems and constitutes a very substantial disadvantage of conventional spreaders. In particular, considerable time is required for the change-over from attachment to the other even if the tractor, the blade attachment and the spreading attachment are all at the same location. Usually, however, the tractor and the attachment then carried thereby are miles away from the other attachment when it is desired to effect the change-over. For example, it frequently occurs that the bulldozing blade structure is left at one location while the tractor is employed for spreading base materials and that the tractor, when its task as the prime mover of the spreader is completed, will be as much as fifteen or more miles from the location of the blade. Since the blade attachment weighs from about two to about four tons, this means that, if the tractor is to be used to perform a bulldozing function, the tractor must deadhead back to the location of the blade structure and then return to the point where spreading was completed, or that a truck and a crane outfit must be sent to the blade location to pick-up the blade structure or attachment and deliver it to and unload it at the location of the tractor. A very similar problem will normally occur as well when it is desired to convert the tractor from performance of a bulldozing function to performance of a spreading function.

The object of the present invention is to provide improved apparatus of the pushed type for spreading base materials, and in particular, to provide improved spreading means overcoming the above stated shortcomings of the prior art.

A primary object of the invention is to provide improved spreading means of the pushed type comprising in fact a simple attachment not only to a tractor per se, but to the combination of a tractor and its normally carried attachments.

It is also an object of the present invention to provide an improved spreading attachment of the pushed type that is carried by the bulldozing blade structure or attachment conventionally mounted on the pushing tractor, and that utilizes the said blade as the rear wall of the material hopper and as its strike-off instrumentality; whereby the spreading attachment, due to elimination of rear wall and strike-off means of its own, is considerably more simple and economical, its attachment to and detachment from a tractor is much more convenient and expeditious, the problem of separately transporting a bulldozing blade attachment from place to place is eliminated, and there is no duplication of expensive equipment. Consequently, by achievement of these results, the present invention entirely eliminates the disadvantages of both the self-contained spreader and the known type of pushed spreader.

It is the particular object of this invention to provide improved base spreading apparatus comprising, in combination, a bulldozer equipped with the usual blade structure including a forwardly disposed vertically movable transverse moldboard blade, and a spreading attachment mounted on said blade structure and comprising a pair of side assemblies extending forwardly of said blade from adjacent the opposite ends thereof, means adjacent the rearward end of each side assembly mounting the spreading attachment at its rear on the blade structure, ground engaging means adjacent the forward end of each side assembly supporting the spreading attachment at its front on the ground, and support means between the blade and the spreading attachment supporting the blade on the

attachment, said side assemblies and said blade defining a forwardly open three-sided hopper disposed rearwardly of said ground engaging means for reception of material to be spread, said side assemblies comprising means for laterally confining the material to a strip of predetermined width and said blade comprising the back wall of the hopper and means for striking-off the material at a predetermined level relative to said ground engaging means.

By virtue of the combination defined, the present invention not only achieves the highly advantageous results above noted, but it also utilizes as the material impelling and strike-off means thereof an exceptionally heavy and ruggedly built instrumentality that cannot feasibly be incorporated in either a self-contained spreader or the known three-sided spreader attachment of the prior art. This instrumentality, i.e., the bulldozing blade, weighs from 2 to 4 tons and is specifically designed for pushing earth materials. Consequently, the combination of this invention is capable of handling in the hopper thereof an exceptionally large mass of base material and is well adapted to push this mass of material along with the spreading attachment. During performance of such material pushing or impelling function, the bulldozer blade has no tendency to rise over the material in the hopper because of its weight and specific design. Due to this relation, the combination of the invention is able to spread base material wider and deeper than prior devices and effects a compaction of the spread material not heretofore capable of attainment with a base spreader.

A further object of the invention is the provision of an improved spreading attachment as above defined that is of economical, simplified and lightweight construction so that the attachment can readily be lifted by the tractor and placed onto a low-boy, and that is also comprised of readily assembled and disassembled components each of which can be loaded into a truck with little effort, thereby to minimize to the greatest extent possible the task of delivering the spreading attachment to the tractor location.

A still further object of the invention is the provision of an improved base spreading attachment as defined including means for readily adapting the same for association with any bulldozer.

Other objects and advantages of the invention will become apparent in the following detailed description.

Now, in order to acquaint those skilled in the art with the manner of making and using my improved spreading apparatus, I shall describe, in connection with the accompanying drawings, a preferred embodiment of the spreading apparatus, and preferred manners of making and using the same.

In the drawings:

Figure 1 is a view in side elevation of a tractor, the spreading attachment of the invention and a dump truck, the view illustrating the cooperative association of the three vehicles for purposes of spreading base materials;

Figure 2 is an enlarged side elevation of the preferred embodiment of the spreading attachment of the invention and the blade of the bulldozing attachment conventionally provided on the tractor, the view illustrating in dotted lines the vertical adjustability of the spreader wing gates;

Figure 3 is a plan view of the apparatus shown in Figure 2, the view illustrating in dotted lines the lateral adjustability of the wing gates and the spreader wheels;

Figure 4 is a view taken substantially on line 4—4 of Figure 2 and comprising, generally, a front elevation of the apparatus shown in Figure 2;

Figure 5 is a fragmentary sectional view, on an enlarged scale, of the connection between one side assembly and its push arm;

Figures 6 and 7 are plan views of alternative means for mounting the push arms of the spreading attachment on the push arms of a bulldozing blade attachment;

Figure 8 is a fragmentary perspective view illustrating one manner of connecting the spreading attachment to the blade of the bulldozer attachment, and also illustrating the apparatus set up to spread a strip of base material wider than the blade;

Figure 9 is a view similar to Figure 8 showing the apparatus set up to spread a strip of base material narrower than the width of the blade;

Figure 10 is a fragmentary plan view of one embodiment of means for varying the length of the cross members of the spreading attachment; and

Figure 11 is a fragmentary plan view of a second embodiment of such means.

Referring now to the drawings, I have shown in Figure 1 the manner of association and use of the apparatus employed according to the invention for spreading base materials. The apparatus is comprised of the combination of a conventional bulldozer and a spreading attachment therefor. For purposes at least of this application, the term "bulldozer" is defined as the known combination of a tractor with a conventional heavy moldboard type blade mounted by push arms, or an equivalent C-frame, ahead of the tractor. A "moldboard" is defined as a curved metal implement for lifting and turning materials, and the combination of the moldboard blade and its push arms is defined as the bulldozer blade structure or attachment. With reference now to Figure 1, the bulldozer is illustrated as comprised of a tractor **10**, which constitutes the prime mover of the apparatus, and a bulldozer blade attachment **12** carried at the front of the tractor. The attachment **12** comprises a vertically movable moldboard blade **14** extending transversely of the tractor forwardly thereof, a pair of blade push arms **16** connected to and extending rearwardly from adjacent the opposite ends of the blade and pivotally mounted adjacent their rearward ends on opposite sides of the tractor, and means **18** for effecting arcuate movement of the blade and blade push arms in a vertical direction about the horizontal pivot axis of the arms **16**. Mounted on and cooperating with the bulldozer is the spreading attachment of my invention, which is indicated generally at **20**. This attachment comprises a pair of side assemblies **22** extending forwardly from adjacent the opposite ends of the blade **14**, a ground engaging wheel **24** supporting each side assembly at its forward end, and an attachment push arm **26** extending rearwardly from each side assembly and mounted at its rearward end on the adjacent blade push arm **16** of the bulldozer. Also, support means **67**, **71** are provided between the blade and the side assemblies which support the heavy, massive moldboard blade **14** on the spreading attachment (the means **18** being de-energized for this purpose), whereby the blade is supported substantially centrally between the pivot axis of the bulldozer push arms **16** and the wheels **24** of the spreading attachment. Due to their relative dispositions, the side assemblies **22** and the moldboard blade **14** define a forwardly open three-sided hopper rearwardly of the wheels **24** for reception of base material to be spread, the side assemblies comprising means for laterally confining the base material and the blade comprising the rear wall of the hopper and means for striking-off the base material at a predetermined depth or thickness.

In use, a dump truck **28** containing base material to be spread is backed into the space between the wheels **24** of the spreading attachment, and its load is dumped, gradually or all at once depending upon relative capacities, into the hopper defined rearwardly of the wheels by the blade **14** and the side assemblies **22**. The bulldozer is then advanced forwardly, causing conjoint forward movement therewith of the spreading attachment. Preferably, the spreading attachment **20** includes means to be described engageable with the wheels of the truck **28** to push the truck forwardly of it, so that the described apparatus advances simultaneously along the roadway. During this movement, the wheels **24** of the spreading attachment ride on the roadbed forwardly of the material in the hopper to serve as a bench mark for the

spreading operation, the side assemblies **22** laterally confine the base material to be spread to a strip of predetermined width, and the blade **14** derives its position from the wheels **24** to strike-off the material at a predetermined depth or thickness relative to the roadbed, thereby to restrict the material to the desired area and desired depth. When the truck is empty, it is driven away and another truck loaded with base material is backed into dumping position relative to the spreading attachment to maintain a supply of base material for the spreading operation. Spreading thus continues, continuously or intermittently depending upon the continuity of supply, to cause a layer of base material of uniform width and thickness to be spread along the desired portion of the roadway.

As will be appreciated from the foregoing, the bulldozer is conventional in all respects, and it is only the construction of the spreading attachment **20** that makes the described combination of, bulldozer and spreading attachment feasible. Consequently, no further description of the bulldozer is necessary, except to state that the moldboard blade **14** is disposed substantially at right angles to the longitudinal axis of the tractor prior to association therewith of the attachment **20**.

Referring now to Figures 2, 3 and 4, the preferred embodiment of the spreading attachment of the invention is illustrated in specific detail. As shown, each side assembly **22** of the attachment is comprised of a frame portion **31** including a generally horizontally extending beam **32** and a support bracket **33** depending from the forward end of said beam. Mounted on the frame portion **31** immediaely rearwardly of and parallel to the bracket **33**, is a pintle pin **34** on which a wing **35** is mounted for swinging movement about the generally upright axis of the pin. This wing adjustably mounts a gate **36** which extends rearwardly therefrom beneath the beam **32**. Two vertically spaced bolts **37** are utilized to connect the gate to the wing, the lower bolt extending through a hole in the wing and a vertical slot in the gate, and the upper bolt extending through a vertical slot in the wing and a generally horizontal arcuate slot in the gate, whereby the bolts mount the gate for vertical adjustment and for angular adjustment in a vertical plane relative to the wing and the frame portion of the side assembly, the wing in turn mounting the gate for generally horizontal swinging movement relative to the frame **31**. When the attachment **20** is mounted on the bulldozer, the wing gate **36** normally terminates forwardly of the blade **14**, whereby the gate may be swung inward or outward relative to the frame **31**, as depicted in Figure 2, to vary the width of the strip of base material to be spread and in particular to facilitate spreading of a strip of base material that is of a width greater than, equal to, or less than the width of the blade **14**.

To afford rigid frame means for the spreader, a pair of cross members **38** and **39** extend horizontally between the frame portions **31** of the side assemblies **22** fixedly to retain the side assemblies in spaced parallel relation at a distance from one another slightly greater than the width of the bulldozing blade **14**. Both cross members are preferably made in at least two parts to facilitate handling thereof and assembly and disassembly of the spreading attachment, each part in the embodiment illustrated being flanged at its opposite ends to facilitate bolted connection of the same to one side assembly and to its complemental part. The cross member **38** extends between the beams **32** of the two assemblies adjacent the rearward ends thereof whereby the same is disposed immediately forwardly of and parallel to the blade **14** in use of the apparatus. The other beam **39** extends horizontally between the bracket portions **33** of the two assemblies, and is thereby disposed adjacent the forward end of the attachment and only a short distance above ground level. In particular, the latter cross member is disposed sufficiently low that the dump body of the dump truck **28** will pass freely thereover to accommodate dumping of base material into the hopper defined by the side assemblies **22** and the blade **14**, the cross member **39** including means defining an inclined apron **40** to facilitate the dumping operation. Also, this cross member suitably constitutes the means of the spreading attachment for pushing a dump truck forwardly thereof during the spreading operation. To facilitate performance of this function, the cross member **39** is provided on its forward surface with bracket means supporting a pair of horizontally spaced rotatable push rollers **41** adapted for engagement with the rear wheels of dump trucks.

The blades **14** of bulldozers conventionally used in the road building industry are appreciably wider than the width of conventional dump trucks, and the cross members **38** and **39** of the spreading attachment locate the side assemblies **22** at such distance from one another that the rearward ends thereof are disposed immediately outward of the opposite ends of the blade. Consequently, the side assemblies are spaced at such distance that dump trucks may readily be backed up into engagement with the push rollers **41** and may freely dump their loads into the hopper. Also by virtue of the described relationship, the supporting wheels **24** for the forward end of the spreading attachment may be disposed appreciably forward of the front cross member **39** since a truck may readily be backed into the space between the wheels.

Each wheel **24** is supported on its respective side assembly by means of a forwardly extending arm **42** and a caster assembly **43** depending from the outer end of the arm. The wheel itself is mounted within the forked portion of the assembly **43** by means of a horizontal axle **44** on which the wheel is journalled. At its upper end, the assembly **43** includes an upwardly extending shaft **45** that is journalled by means of bushings in a tubular housing **46** provided at the outer end of the arm **42**. The arm **42** in turn is adjustably mounted at its inner end on the frame portion **31** of the respective side assembly **22**, the mounting means including a pair of vertically spaced triangular brackets **47**, a pin or bolt **48** pivotally mounting the inner end of the arm between the brackets for horizontal swinging movement about an upright axis, and a lock pin or bolt **49** that is insertable through a hole in the arm and any one of a plurality of sets of arcuately spaced holes **50** in the bracket. By virtue of this mounting, the arm **42** is adjustable in a generally horizontal direction to be disposed in alignment with or at an inclination to the respective side assembly **22**, thereby to permit lateral offset of the wheel relative to the side assembly, the caster **43** in turn causing the wheel to run true irrespective of its position relative to the side assembly. The purpose of the adjustable wheel mounting will be described in detail hereinafter, and it will suffice for the present to state that this adjustment permits both wheels **24** to engage a common surface at the same elevation relative to the side assemblies **22** thereby to cause the spreading attachment to run true to this surface. Moreover, since the wheels are extended appreciably forward of the hopper, the surface on which the wheels engage constitutes the bed on which the base material is to be spread. Accordingly, the spreading attachment is effectively supported and guided on the surface constituting the bench mark for the layer of base material to be spread.

At its rearward end, the spreading attachment **20** is supported on the bulldozer attachment or structure **12** by means of the attachment push arms **26**. Each attachment push arm **26** is adjustably secured at its forward end to the rearward end of the beam **32** of the respective side assembly **22** so as to accommodate such relative disposition of the arms **26** as may be necessitated by the relative positions of the side assemblies **22** and the blade **14** and blade push arms **16** of the bulldozer. According to the preferred embodiment of the invention, this ad-

justable connection is resolved to pivotal movement about a generally upright axis, thereby to accommodate horizontal angulation of each arm **26**. In particular, as shown in Figure 5, each attachment push arm **26** is provided at its forward end with an upright flange **51** having a convex forward surface. Preferably, this flange is in the form of a semi-cylinder projecting both above and below the push arm and includes a pair of studs **52** projecting forwardly therefrom from adjacent the opposite ends thereof. For cooperation with this flange, a complemental, rearwardly concave flange **53** is suitably secured, as by welding, to the rearward end of the beam **32**, the flange **53** having horizontal slots therein adjacent its opposite ends adapted for passage of the studs **52**, whereby the attachment push arm is pivotally movable in a generally horizontal arc relative to the beam. To secure the attachment push arm to the beam in adjusted position, suitable washers are placed on the studs **52** and nuts **54** are threaded tightly thereon. Thus, the studs and nuts serve as clamp means clamping the push arm to the side assembly in the adjusted position thereof. By virtue of this connection, the push arms **26** are normally fixedly secured to the side assemblies, are readily adjusted relative to the side assemblies **22**, and are quickly assembled on and disassembled from the side assemblies ot facilitate field assembly and disassembly and ready transport of the spreading attachment.

At its rearward end, each of the push arms **26** of the spreading attachment is mounted on the adjacent blade push arm **16** of the bulldozer attachment or structure. Since the bulldozer blade is vertically adjustable, it is necessary that the mounting means for the spreading attachment accommodate vertical movement of the blade, but otherwise retain the spreading attachment against relative lateral and fore and aft movement. To this end I provide essentially a transverse horizontal pivot connection. However, since the push arms **26** are normally angulated in the horizontal plane, it is desirable that a vertical pivot connection be provided as well to accommodate disposition of the mounting means parallel to the sides of the tractor. Suitable alternative means for effecting such connections are shown in Figures 6 and 7.

In the embodiment of Figure 6, the mounting means comprises a bracket **55** adapted to be secured, as by welding, to the upper surface of the blade push arm **16** of the bulldozing attachment, the bracket preferably being disposed parallel to the side of the tractor. As shown in Figure 1, this bracket is relatively tall and is provided with a plurality of vertically spaced bearing holes adapted for rotatable reception therein, at the selection of the user, of a mounting pin **56**. The mounting pin is preferably shouldered to abut against the outer surface of the bracket and is of a length to extend through the bracket as shown in Figure 6. To retain the pin in the selected hole, a fastening pin or cotter key **57** is passed through a diametrical hole in the inner portion of the pin. At its outer end, the mounting pin **56** is provided with another diametrical hole adapted for the rotatable reception of an upright pivot pin or bolt **61** which serves to connect the mounting pin to a fork **62** that is fixed to the rearward end of the attachment or spreader push arm **26**. The vertical or upright pivot pin **61** is provided for the purpose of accommodating relative horizontal angulation between the push arm **26** and the bracket **55** so that the bracket may be disposed parallel to the side of the tractor while the push arm maintains its necessary degree of angulation relative to the tractor and the respective side assembly. This results in a neat disposition of the bracket **55**, especially when the spreading attachment is removed from the bulldozer. However, the bracket could initially be fixed to the push arm **16** of the bulldozer at the angle or inclination required by the disposition of the push arm **26**, whereupon the connection would be reduced to a transverse horizontal pivot connection, or any other suitable connection accommodating vertical movement of the blade **14** and vertical pivoting movement of the push arm **16**. Thus the described mounting means connects the spreader push arm **26** to the bulldozer push arm **16** for relative pivotal movement about the horizontal axis of the pin **56** and also for vertical adjustment on the bracket **55**. When the mounting is completed, the push arm **26** is effectively retained against relative movement other than pivotal movement about the transverse horizontal axis of the pin **56**.

In the embodiment of Figure 7, the mounting means includes an upstanding bracket **155** having a general similarity to the bracket **55**, and a mounting pin **156** adapted to extend into any selected one of a plurality of vertically spaced holes in the bracket. In this case, however, the bracket is simply a vertical plate and the pin is simply a bolt threaded into a selected one of several tapped holes in the bracket. At the outer side of the bracket, the bolt carries a conical washer **158** adapted to be wedged by the bolt into a socket defined by segmental flanges **159** on the outer surface of the two legs of a bifurcated mounting plate or fork **160**, this plate being bifurcated at its rearward end to slip over the bolt or pin **156** and being pivotally connected at its forward end, by means of an upright pivot pin or bolt **161**, to the fork **62** that is fixed to the rearward end of the spreader push arm. The purpose of the pin or bolt **161** is, of course, the same as that described for the pin **61**. Consequently, the illustrated means mounts the spreader push arm **26** on the bulldozer push arm **16** for relative pivotal movement about the horizontal axis of the bolt **156** and also for vertical adjustment on the bracket **155**. When the mounting is completed, the push arm **26** is effectively retained against relative movement other than pivotal movement about the transverse horizontal axis of the bolt **156**.

In addition to its connection to the push arms **16** of the bulldozer, the spreading attachment **20** also has connection with the blade **14** for the two-fold purpose of mitigating side sway between the blade and the spreading attachment and of causing the blade to be supported on the spreading attachment, thereby to derive its position relative to ground from the spreading attachment and especially the wheels **24** thereof. In particular, the rear cross member **38** is provided with at least one set of guide tubes **65** extending vertically therethrough, one tube being provided adjacent each end of the member. For purposes to be described, I prefer to include a second set of guide tubes **66** in the cross member, a tube **66** being disposed adjacent but inwardly of each tube **65**. Extending downwardly through each tube of one or the other set of tubes is a blade supporting and depth adjusting rod **67** that is threaded at its upper end for adjustable reception thereon of a wing nut **68**, each nut engaging the top surface of the cross member **38** and limiting the extension of the respective rod therebelow. At its lower end, as best shown in Figure 8, each of the rods **67** is flexibly connected by means of a clevis **69** and a pin **70** to a blade clamp and bracket assembly indicated generally at **71**. Each of the assemblies **71** includes a base plate or bracket **72** adjacent the lower end thereof, a hook-like lower blade clamp **73** welded to the bracket **72** and projecting downwardly and rearwardly therefrom, a rod **74** welded to and projecting upwardly from the bracket **72**, an upper blade clamp **75** slidably mounted on the rod **74**, and a wing nut **76** threaded on the upper end of the rod **74**. In use, the bracket **72** is disposed to the forward side of the blade **14** adjacent the lower edge thereof, the lower hook **73** is engaged with the lower edge of the blade, the upper hook or clamp **75** is engaged with the upper edge of the blade, and the wing nut **76** is tightened down to cause the members **73** and **75** to clamp the blade therebetween. In this respect, it is noted that the upper clamp **75**, in addition to a downwardly facing hook, is provided with a

lateral projection 77 engageable with the face of the blade 14 to retain the lower end of the clamp outwardly from the blade and in alignment with the lower clamp, thereby to prevent bending of the rod 74. The blade supporting and depth adjusting rod 67 is preferably connected to the lower clamp member 73 of the respective assembly 71 by the said pin 70.

To accommodate adjustment of the blade 14 to the desired strike-off height, the tractor is disposed with its treads and the wheels of the spreader on the bed on which the base material is to be spread. The blade supporting and depth adjusting wing nuts 68 are then loosened and the blade raised or lowered by its actuating mechanism 18 to the desired distance above the said bed. With the blade held in this position, the wing nuts 68 are threaded downwardly into firm engagement at their lower surfaces with the upper surface of the cross member 38, whereafter the actuating mechanism 18 of the bulldozing attachment is de-activated to cause the blade to float relative to the tractor. Consequently, the blade 14 is then held in elevated position by the blade supporting and depth adjusting rods 67 and nuts 68, and derives its support from the spreader and its position relative to the bed surface from the wheels 24. Being an exceedingly heavy instrumentality, the moldboard blade will not move upward from its set position during use of the apparatus, and because of its weight and configuration will not rise over the base material in the hopper. Consequently, the base material will be struck-off at a predetermined constant depth or thickness.

In use of the apparatus illustrated in Figure 1 in the building of roads, the initial layer of base material is spread over the finished grade of the roadbed. During such spreading, the tractor 10 rides on the layer of base material as it is spread, and the wheels 24 of the spreading attachment, since they are forward of the hopper, ride on the finished grade. Inasmuch as the strike-off means of the spreading apparatus, i.e., the blade 14, derives its position from the spreading attachment at a point midway between the pivot axis of the bulldozer push arms 16 and the wheels 24, the base material being spread by the apparatus is struck-off evenly at a predetermined accurately maintained distance above the finished grade, thereby to insure spreading of the base material to exacting specifications. In the event the base material is to be spread in contiguous parallel strips, this same relationship is readily maintained by virtue of the fact that the wheel 24 adjacent the previously spread strip may be moved laterally inward of the respective side assembly, by appropriate adjustment of the respective arm 42, as illustrated in dotted lines in Figure 3, to ride on the finished grade even though the respective side assembly 22 overlies the previously spread strip of base material. Moreover, if need be, both wheels 24 can be moved inwardly to ride on a previously spread and compacted layer of base material when spreading a subsequent layer of the same or a different base material, again to cause the strike-off blade 14 to derive its position from an accurate guide surface or bench mark. Since these capabilities generally satisfy the demands of the art, I have simply provided for disposition of each of the wheels 24 in one or the other of two positions in the preferred embodiment of my invention, namely, a first position in alignment with the respective side assembly and a second position spaced laterally inward of the respective side assembly. However, if desired, the wheels could readily be mounted for disposition in any one of a number of positions inwardly and/or outwardly of the side assemblies by appropriate modification of the brackets 47 which support the arms 42.

In addition to the foregoing, the present invention facilitates crowning of the base material when that is desired. Specifically, if the base is to be spread in two contiguous strips, and the crown grade is a straight incline from the edges to the center of the two strips, i.e., the line of juncture thereof, it is only necessary to adjust the depth determining nuts 68 in such manner that rods 67 support the blade at the specified inclination, whereby the spreading attachment will support the blade at this inclination relative to the finished grade. The base material may then be spread without further adjustment of the spreading apparatus by spreading one strip on the outbound excursion of the apparatus and the other on the inbound trip. If the crowning is to be along an arc, or if each strip of base material is to be individually crowned, it is necessary only to secure a suitably configured strip-like member to the lower edge of the blade 14 to constitute the strike-off edge of the blade.

To afford sharp definition of the edges of the strip of base material being spread, each wing gate 36 is vertically adjustable, both up and down as a unit and in an arc about the axis of the lower one of the bolts 37, whereby the same, especially at its trailing end, may be set with its lower edge just above finished grade or the bed surface irrespective of the strike-off height of the blade 14. Consequently, the free edge or edges of the base material being spread can readily be maintained straight and accurate. Moreover, when spreading a strip of base material parallel and contiguous to a previously spread strip, the inboard one of the gates 36 may readily be set at exactly the same height as the strike-off means so as to assure proper definition of the inboard edge of the strip without disturbing the previously spread strip, leaving a space between the strips, or even causing a significant line of demarkation between the two strips.

In addition their vertical adjustability for the purposes stated, the wing gates 36 are also adjustable in a generally horizontal direction to vary the width of the strip of base material to be spread. Assuming first that the strip is to be wider than the blade 14 of the bulldozing attachment, the wing gates are preferably swung outwardly equal distances from the frame portions 31 of their respective side assemblies 22, about the axis of the respective pin 34, until the distance between their trailing ends is equal to the width of the strip to be spread. Then, as shown in Figure 8, each gate 36 is retained against further outward movement by stop means in the form preferably of a chain 78 that is connected to the lower rearward edge of the respective gate and is of a length to extend from the gate to the beam 32 of the respective side assembly regardless of the degree of adjustment of the gate. At its inner end, the chain 78 is adapted to have a selected one of the links thereof inserted into a vertical slot in a bracket 79 that is fixed to the beam 32, whereby the gate may be retained in substantially any selected position relative to the respective side assembly.

As the gate is thus disposed, there is a gap between the gate and the end of the blade 14 that must be closed to complete the hopper and define a continuous strike-off edge. For this purpose, I prefer to employ one or more strike-off extension plates 80, the plates all being of the same size and being connectable to one another to form an extension of sufficient length to close the aforesaid gap. Since these plates form part of the strike-off edge, I further prefer that the same be secured to the blade 14 to be simultaneously adjustable therewith and thereby. It is for this purpose in particular that the bracket 72 is included in the blade clamp assembly 71. Specifically, in accordance with the preferred embodiment of the invention, each bracket 72 at the outboard edge thereof includes a forwardly projecting portion 81 defining a hinge leaf for hinged connection thereto of one of the extension plates 80, the connection being effected by means of a generally upright hinge pin 82. The portion 81 of the bracket 72, the extension means 80 and the hinge pin 82 are so constructed and assembled that the lower edge of the plate 80 is substantially co-planar with the lower edge of the blade 14, thereby to form a continuous, straight strike-off edge. If one plate 80 is sufficient to close the gap, that is all

that need be provided. If not, a second plate 80 is secured to the first or hinged plate 80 by means preferably of bolts 83. Thereafter, the extension means 80 is swung about the axis of the pin 82 to bring the outer edge thereof into engagement with the inner surface of the gate 36 and to cause the extension to be wedged thereagainst, whereby the extension is retained in operative position and the wing gate is retained in its pre-adjusted outward position. Nevertheless, the extension 80 simply frictionally engages the wing gate 36 so that the extension may be adjusted simultaneously with the blade 14 in the vertical direction relative to the wing gate.

Since the extensions 80 are required to extend beneath the beams 32 of the side assemblies 22, there would be ocassions, in the absence of compensating means, in which the blade and extensions would be limited in their elevation above ground due to interference between the extensions and the beams. To eliminate such possibility, I provide as compensating means the upstanding brackets 55 and 155 of the push arm mounting means. In particular, each such bracket as shown in Figure 1 projects upward a significant distance above the push arm 16 of the bulldozer attachment and is provided with a number of vertically spaced holes thereby to accommodate such elevation of the push arms 26 of the spreading attachment as may be necessary to afford adequate clearance below the beams 32 for the extensions 80. If desired, of course, this capability for vertical adjustment could be embodied elsewhere in the spreading attachment, for example, at the connection between the side assemblies and push arms of the spreader.

Assuming now that the strip of base material to be spread is to be of substantially the same width as that of the blade 14, it is simply necessary to remove the extensions 80 or to swing the same inwardly, to swing the wing gates 36 into alignment with the ends of the blade, and to lock the wing gates into that position by means of the chains 78.

If it is desired to spread a strip of base material of a width less than that of the blade 14, the extensions 80 are removed, by removing the pins 82, the chains 78 are detached from their brackets 79, and the gates 36 are swung inwardly to the desired position. Then, as shown in Figure 9, an extension 84, which may in actual practice be one or more of the plates 80, is bolted to each wing gate to extend the same rearwardly into engagement with the blade 14. The respective chain 78 is then pulled outwardly to wedge the extension 84 against the face of the blade, and an appropriate link of the chain is entered into the slot in the bracket 79 to secure the gate and its extension in adjusted position. Since the extension 84, as thus disposed, has only frictional engagement with the blade 14, the blade is readily moved to effect vertical adjustment of the strike-off level.

In view of the foregoing, it is believed apparent that the present invention affords highly improved, greatly simplified apparatus for effecting exceedingly accurate spreading of base materials to any desired width and depth. In particular, by virtue of the described construction, the present invention brings to fruition the combination as illustrated in Figure 1 of a standard bulldozer and a spreading attachment. The advantages of so combining these instrumentalities are manifold; the more dominant of which include the resulting simplification of the spreading attachment and the permanent retention of the bulldozing blade attachment or structure on the tractor, whereby the problems and drawbacks of prior art devices as described hereinbefore are eliminated. To cause these advantages to result in immediate commercial benefit, it is very desirable that the spreading attachment be universally adaptable to the wide variety of bulldozers now encountered in the field. In other words, while the spreading attachment of this invention could be made in specific sizes to fit specific brands of bulldozers, I much prefer that my attachment be universally adaptable to substantially all known styles and sizes of bulldozers, thereby to facilitate immediate commercial adoption of the concepts of this invention, to eliminate necessity for purchase by the prospective user of a special tractor or a special blade attachment, and to eliminate any need for manufacture of several different sizes and styles of spreading attachments. To accomplish these objectives, I provide, quite simply, the pivotally adjustable connections of Figure 5 and either Figure 6 or Figure 7, and means for varying the length of the cross members 38 and 39 of the spreader. In this latter respect, as illustrated in one embodiment in Figure 10, the length of the cross members 38 and 39 may be increased or decreased simply by the insertion between, or removal from between, the two parts of the respective cross member of any one of a number of flanged spacers 85 of different lengths. Alternatively, as shown in Figure 11, the cross members 38 and 39 may each include, adjacent each side assembly 22, a telescopic mounting assembly 86 for facilitating effective elongation and contraction of the cross members. In either case, the two parts of each member are preferably made of equal length and are each of a length equal approximately to one-half the width of the narrowest blade conventionally encountered in commercial use on tractors of a size and power output suitable for use as the prime mover of a base spreader, the spacers 85 and telescopic assemblies 86 being of a length to accommodate extension of the cross members in incremental steps up to a length slightly greater than the widest blade conventionally encountered in commercial use.

In associating the spreading attachment of the invention with a bulldozer, substantially irrespective of the style and type of the tractor and the blade structure or attachment, the following sequence of steps is recommended: The first step is to install one of the blade supporting and depth adjusting rods 67 in each section of the rear cross member 38 by extending the same upwardly through an appropriate one of the tubes 65 and 66. On smaller bulldozers, especially those with straight bulldozing blades, the rods 67 are placed in the inside tubes 66. On larger bulldozers, and most bulldozers with angling blades, the rods 67 are placed in the outside tubes 65. Thereafter, the individual sections of the two cross members 38 and 39 are bolted to the frame 31 of the respective side assembly 22. Then the two cross members are bolted together at their inner ends. If the bulldozing blade with which the spreading attachment is to be associated is wider than the smallest blade with which the attachment is adapted for use, it will be necessary to insert a spacer 85 between the adjacent ends of each cross member, or to effect appropriate adjustment of the telescopic connections 86 embodied in the cross members, thereby to complete the basic frame work of the spreading attachment.

In the meantime, the bulldozer is brought to the vicinity of the spreader and the bulldozing blade thereof is set to a straight position substantially perpendicular to the longitudinal axis of the tractor. The blade clamp and bracket assemblies 71 are then mounted adjacent the opposite ends of the blade, the initial mounting being effected relatively loosely to accommodate subsequent adjustment of the clamps. The bulldozer is then moved to dispose the bulldozing blade 14 centrally in back of the spreader frame. The blade 14 is then lifted, by the mechanism 18, to a position approximately 6 inches off the ground. The blade clamp and bracket assemblies are then disposed directly behind the respective depth adjustments rods 67, the clamps tightened onto the blade, and the clevis 69 attached to the respective assembly 71 by the pin 70.

The forward portion of the spreader frame is then raised above the ground to permit association therewith of the two wheel assemblies, each consisting of a wheel

24, a caster 43 and and arm 42, the connection being effected by means of the bolts 48 and 49. With the wheels in position, the spreading gates 36 may now be mounted on the wings 35 by means of the bolts 37, the width adjustment chains 78 associated with the gates 36 being looped over their respective brackets 79.

As thus far assembled, the rearward end portions of the side assemblies 22 are disposed immediately outside the opposite ends of the blade 14, whereby the ends of the side assemblies are freely exposed for attachment thereto of the push arms 26. The push arms 26 are then brought into position and the studs 52 thereof are extended through the slots in the flanges 53 at the rearward ends of the side assemblies. The nuts 54 are loosely applied to the studs 52 to retain the push arms in association with the side assemblies.

Thereafter, the bulldozing blade 14 is lowered to the ground and both spreader push arms 26 are swung inwardly toward the push arms 16 of the bulldozer. Preferably, the mounting means of either Figure 6 or Figure 7 is connected to the fork 62 at the rearward end of each push arm 26, and the push arms 26 are moved inwardly to bring the bracket 55 or 155 of the respective mounting means into alignment with the respective push arm 16 of the bulldozing attachment. The bracket is then turned so that the same parallels the side of the tractor and is placed on the push arm of the bulldozing attachment, whereby its exact position for the particular installation is automatically determined. Then, all that is necessary is to weld the mounting bracket to the push arm 16 and to tighten the nuts 54, whereupon the assembly of the spreading attachment on the bulldozer is completed.

Subsequently, the bulldozing blade 14 and the wing gates 36 of the spreading attachment may be adjusted in any of the manners described hereinbefore to set the apparatus for the spreading of base materials in accordance with a broad range of specifications.

As is to be appreciated from the foregoing, the blade supporting rods and clamps 67, 71, the push arms 26 and the mounting brackets 55, 155 comprise means detachably interconnecting the spreading attachment and the bulldozer; the arms and brackets movably, and also adjustably, mounting the spreading attachment at its rearward end on the tractor, the wheels 24 supporting the forward end of the spreading attachment on the ground or roadbed, and the rods and clamps supporting the blade structure, i.e., the blade and the forward portions of its push arms, on the side assemblies 22, thereby to support the blade on the spreading attachment substantially midway between the wheels 24 and the pivot axis of the blade push arms 16 so that the blade is guided as to level by the wheels and is also disposed to halve any discrepancy in level encountered either by the wheels 24 or the tractor 10. Consequently, the blade is supported to maintain a highly accurate strike-off level.

When it is desired to remove the spreading attachment from the bulldozer, it is only necessary to manipulate the tractor in such manner as to bring the spreading attachment into a suitable storage area, whereupon the blade clamp assemblies 71 are removed and the retaining pin or key 57 removed if the mounting means shown in Figure 6 is utilized, or the bolt 156 loosened if the mounting means of Figure 7 is employed, to accommodate detachment from the bulldozer of the spreading attachment. Then, it is only necessary to back the bulldozer out from the space between the push arms of the spreader, whereupon the bulldozer is immediately available for performance of customary bulldozing functions. Prior to this backing movement of the tractor, it may be necessary to swing the push arms 26 of the spreading attachment outwardly, and this is readily accomplished simply by loosening the nuts 54 that clamp the push arms 26 to the side assemblies 22.

If there is advance information as to the location in which the spreading attachment will next be used, the bulldozer may be employed to load the spreading attachment directly onto a low-boy for transport to the next point of use. Specifically, it is only necessary to activate the lifting mechanism 18 of the bulldozer attachment to cause the bulldozer to lift the entirety of the spreading attachment off the ground, whereupon the tractor may be moved forwardly, or manipulated as necessary, to dispose the spreading attachment on the low-boy transversely of the low-boy. The blade clamp assemblies 71 are removed and the push arms 26 are detached from both the tractor and the side assemblies of the spreading attachment. The bulldozer may then be put in use elsewhere. The push arms 26 are simply loaded onto the low-boy, whereafter the low-boy and the spreading attachment may be transported to the next locale of use. In the preferred embodiment of the attachment 20, the length of the same from the wheels 24 to the rearward ends of the side assemblies 22 is equal substantially to the width of a standard low-boy, thereby to facilitate transport of the spreading attachment in the manner indicated. When manufactured in this size, the spreading attachment has a minimum capacity of approximately 8 cubic yards which is somewhat greater than the capacity of standard dump trucks. Accordingly, in use of the spreading attachment, dump trucks such as that shown in Figure 1 can dump their entire load into the hopper and be immediately driven away for purposes of hauling another load of base material to the spreading apparatus. It is only in the case of oversize and semi-trailer dump trucks that there is any need for the dump truck to be pushed along forwardly of the spreading apparatus, since the spreading apparatus will normally effect spreading at such rapid speed that conventional dump trucks can dump the entirety of their loads into the hopper just as rapidly as one truck can be driven away from the spreading apparatus and a second truck brought into dumping position.

In addition to the foregoing, in the event that the spreading attachment is stored at some distance from the locality of its next point of use, the same is readily disassembled into a small number of pieces each of a size and weight to be quite readily manipulated manually, whereby the attachment may quickly be disassembled, loaded onto a pick-up truck, transported to the intended point of use, and quickly re-assembled without necessity for the bulldozer deadheading back to the location at which the spreading attachment was stored in order to pick it up.

Moreover, the attachment is readily adapted for use with any one of a plurality of bulldozers, irrespective of their sizes and the character of the blades thereof, by the simple expedient of obtaining as many pairs of mounting brackets 55 or 155 as the contractor has bulldozers, and adjusting the spreading attachment to each bulldozer and welding brackets in appropriate positions on the push arms 16 of each bulldozer, whereafter each bulldozer may be readily combined with the spreading attachment by appropriate manipulation of the means provided to vary the length of the cross members 38 and 39 and appropriate angulation of the push arms 26. By this means, the spreading attachment is adapted for immediate use with any one of a plurality of bulldozers, depending upon which bulldozers are not presently in use for other purposes and which is closest to the location of the spreading attachment.

From the foregoing, it is to be appreciated that the present invention affords marked improvements in the art of base spreading, and in particular, brings to practical commercial use a novel base spreading combination comprising a standard bulldozer and a spreading attachment. Moreover, the spreading attachment itself is of a highly simplified and improved character and embodies therein a highly convenient and practical manner of adjustment to effect the spreading of base materials to any desired width and thickness. One predominant advantage of the

invention resides in the fact that the bulldozer blade is required to derive its position from the finished grade surface that constitutes the bench mark of the layer of base material to be spread, whereby the base material may be spread to very exacting specifications. In view of the foregoing, it is believed apparent that all of the objects of the invention have been shown herein to be attained in a convenient, economical and practical manner.

While I have shown and described what I regard to be the preferred embodiment of my invention, it will be appreciated that various changes, rearrangements and modifications may be made therein without departing from the scope of the invention, as defined by the appended claims.

I claim:

1. Apparatus for spreading base materials for roads directly from a dump truck onto a roadbed comprising, in combination, a bulldozer comprising a tractor, a vertically movable transverse moldboard blade in front of the tractor and blade pusher arms connected to said blade and movably mounted on said tractor, and a spreading attachment comprising a pair of side assemblies extending forwardly of said blade from adjacent the opposite ends thereof, ground engaging means on the forward end of each side assembly supporting the forward end of said spreading attachment on the roadbed, mounting means adjacent the rearward end of each side assembly mounting the spreading attachment at its rearward end on said bulldozer, said mounting means comprising a pair of relatively movable elements connected to one another and mounted respectively on said bulldozer and the respective side assembly, the connection of said elements being substantially rigid in the direction longitudinally of said tractor, and accommodating relative movements of said elements in a vertical plane transverse to the axis of said tractor, thereby to connect said bulldozer and the spreading attachment for conjoint longitudinal movement and to accommodate vertical movement of said blade, and support means operatively connected to said blade and said side assemblies supporting said blade on said side assemblies, said side assemblies defining a forwardly open space for entry of a truck between the forward end portions of said side assemblies, said side assemblies and said blade defining a three-sided hopper rearwardly of said forward end portions of said side assemblies and said ground engaging means for reception therein directly from the truck of material to be spread, said side assemblies comprising means for laterally confining the material to a strip of predetermined width and said blade constituting the rear wall of said hopper for pushing a substantial load of the material and for striking-off the material at a predetermined level.

2. Apparatus for spreading base materials for roads directly from a dump truck onto a roadbed comprising, in combination, a bulldozer comprising a tractor and a blade structure carried by the tractor, said blade structure including a vertically movable transverse moldboard blade in front of the tractor and blade pusher arms connected to said blade and movably mounted on said tractor, and a spreading attachment comprising a pair of side assemblies extending forwardly of said blade from adjacent the opposite ends thereof, first mounting means adjacent the rearward end of each side assembly mounted on said bulldozer and including horizontal transverse pivot means pivotally supporting the side assemblies on said bulldozer on a horizontal pivot axis extending transversely of said tractor, ground engaging means on the forward end of each side assembly supporting the forward ends of said side assemblies on the roadbed, second mounting means operatively connected to said blade structure and said side assemblies supporting said blade on said side assemblies, said side assemblies defining a forwardly open space for entry of a truck between the forward end portions of said side assemblies, said side assemblies of said blade defining a three-sided hopper rearwardly of said forward end portions of said side assemblies and said ground engaging means for reception therein directly from the truck of material to be spread, said side assemblies comprising means for laterally confining the material to a strip of predetermined width and said blade constituting the rear strike-off wall of said hopper for pushing a substantial load of the material and for striking-off the material at a predetermined level, and adjusting means embodied in one of said mounting means to vary the strike-off level of said blade.

3. Apparatus for spreading base materials for roads directly from a dump truck onto a roadbed comprising, in combination, a bulldozer comprising a tractor and a blade structure carried by the tractor, said blade structure including a vertically movable transverse moldboard blade ahead of the tractor and blade pusher arms connected to said blade and movably mounted on said tractor, and a spreading attachment detachably associated with said blade structure and comprising a pair of side assemblies extending a substantial distance forwardly of said blade from adjacent the opposite ends of said blade, a ground engaging element on the forward end of each side assembly supporting the forward end of the spreading attachment on the roadbed, and connecting means adjacent the rearward end of each side assembly detachably interconnecting the spreading attachment and said blade structure, said connecting means comprising a pair of relatively movable members connected to one another and mounted respectively on said blade structure and the respective side assembly, the connection of said members being substantially rigid in the direction longitudinally of said tractor and accommodating relative movement of said members in a vertical plane, thereby to connect said bulldozer and the spreading attachment for conjoint longitudinal movement and to accommodate vertical movement of said blade, and adjustable support means operatively connected to said blade structure and said side assemblies supporting said blade on said side assemblies, said side assemblies defining a forwardly open space for entry of a truck between the forward end portions of said side assemblies, said side assemblies and said blade defining a three-sided hopper rearwardly of said forward end portions of said side assemblies and said ground engaging means for reception therein directly from the truck of material to be spread, said side assemblies comprising means laterally confining the material to a strip of predetermined width and said blade constituting the rear wall of said hopper for pushing a substantial load of the material and striking-off the material at a predetermined level, said adjustable support means being adjustable to accommodate variation in the vertical disposition of said blade relative to said ground engaging elements thereby to vary the strike-off level of said blade.

4. Apparatus for spreading base materials for roads onto the finished grade surface of a roadbed, comprising, in combination, a bulldozer and a base spreading attachment therefor, said bulldozer comprising a tractor and a moldboard blade structure, said blade structure comprising a vertically movable transverse moldboard blade ahead of the tractor and blade pusher arms connected to the blade and movably mounted on the tractor, said spreading attachment comprising a frame including spaced side members extending forwardly respectively from adjacent the opposite ends of the blade, a wheel on the forward end of each side member supporting the forward end of said frame on the finished grade surface of the roadbed, connecting means on said frame adjacent the rearward end thereof detachably interconnecting said frame and said bulldozer, said connecting means comprising a pair of relatively movable elements connected to one another and mounted respectively on said bulldozer and said frame, the connection of said elements being substantially rigid in the direction longitudinally of said tractor and accommodating relative movement of said elements in a vertical plane, thereby to connect said bulldozer and said spreading attachment for conjoint

longitudinal movement and to accommodate vertical movement of said blade, and adjustable support means operatively connected between said blade structure and said frame supporting said blade on said frame, said side members and said blade defining a hopper rearwardly of said wheels between said side members which hopper is forwardly open for direct reception from the truck of material to be spread, said side members comprising means laterally confining the material to be spread to a predetermined width, said blade constituting the rear strike-off wall of said hopper for pushing a substantial load of the material and striking-off the material at a predetermined level relative to the finished grade surface of the roadbed.

5. Apparatus for spreading base materials for roads onto the finished grade surface of the roadbed, comprising, in combination, a bulldozer and a base spreading attachment therefor, said bulldozer comprising a tractor, a vertically movable transverse moldboard blade ahead of the tractor and blade pusher arms connected to the blade and movably mounted on the tractor, said spreading attachment comprising a frame including spaced side members extending forwardly respectively from adjacent the opposite ends of the blade, mounting means on said frame adjacent the rearward end of each side member, said mounting means being mounted on said bulldozer and including horizontal transverse pivot means pivotally supporting the rearward ends of said side members on said bulldozer on a horizontal pivot axis extending transversely of said tractor, a wheel at the forward end of each side member supporting the forward end of said frame on the finished grade surface of the roadbed, and adjustable support means operatively connected between said blade and said frame supporting said blade on said frame, said adjustable support means comprising a pair of clamps detachably connected to the lower edge portion of said blade adjacent the opposite ends of the blade, a rod connected to each of said clamps and extending upwardly therefrom, said rods adjacent their upper end portions having slidable connection with said frame, and nut means adjustably mounted on the upper end portion of each of said rods and each having a lower surface engageable with an upwardly facing surface of said frame and suspending said blade from said frame, said side members and said blade defining a hopper rearwardly of said wheels between said side members which hopper is forwardly open for direct reception from a truck of material to be spread, said side members comprising means laterally confining the material to be spread to a predetermined width, said blade constituting the rear strike-off wall of said hopper for pushing a substantial load of the material and striking-off the material at a predetermined level relative to the finished grade surface of the roadbed.

6. Apparatus as set forth in claim 5, wherein each of said clamps includes a plate extending upwardly adjacent the blade from the lower edge of the blade, and a strike-off extension pivotally mounted on said plate on a generally upright axis and extending laterally outward from said plate with its lower edge substantially coplanar with the lower edge of the blade.

7. Apparatus for spreading base materials for roads directly from a dump truck onto the finished grade surface of the roadbed comprising, in combination, a bulldozer comprising a tractor and a blade structure carried by the tractor, said blade structure comprising a vertically movable transverse moldboard blade ahead of the tractor, a pair of blade pusher arms connected to and extending rearwardly from said blade along the opposite sides of the tractor, and means adjacent the rearward ends of said blade pusher arms movably mounting said pusher arms on the tractor, and a base spreading attachment comprising a pair of spaced parallel side assemblies extending forwardly of said blade from adjacent the opposite ends of said blade, an attachment push arm connected to the rearward end of each side assembly and extending rearwardly from the respective side assembly to the adjacent blade pusher arm of said blade structure, horizontal transverse pivot means on the rearward end of each attachment push arm of said spreading attachment pivotally mounting the attachment push arm of said spreading attachment on the respective blade pusher arm of said blade structure and supporting the spreading attachment at its rearward end on said blade structure, ground engaging means on the forward end of each side assembly supporting the forward end of said spreading attachment on the finished grade surface of the roadbed, and vertically adjustable support means extending between and operatively connected to said blade structure and said spreading attachment at respective locations spaced one above the other and spaced forwardly of the location of said pivotal mounting means, said side assemblies and said blade defining a three-sided hopper rearwardly of said ground engaging means between said side assemblies which hopper is forwardly open for direct reception from a truck of material to be spread, said side assemblies comprising means laterally confining the material to a predetermined width and said blade constituting the rear strike-off wall of said hopper for pushing a substantial load of the material and striking-off the material at a predetermined level, said vertically adjustable support means being adjustable to vary the strike-off level of said blade.

8. Apparatus as set forth in claim 7, including at least one cross member extending between and connected to said side assemblies and normally retaining the same in spaced parallel relation, means cooperable with each cross member to vary the length thereof and thus the distance between said side assemblies, means comprising an upright pivot connection adjustably mounting each push arm of said spreading attachment on the respective side assembly whereby the push arms of said spreading attachment may be pivoted horizontally toward the respective pusher arm of said blade structure irrespective of the distance between said side assemblies, and whereby the spreading attachment may be adapted to substantially any bulldozer irrespective of the width of the blade and the relative location of the pusher arms thereof, and clamp means on said pivot connections clamping said push arms of said spreading attachment to said side assemblies in their adjusted position.

9. In combination with a bulldozer including a vertically movable transverse moldboard blade disposed ahead of a tractor and pivotally mounted push arms connected to said tractor and supporting said blade, a base spreading attachment detachably associated with said bulldozer, said attachment including side members extending forwardly of the blade from adjacent the opposite ends of the blade and defining therewith a three-sided hopper for reception of material to be spread, said blade constituting the rear wall of the hopper for pushing and striking-off the material within said hopper, a ground engaging wheel on the forward end of each side member forwardly of the hopper supporting the forward end of the spreading attachment on the ground, mounting means on each side member adjacent the rearward end thereof mounting the rearward end of said spreading attachment on said bulldozer, said mounting means comprising a pair of relatively movable elements connected to one another and mounted respectively on said bulldozer and the respective side member, the connection of said elements being substantially rigid in the direction longitudinally of said bulldozer and accommodating relative movement of said elements in a vertical plane, thereby to connect said bulldozer and said spreading attachment for conjoint longitudinal movement and to accommodate vertical movement of said blade, and adjustable support means between said blade and said spreading attachment supporting said blade on said attachment and adjustable to lower said blade and the forward ends of said blade push arms simultaneously.

10. In combination with a bulldozer including a vertically movable transverse moldboard blade disposed ahead of a tractor and pivotally mounted blade push arms connected to said tractor and supporting said blade, a base spreading attachment detachably associated with said blade, said attachment including side members extending forwardly of the blade from adjacent the opposite ends of the blade and defining therewith a three-sided hopper for reception of material to be spread, said blade constituting the rear wall of the hopper and strike-off means for the material, a ground engaging wheel on the forward end of each side member forwardly of the hopper supporting the forward end of the spreading attachment on the ground, an attachment push arm connected to the rearward end of each side member and extending rearwardly therefrom to the adjacent blade push arm, mounting means pivotally mounting each attachment push arm of the spreading attachment at its rearward end on the adjacent blade push arm rearwardly of the blade, and vertically adjustable support means having connection between said blade and said spreading attachment at substantially vertically spaced points in the vicinity of said blade for supporting said blade on said attachment and adjustable to lower said blade and the forward ends of said blade push arms simultaneously.

11. In combination with a bulldozer including a vertically movable transverse moldboard blade disposed ahead of a tractor and pivotally mounted blade push arms connected to said tractor and supporting said blade, a base spreading attachment detachably associated with said blade, said attachment comprising a frame including side members extending forwardly of said blade from adjacent the opposite ends of the blade and defining therewith a three-sided hopper for reception of material to be spread, said blade constituting the rear wall of the hopper and strike-off means for the material, a ground engaging wheel on the forward end of each side member forwardly of said hopper supporting the forward end of the spreading attachment on the ground, mounting means on each side member adjacent the rearward end thereof mounting the rearward end of said spreading attachment on said bulldozer, said mounting means comprising a pair of relatively movable elements connected to one another and mounted respectively on said bulldozer and the respective side member, the connection of said elements being substantially rigid in the direction longitudinally of said bulldozer and accommodating relative movement of said elements in a vertical plane, thereby to connect said bulldozer and said spreading attachment for conjoint longitudinal movement and to accommodate vertical movement of said blade, a clamp secured to the lower edge of said blade adjacent each end thereof, a depth adjusting rod connected to each of said clamps and extending upwardly therefrom, said rods adjacent their upper ends having slidable connection with said frame at a location thereon spaced longitudinally from said mounting means, and nut means adjustably mounted on the upper end portions of said rods and each having a lower surface engageable with an upwardly facing surface of said frame and suspending said blade from said frame, said nut means being adjustable to lower said blade and the forward ends of said blade push arms simultaneously.

12. A base spreading attachment adapted to cooperate with a heavy moldboard type blade which is disposed ahead of a tractor, comprising, in combination, a pair of spaced parallel side assemblies adapted to be extended forwardly of the blade from adjacent the opposite ends of the blade, a pair of blade clamps connected respectively to said side assemblies and adapted to be secured to the blade adjacent the opposite ends thereof, a wing gate on each side assembly, means movably and adjustably mounting each wing gate on the respective side assembly for laterally outward movement of the rearward end portion thereof to increase the width of spread, stop means on each side assembly restricting outward movement of the rearward end portion of the respective wing gate, and strike-off extension means pivotally mounted on an upright axis on each of said blade clamps, said extension means each being adapted to extend laterally and forwardly outward from their respective blade clamps into wedged engagement with the adjacent one of said wing gates to be retained thereby in operative position.

13. A base spreading attachment adapted to cooperate with a heavy moldboard type blade which is disposed ahead of a tractor on pivotally movable blade push arms which connect the blade with the tractor, comprising, in combination, a pair of spaced parallel side assemblies adapted to be extended forwardly of the blade from adjacent the opposite ends of the blade, a ground engaging wheel on the forward end of each side assembly, at least one cross member extending between and connecting said side assemblies, means cooperable with each cross member to vary the length thereof and thus the spacing between said side assemblies, a wheel on the forward end of each side assembly for supporting the forward end of the spreading attachment, an attachment push arm extending rearwardly from the rearward end of each side assembly, transverse horizontal pivot means on each attachment push arm adjacent its rearward end adapted to be connected to the adjacent blade push arm pivotally to support the rearward end of the spreading attachment on the blade push arms, and combined mounting and clamping means mounting each attachment push arm of the spreading attachment at its forward end on the rearward end of the respective side assembly, the last-named means each comprising a generally upright pivot connection adjustably mounting the attachment push arm on the side assembly for horizontal angulation relatively to said side assembly to a position adjacent to said blade push arm, and clamp means clamping the attachment push arm to the side assembly in its adjusted position, whereby the spreading attachment is adapted for association with moldboard blade and blade push arm assemblies having different widths.

14. A base spreading attachment adapted to cooperate with a vertically movable heavy moldboard type blade which is disposed ahead of a tractor on blade push arms pivotally mounted on the tractor, comprising, in combination, a pair of spaced parallel side assemblies adapted to be extended forwardly of the blade from adjacent the opposite ends of the blade, an extensible cross member extending between and connected to said side assemblies adjacent the rearward ends thereof, means cooperable with said cross member to vary the length thereof and thus the spacing between said side assemblies, a wheel on the forward end of each side assembly for supporting the forward end of the spreading attachment, an attachment push arm extending rearwardly from each side assembly for connection to the adjacent blade push arm, a pivotal mounting assembly on each attachment push arm at its rearward end adapted pivotally to support the rearward end of the spreading attachment on the blade push arms, each attachment push arm and the respective side assembly including generally upright relatively adjustable, interengaging arcuate portions accommodating horizontal angulation of each attachment push arm toward the adjacent blade push arm, means clamping said portions together in adjusted position, both of said means accommodating relative adjustment of said side assemblies and said attachment push arms for adaptation of the spreading attachment to said blade and blade push arms, a rod extending from said cross member toward the blade, a clamp member connected to said rod and adapted to be clampingly engaged with the blade, and nut means adjustably mounted on said rod and engaged with said cross member retaining such clamp member in predetermined relation to said cross member.

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