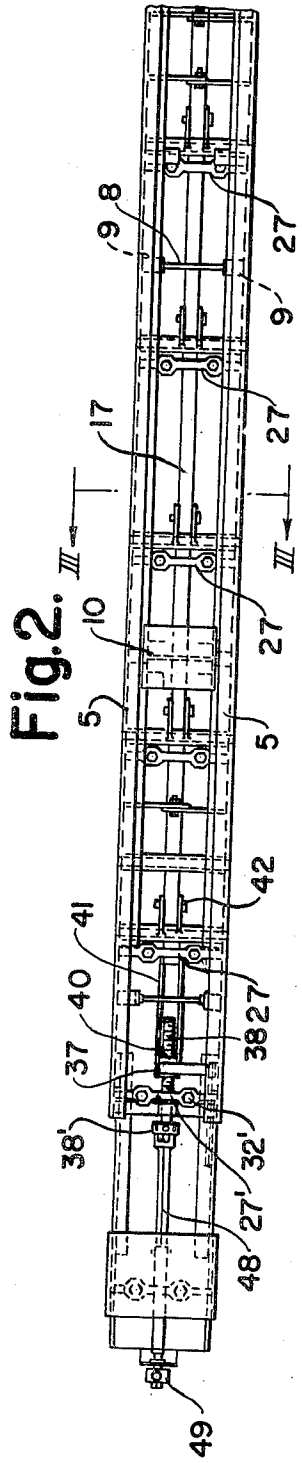
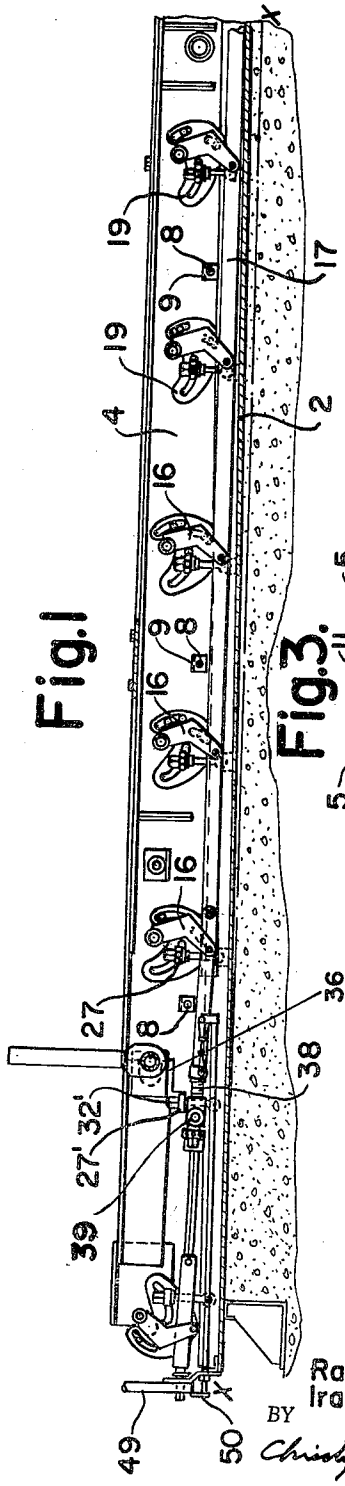
March 12, 1963 R. A. McCULLOUGH ETAL 3,080,798

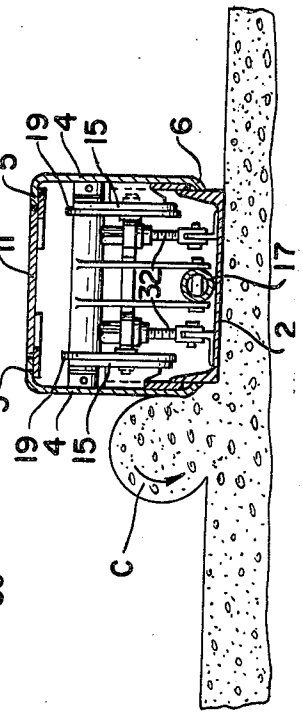
ADJUSTABLE SCREED AND ADJUSTMENT LINKAGE THEREFOR

Filed July 15, 1958

3 Sheets-Sheet 1







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ADJUSTABLE SCREED AND ADJUSTMENT LINKAGE THEREFOR

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3 Sheets-Sheet 2

Fig.4.

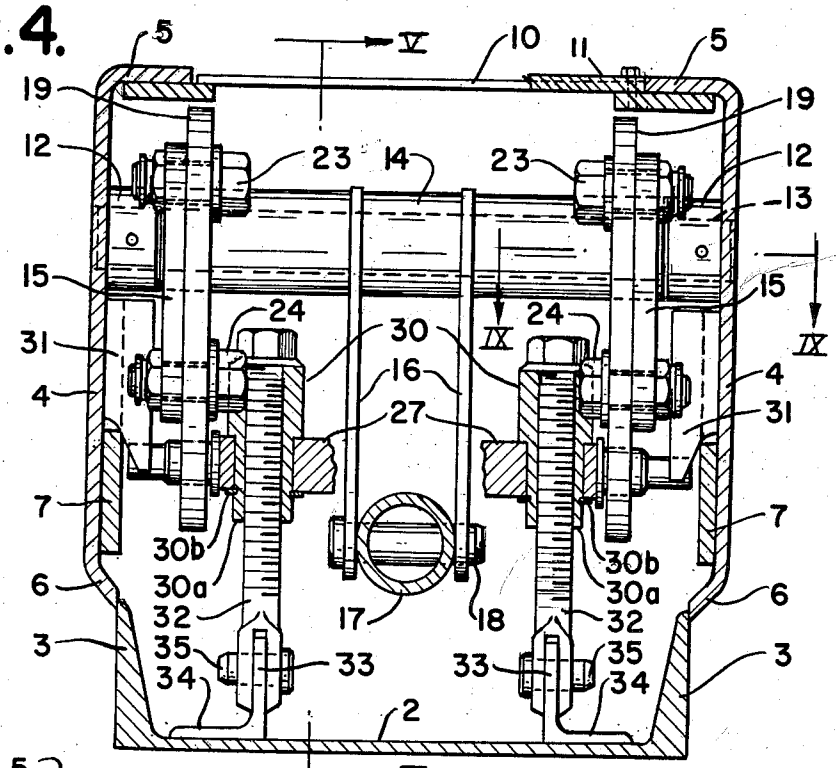
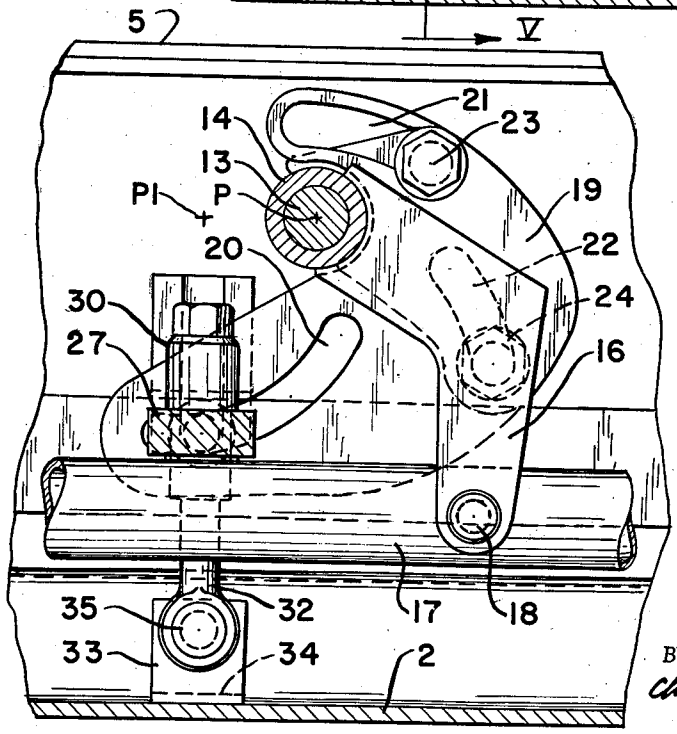


Fig.5.



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ADJUSTABLE SCREED AND ADJUSTMENT LINKAGE THEREFOR

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Fig.6.

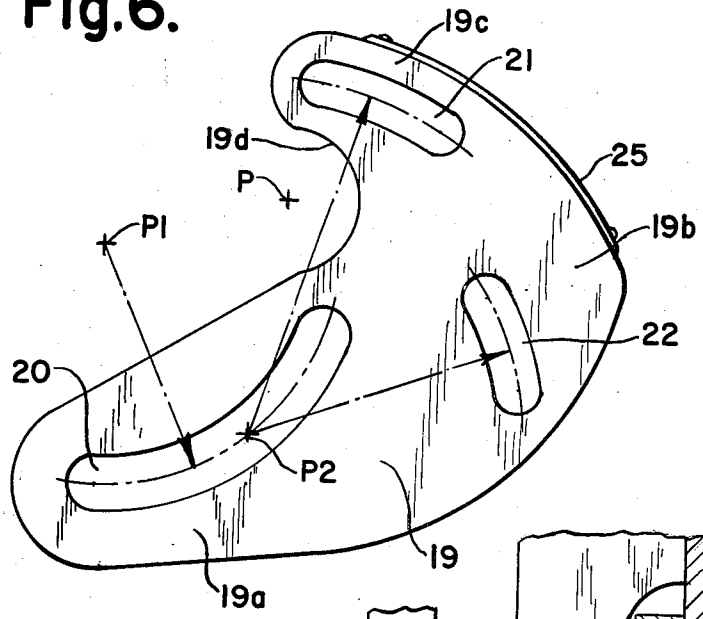


Fig.7.

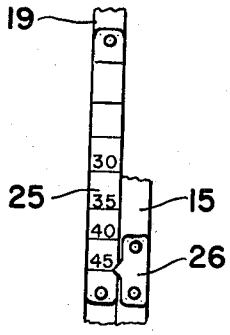


Fig.8.

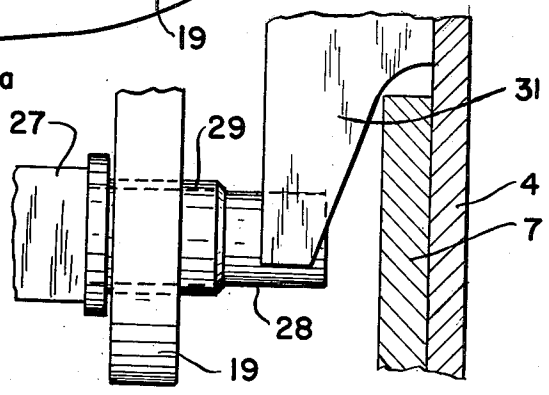
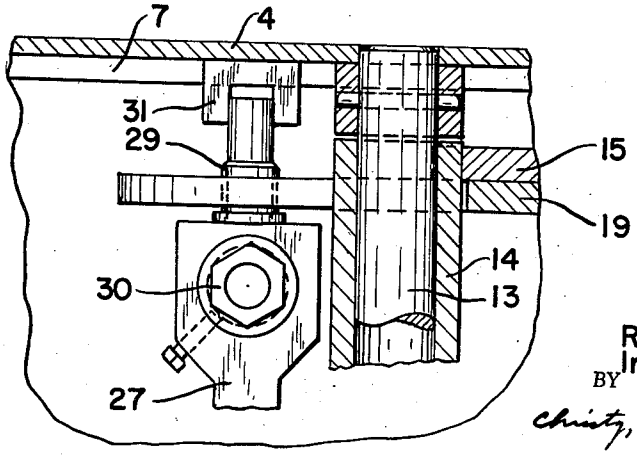


Fig.9.



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3,080,798

ADJUSTABLE SCREED AND ADJUSTMENT LINKAGE THEREFOR

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11 Claims. (Cl. 94—45)

This invention relates to the art of paving with concrete and is for a screed for finishing machines used in such operations. More particularly this invention is for a screed of the so-called quick adjustable type which may be changed to meet the change in contour of the road surface, that is, to provide a positive or negative or flat crown where and when conditions or specifications so require.

The use of quick adjustable screeds in mechanical finishing machines for paving is a known expedient, as shown for example in Patents 1,995,450; 2,296,418 and 2,299,700, and screeds so constructed commonly have a main body portion of generally box-like section with a separate body member in the form of a channel with the flat web of the channel forming the bottom surface of the screed and the upturned side flanges of the channel telescoping into the body. To form a flat paved surface the channel is flat from end to end, but if the surface is crowned the channel is flexed transversely to raise or project certain areas on a predetermined curve from end to end so that as the screed moves over the surface of the concrete the concrete is finished to the curved contour of the screed. This flexing must be under the control of the operator so that if the road contour is to change as the roadway changes from a tangent to curve, the operator can change the screed without extended delay, and often gradually change it as a tangent merges into a curve or vice versa.

The flexing and straightening of the screed is accomplished by linkages at intervals along the length of the channel with cooperating parts on the body of the screed including cams or cranks connected with a common operating mechanism so that upon reciprocation of the operating mechanism the linkages are actuated to transmit motion to the screed to flex it. This linkage, whether it includes cranks or cams, is designed so that for a given increment of movement of the common operating member, one link will be depressed or raised through a distance less or greater than the ones adjacent to it, whereby the greatest increment of movement occurs where the channel is flexed furthest from a normal level plane, and succeeding linkages raise or lower progressively less toward the neutral axis of bending.

Such mechanisms, however, lack flexibility in the sense that very little departure from a predetermined contour is possible without substituting one set of cranks or cams with another. That is to say, they may be infinitely adjustable between a flat contour and a predetermined maximum curvature, but if they flex the channel in an arc, they cannot shape it to a parabola, or flat crown, or inverse curve. Some machines provide certain increments of change in steps, but this is not satisfactory and is inadequate.

The present invention has for its principal object to provide a quick adjustable screed which, by simple selective adjustment, can be set to secure any one of several crown contours normally required, either positive or negative, and which may be normally encountered in paving operations, and which does not involve the use of separate sets of cams or cranks to secure such selection.

A further important object of this invention is to provide an improved motion transmitting linkage in an adjustable screed construction.

A further object of our invention is to provide an improvement in adjustable screeds whereby to improve their performance and exclude the concrete from the interior thereof.

These and other objects and advantages are secured from our invention, as will be more fully apparent from the detailed description in conjunction with the accompanying drawings, in which:

FIG. 1 is a longitudinal vertical section through a part of the length of a screed embodying our invention;

FIG. 2 is a top plan view of FIG. 1 with the cover plates omitted;

FIG. 3 is a transverse vertical section in the plane of line III—III of FIG. 1;

FIG. 4 is a view similar to FIG. 3, but on a larger scale and showing more of the detail of construction;

FIG. 5 is a fragmentary view in the plane of line IV—IV of FIG. 4;

FIG. 6 is a detail showing the cam in side elevation;

FIG. 7 is an edge view of the cam shown in FIG. 6 rotated to a different angle and showing the indicator on the adjacent cam connector or mounting;

FIG. 8 is a fragmentary view showing in detail, in side elevation, one end of the trunnion bar engaged in the cam and provided with a bushing that constitutes the cam follower; and

FIG. 9 is a fragmentary horizontal section in the plane of line IX—IX of FIG. 4.

Referring to the drawings, and first to FIGS. 1 to 4, the screed has two principal parts, a bottom member and a body. The bottom of the screed comprises a wide, flat channel 2 with its flanges 3 turned upwardly. It is supported in the body comprised of two spaced vertical plates 4 with inturned flanges 5 at the top through the operating linkages hereinafter described. The bottom edges of the side plates 4 are sharply turned in at 6 against the flanges 3 of the channel 2. Welded to the inner or confronting faces of the side plates so that their faces are flush with the inturned edges 6 are metal bars 7. These bars bear against the outer faces of the flanges 3 of the channel to exclude concrete that tends to work up around the sides of the channel. They also provide a bearing against the channel flanges so that the side plates are reinforced against the channel when concrete is being pushed or rolled ahead by the screed. The sharply inturned bottom edges 6 of the side plates produces a better rolling action of the concrete ahead of the screed, as will be seen by reference to FIG. 3 where the surplus concrete is marked C.

The two plates are tied together at intervals by tie rods 8, which rods have their ends passing through inverted clips 9 (see FIG. 2) and which tend to spring the side plates against the flanges 3 of the channel. Also connecting the side bars at intervals are plates 10. Removable sectional cover plates 11 set on brackets welded to the flanges 5 (see FIGS. 3 and 4) and are bolted thereto. These cover plates extend from one connecting plate 10 to the next. The channel 2 is relatively flexible so that it may be flexed up or down about a neutral axis.

At intervals along their inner faces the opposed side plates have socket elements or bosses 12 welded thereto (see FIG. 4) in confronting alined pairs. They receive the ends of transverse pins or fixed bearing shafts 13. Fitted about each shaft for rotation thereon is a sleeve 14. It has a flat, plate-like wing or flange 15 at each end, and which is herein termed a cam connector or mount, since the cams hereinafter described are mounted thereon, which sleeve constitutes a rock shaft or rocker.

Each of these sleeves 14 also has a pair of closely spaced arms 16 thereon which preferably extend downwardly from the plane of the axis of the sleeve. These

arms, located close to the center of the sleeve, in effect form a single bifurcated arm or crank on the sleeve on which they are carried. The outer ends of these arms straddle an operating member or pull rod in the form of a pipe or tube **17** that extends lengthwise of the screed. A transverse pivot pin **18** passes through each pair of arms and through the pipe, the arrangement being such that when the pull rod is moved endwise, all of the sleeves **14** are rotated in the same direction and through an equal angle or arc.

A cam member or plate **19** is bolted to the inner face of each of the connectors **15**. These cam plates are all of like construction, and are of the shape shown in FIG. 6. As viewed in this figure, it is of comma-like contour or reversed letter **C**, having a main bottom leg portion **19***a*, a vertical part **19***b* which merges indistinguishably into **19***a*, and at the top of which is the turned-over top or hook portion **19***c*. The recess **19***d* formed by the inner edge of the cam body is generally semi-circular and is adapted to embrace the sleeve **14**, when one of these cams is bolted against the cam connector.

The main part **19***a* of the cam plate has a curved cam slot **20** therein, the center of curvature of which is located above and to one side of the center of rotation of the cam when it is operating with the sleeve, which latter center marked P coincides with the axis of the pin **13** when the cam is adjusted for maximum throw, while the center of curvature for the cam slot **20** is marked P^1.

The cam plate has two other slots therein, an upper one **21** and a lower one **22**. These slots are arcuate, being disposed about a center of curvature marked P^2 in FIG. 6, and which lies on the center line of the slot **20** intermediate its ends. Bolts **23** and **24**, passing through slots **21** and **22**, pass through holes in the cam connectors **15** and have nuts thereon. By loosening the bolts and nuts **23** and **24**, the cam may be adjusted relatively to the connector or mount **15**, it being rotated about the shaft **13**, but with point P^2 its center of adjusting rotation, which is different from its operating center P. By thus rotating the cam relative to its mounting, the position of the cam slot **20** may be changed relative to the axis of the sleeve **14**, but within a range where the slot **20** is below the center of curvature P^1 of the slot and also below the axis of rotation P of the sleeve. For gauging the adjusting of the cam, there is a scale **25** on the periphery of the cam, and the mounting or connector plate has a concentric periphery with a pointer **26** thereon (see FIG. 7). The calibrations on the gauge are arbitrary and are employed in conjunction with our instruction sheet or manual.

It will of course be appreciated that there are two cams on each sleeve **14**, one of them being parallel with each of the main side plates **4**, the cam mounts or connectors being also parallel with the side plates and being located between the cams and the side plates. Therefore the two cams on each sleeve are always adjusted to the same relative positions.

Between each pair of cam elements **19** there is a trunnion bar **27** having a trunnion **28** on each end. Each trunnion has a bushing **29** thereon (see FIG. 8) and this bushing, constituting the cam follower, has a working fit in the cam slot **20**. An internally threaded sleeve-nut **30** is mounted near each end of the trunnion bar, the nut having a reduced lower end portion **30***a* that passes through the trunnion bar, while a snap ring **30***b* encircling the portion **30***a* immediately below the bar holds the nut in place while permitting it to turn. The trunnions **27** are preferably long enough to engage in vertical guides **31** on the inner face of the plate **4** (see FIG. 9). A link or lift screw **32** has its upper end threaded into this nut, while its lower end is bifurcated and straddles the vertical web **33** of an angle clip **34** welded to the web of the channel **2**. A pivot pin **35**, the axis of which is transverse to the length of the channel, passes through the lower end of the lift screw and the vertical web of the angle clip to pivotally connect them.

The channel **2** is thus suspended in the screed body from pairs of lift screws at intervals along its length, with the lift screws being hung from the trunnion bars which in turn are supported by the cams through the engagement of the trunnions **28** and their bushing **29**. Rotation of the cams therefore transmits a raising or lowering movement to the channel **2**. At times, particularly on longer screeds, there are a pair of lift screws located inwardly from the outermost end of the screed so as not to be located over the road forms which have no actuating cam, these being marked **32'**. They engage sleeve-nuts in a relatively fixed trunion bar **27'**, attached to fixed brackets **36**. This is a point of zero deflection, and outwardly from this location the cams may be set to give a negative deflection, i.e., flex the channel **2** downwardly, while inwardly of this point the cams are set to produce a positive deflection, that is, flex the channel upwardly, as shown in FIG. 1. By reason of this arrangement, the bottom channel can be flexed an overall distance greater than the height of the side flanges **3** on the channel without opening a gap between the tops of these flanges and the bottom edges of the side plates. Without such fixed point of zero deflection and cams which will give positive or negative deflection, this is not possible.

It should be noted that the lift screws of each pair and the trunnions are to the side of the sleeve **14** and almost directly under the center of curvature of the cam slot **20**. As the cam is rocked one way or the other, the center of curvature will shift slightly to one side or the other of the vertical plane of the axes of the pins, but to a very small extent. Consequently the vertical forces applied to the trunnion bushings closely coincide with the center of curvature at all times, minimizing components of these forces in a horizontal direction. This is desirable since any horizontal component increases friction as it does in screeds using cams with inclined slots, which cams are moved horizontally with reference to the cam follower.

With our invention, it will be noted that all cams in a given screed may be the same. However, by adjusting the cam slot in the manner described relative to the axis of rotation of the sleeve and turning the nuts **30** to lengthen or shorten the effective linkage between the cam follower and the channel, an infinite number of adjustments are possible. By setting the cam to its furthest limit in a clockwise direction relative to its mounting, it will produce the minimum vertical deflection of the channel for a given angular rotation of the sleeve **14**, whereas, adjusting it in a counter-clockwise direction, as viewed in FIG. 5, it increases the deflection. This may be seen in FIG. 1, where the series of cams to the right of **32'** are each set a little more away from a position where the top bolt **23** is at the top limit of the slot **21** to increase the deflection away from the zero point to the point of maximum crown. Now if a flatter or a steeper crown is needed, adjustment of the cams on their connectors is correspondingly made. Once the selection of the crown shape has been made and all cams set and the bolts **23** and **24** tightened, the channel may be flexed from a crowned to a flat position by simultaneously moving all of the shafts **14** through the same arc of movement by moving the pull rod or pipe **17** in the proper direction.

The pull rod **17** is moved and held in position by a screw jack which is here shown at one end of the screed and is designated **37**. It includes a screw **38** with a head **39** with holes into which an operating bar (not shown) may be placed, and a fixed cross member **39** through which the screw passes. A nut **40** is engaged on this screw and is connected by links **41** and pin **42** to the pull rod **17**. The jack may include an operating extension **48** with a ratchet lever **49** for turning the screw. At **50** is shown an indicator to show the extent of movement of the pull rod and hence the extent of crowning. By rotating the screw a pull or thrust is exerted on the tubular pull rod **17** to transmit motion simultaneously to all of the

sleeves **14** and their associated cams in the manner above explained.

Although it is not necessary that it be so constructed, it is advantageous that the pull rod **17** be below the shafts **13** and sleeves **14**. This not only conserves height or head room and utilizes available space within the body of the screed, but it tends to reduce deflection in the body of the screed.

It will be noted in FIG. 1 that the cam or cams at the left of the point of zero deflection are reversed, but otherwise like those to the right. This is made necessary by the fact that the left end of the channel is pushed down while the part to the right is simultaneously pushed up. This would be unnecessary in any screed in which the point of zero deflection is not intermediate the end of the channel and the point of maximum flexing. In FIG. 1 dot and dash line X—X shows the contour of the screed when it is flattened, while the drawing shows the channel in full lines as being set to crown the roadway.

It is a desirable feature of the cam **19** that the slot **20** is most nearly horizontal at the points where the deflection of channel is greatest, and hence most effective to effect the maximum vertical transition to the screw pins, whereas the inclination of the cam slots to the horizontal increases toward the point of neutral deflection.

Where vertical clearances on a given screed make it impractical to use identical cams at all stations, our invention still provides great flexibility over a wide range of contours through the rotational adjustment of the cams on their mounts even though they may not all be identical in shape.

Various changes and modifications may be course be made in the construction and design of parts within the contemplation of our invention and under the scope of the following claims.

We claim:

1. A quick adjustable screed comprising a body member and a bottom member, a plurality of linkages at intervals along the screed connecting the body member and bottom member, each linkage comprising a cam mount rotatable about a fixed axis, a cam with a curved cam surface adjustably fixed on each mount eccentrically of its axis of rotation selectively movable through a range of positions relative to the mount to vary its amplitude of throw, a vertical link associated with each cam having its lower end secured to the bottom member, a cam follower connected with the other end of the link and engaging the curved cam surface of the cam with which it is associated, and a common operating means for rotating all of the cam mounts about their axes of rotation and the cams which are mounted thereon in unison.

2. A quick adjustable screed comprising a body member and a bottom member, linkages at intervals along the length of the screed for suspending the bottom member from the body and flexing the same, each linkage including a link attached at one end to the bottom member and having a cam follower at its other end a cam assembly in the body for each link, each assembly comprising a mount pivotally supported in the body for rotation about an axis transverse to the length of the body, each cam assembly comprising a slotted cam element on the mount eccentric thereto and adjustable eccentrically to the axis of rotation of the mount, means for releasably holding he cam element in selectively fixed position on the mount, the cam followers at the end of the several links being each engaged in their respective slotted cam elements, and a common operating member connected with all of said cam mounts for simultaneously rotating the same.

3. A quick adjustable screed comprising a body member having spaced side walls and a bottom member of channel section fitted between the lower edges of the side walls, a plurality of transverse rock shafts spaced at intervals along the body and supported therein for rocking motion about an axis transverse to the longitudinal axis of the screed, a cam mount on each rock shaft, a cam plate eccentrically carried on each mount and adjustably secured thereto for adjustment about the axis of rotation of the mount whereby the relation of the cam plate to the mount may be selectively changed, the cam plate having a curved cam slot therein, a link for each cam plate having a follower at one end engaging the cam slot in the cam plate with which it is associated and having the other end thereof attached to the bottom member of the screed, each rock shaft having a downwardly-extending crank arm, and a pull rod extending longitudinally of the body under the rock shafts and above the channel, and connections on the pull rod and cranks for transmitting motion from the former to each of the latter.

4. A screed bottom flexing linkage for location in a screen having a rigid body member and a transversely flexible bottom member, said linkage comprising a cross bar having a cam follower at each end, a pair of vertical links, one near each end of the cross bar for transmitting motion from the cross bar to a screed bottom member, means for adjusting said links vertically relative to the cross bar, a rock shaft positioned transversely in the screed body member located above and to one side of the cross bar and having a cam connector at each end thereof, a cam plate adjustably bolted against one face of each cam connector, the cam plates each having a curved cam slot the centers of curvature of which are above and in proximity to the vertical plane of the axes of the two links, the cam followers on the cross bar being engaged in the curved cam slots of the cam plates, the links being secured at their lower ends to the flexible bottom member of the screed.

5. A quick adjustable screed having a body comprising two spaced side plates extending lengthwise of the screed, a bottom member in the form of a channel having its flanges telescoped between the side plates, links secured to the bottom member in transverse pairs at intervals along the bottom member, the links of each pair being at opposite sides of the longitudinal center of the bottom member, a trunnion bar to which the upper ends of the links are connected having a trunnion at each end comprising a cam follower, a pair of cam members for each trunnion bar, one at each end thereof parallel with the side plates of the screed, each cam member having curved cam slots therein in which the cam followers of the respective trunnion bars are engaged, a rock shaft for each pair of cams rotatable about a transverse axis above and to one side of the trunnion bar having a cam connector at each end on which the respective cams are carried, a crank carried by and adjacent the center of each rock shaft, a pull rod pivotally connected with each of the cranks for rotating all of the cams in unison, and operating means for moving the pull rod or holding it against movement.

6. A quick adjustable screed as defined in claim 5 in which each pair of links is pivotally connected with the channel with the axes of the pivots transverse to the length of the channel and the upper ends of the links are secured to their respective trunion bars through adjusting nuts.

7. A quick adjustable screed as defined in claim 5 in which the cam members are rotatably adjustable on their respective connectors in the plane in which they are rotated by the rocker arms.

8. A quick adjustable screed as defined in claim 7 in which the cams are adjustable about an axis below the center of curvature of the cam slot and below the axis of rotation of the rock shaft and which is offset to one side of the axis of rotation of the rock shaft toward the cam followers.

9. A quick adjustable screed as defined in claim 6 in which vertical guideways are provided on the inner faces of the side plates of the screed body and the trunnions also engage in said guideways.

10. In a screed having a rigid inverted U-shaped body member having a top and downwardly-extending sides

and a bottom member comprising a channel adapted to be flexed transverse to its length with the side flanges of the channel telescopically received between the side walls of the body member, a pluraltiy of channel-flexing mechanisms at spaced intervals along the screed, each channel-flexing mechanism comprising a cam connector supported for rotation in the body about an axis transverse to the length of the channel, a cam plate carried by the connector eccentric to the axis of rotation of the connector, said plate being adjustable on the connector through an arc the center of which is eccentric to the axis of rotation of the connector, means for releasably holding the cam plate in fixed position on the connector when it has been adjusted, a curved cam surface in the cam plate, a vertical link having a follower at its upper end operatively engaging the curved cam surface of the cam plate for moving the link vertically when the connector is rotated, the lower end of the link being attached to the channel.

11. In a screed as defined in claim 10 having a rigid body member of inverted U shape wtih a top and downwardly-turned sides and having a bottom member, wherein

the downwardly-turned sides of the body member each have a vertical guideway on the inner face thereof, the follower having an extension thereon projecting into said guideway and having a working fit therein for confining the follower to movement in a vertical direction only.

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