SELF-CLEANING TUBULAR SCREEN

This invention relates to an improved form of self-cleaning screen for use in separating fluids from solid particulates. More specifically, this invention relates to a self-cleaning tubular screen formed by helically winding a wedge-shaped wire about a plurality of support rods and attaching same thereto in a manner to provide for radial outward flows. In other words, the cross-sectional area of the resulting continuous V-slot increases in the outward radial direction to give a self-cleaning effect when the flow of material initiates from the center of the tubular screen. The screen is susceptible to being rotated about its longitudinal axis so as to centrifugally force the material introduced into its interior, radially outward. In a preferred form, the support rods may be spiralled so as to help effectuate longitudinal flow of the material introduced into the screen.

It is recognized that wedge-form separation screens are known and are used in various services such as well screens, vibrating or shaker screens, ore classifiers, and the like. Screens of tubular shape also have been used in a rotating action to centrifugally force a fluid from slurry materials. However, it is to be noted that tubular screens of the self-cleaning type are generally fabricated to accommodate out-to-in flows. If an in-to-out flow screen is to be manufactured, it is generally fabricated as an out-to-in flow screen and then reformed in a reverse manner in order to have the V-slot increase in an outward radial direction. This procedure is, of course, expensive and generally prohibitive.

It is thus a principle object of this invention to provide for an in-to-out flow tubular screen, suitable for rotation, having the benefit of a self-cleaning, but inexpensive construction. An alternative object, is to provide for an in-to-out flow screen construction that has support rod means that can aid in the positive movement of particulates in the longitudinal direction.

Broadly, this invention is a self-cleaning tubular screen comprising a plurality of spaced-apart longitudinal support rods and a wedge-shaped wire wound helically about said support rods and attached thereto, said wedge-shaped wire forming a resulting continuous V-slot of increasing cross-sectional area in the outward radial direction.

The means by which this type screen can be fabricated is generally known and is described in Johnson patents, U.S. Pat. Nos. 2,046,457; 2,046,458; 2,046,459; 2,046,460 and 2,046,461. Summarizing, these patents cover the apparatus and process whereby a wedge-shaped wire is helically wound about support rods and spot welded at each junction of wire and rod. The welding operation is described as an electrical resistance weld that fuses the two pieces together, the wire sinking into the rod some predetermined distance.

In most instances, the screen of this invention will be used for a flow or slurry of material to be directly introduced into the interior of the tubular screen. The fluid part of the slurry would be drawn off and thusly separated from solid particulates through the continuous slot by means of gravity, by means of maintaining a pressure differential between the interior and the exterior surfaces of the screen, or by means of rotational force; the particular means, however, not being a subject of this invention. In the simplest embodiment, the longitudinal flow of slurry is effectuated by maintaining the screen at a slope.

The solid particulates contained in the slurry of material are prevented from slogging in the continuous V-slot because the narrowest part of the V-slot is at the entry point on the interior periphery of the screen, and there is no depressed zone to permit particle bridging effects. Even in the event that a particulate would temporarily catch itself at one point of the slot, other particulates would tend to free it because of the continuity of the V-slot.

A preferred embodiment makes use of the support rods as a means of establishing the flow of the particulates longitudinally through the screen. In other words, the support rods may be slightly spiralled so that when the screen is rotated, the rods will drive the slurry of materials longitudinally forward. In an alternative application of this embodiment where rotation is not utilized, these spiralled support rods will enhance screening efficiency by changing initial longitudinal flow to circular flow, thereby increasing the contacted slot area. The resulting circular flow will also drive the fluid and finer materials through the slotted opening. In this embodiment, the preferred cross-sectional shape of each of the support rods is substantially rectangular, thereby giving them a cross-sectional profile more likely to effect flow.

In this present invention, as previously noted, the novelty is in the winding of the wedge-shaped wire initially around the support rods to form the V-slot with a cross-sectional area increasing in the outward radial direction. However, the difficulty in obtaining such a result is manifested in the form of an attachment of the wide face of the wedge-shaped wire to the support rods, as contrasted with the present conventional practice, which requires a weld to take place at the apex or smaller side of the wedge. If conventional wedge-shaped bars are used and a weld were to be made at the wide part or base section of the wedge, the continuous feature of the resulting V-slot would be broken. Clogging would more likely take place, and any classification operations would be interferred with. Thus, preferably, a novel cross-sectional profile for the wedge-shaped wire is used as one means of fabricating the present in-to-out flow screen. This novel profile includes a ridge means along the central portion of the wide face of the wire, which may be used to assist in effectuating a weld to the longitudinal support rods; however, it is not intended to limit the ridge means to any one shape or cross section. Any shape chosen should be large enough to take a weld at the junction of a support rod and also have the dimensional requirements to prevent the weld from disturbing the edge of the wire.

The support rods will generally be equally spaced around the inner periphery of the tubular screen but may be spaced in any desirable manner. If the rods are not to be used to establish longitudinal flow through the screen, most probably they will be made parallel to the longitudinal axis of the screen. Also, the cross-sectional profile of the support rods may be of most any shape but consideration must be made in order to facilitate a strong weld. Round, oval, square, rectangular and all possible combinations may be considered probable cross-sectional profiles. In choosing a proper shape, the overall strength of the screen must be taken into account, in addition to the strength of the weld.

When the support rods are used as means of establishing flow, consideration must also be given to the area exposed to the particulate flow. It is for this reason that the dimension of the inner and outer sides of the cross-sectional area of the support rods will generally be made smaller than the dimension of the two adjacent sides. Again consideration must be given to the strength of weld and to the overall strength of the screen in establishing a proper cross-sectional profile.

Reference to the accompanying drawing and the following description will serve to more fully illustrate the design and construction of the various embodiments of the present invention, as well as to assist in pointing out advantageous features in connection therewith.

DESCRIPTION OF DRAWING

FIG. 1 is a schematic longitudinal elevational view of the one embodiment of the tubular screen with the slot formed to increase in area radially outwardly.

FIG. 2 is the schematic end view of the embodiment of FIG. 1.

FIG. 3 is a schematic perspective type of view of an embodiment in which the longitudinal support rods are spiralled.

FIGS. 4*a*, 4*b*, 4*c*, 4*d* and 4*e* are end views of various cross-sectional areas of the support rods.

FIGS. 5*a*, 5*b*, 5*c* and 5*d* are end views of various cross-sectional profiles of the wedge-shaped wire.

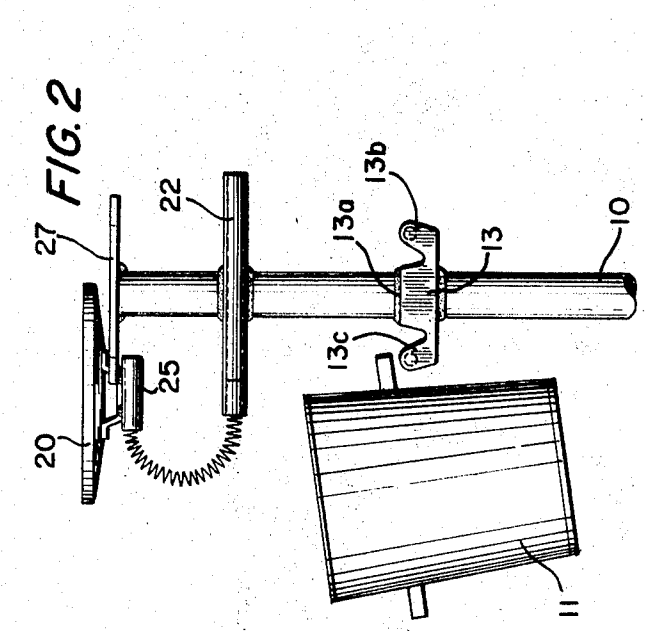


FIG. 2

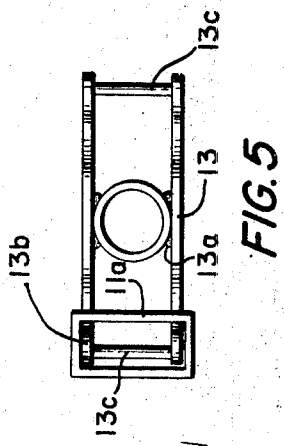


FIG. 5

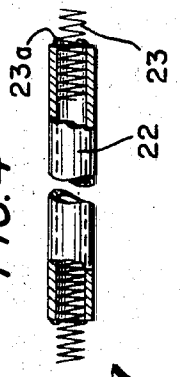


FIG. 4

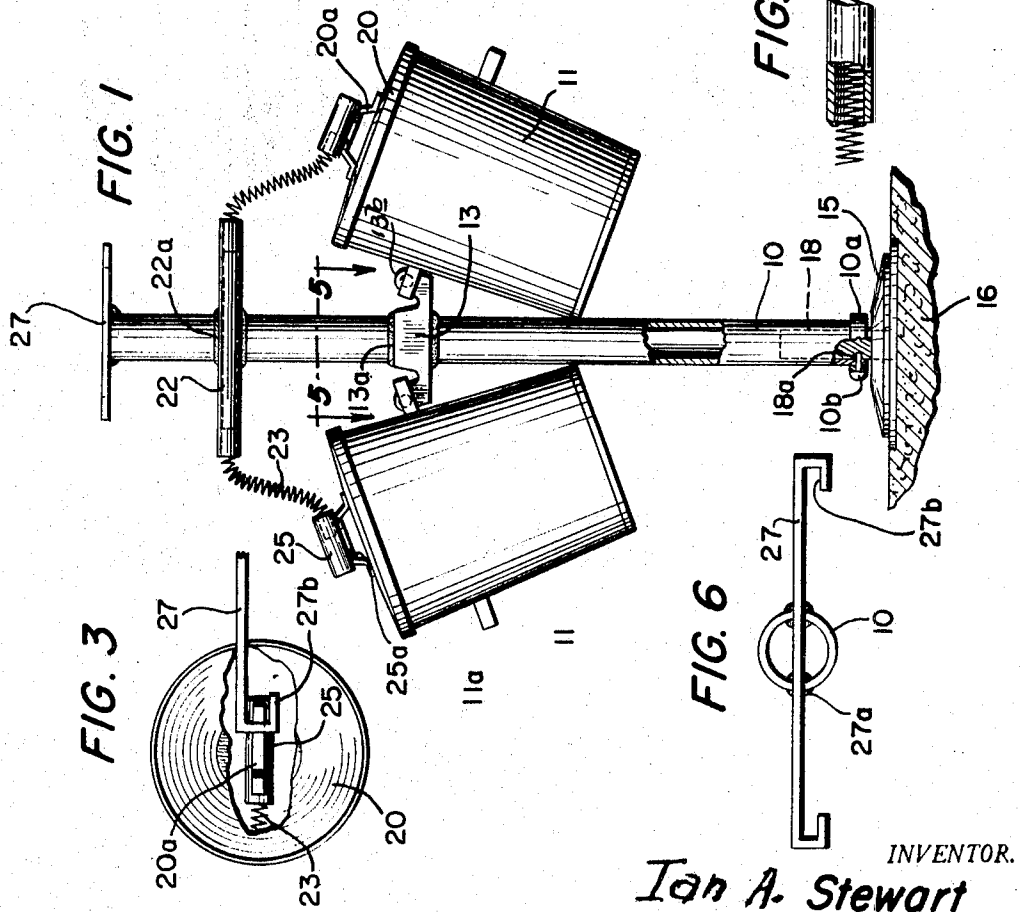


FIG. 1

FIG. 3

FIG. 6

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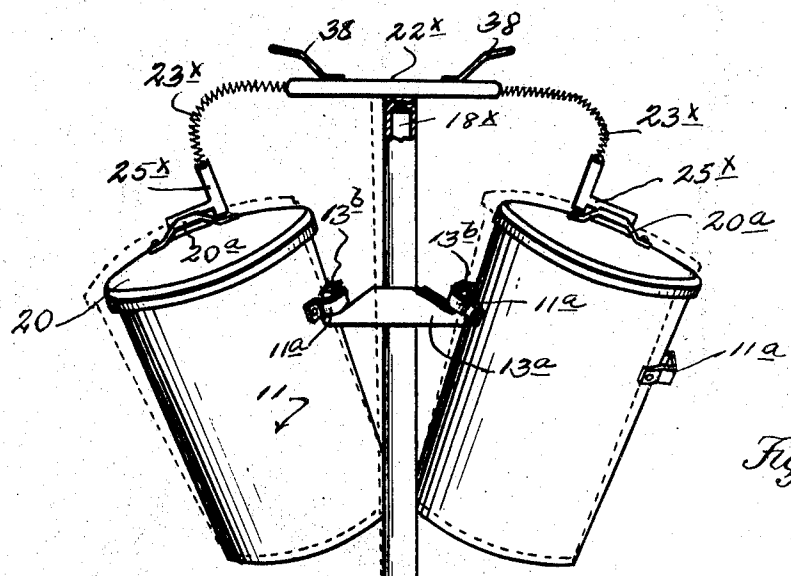
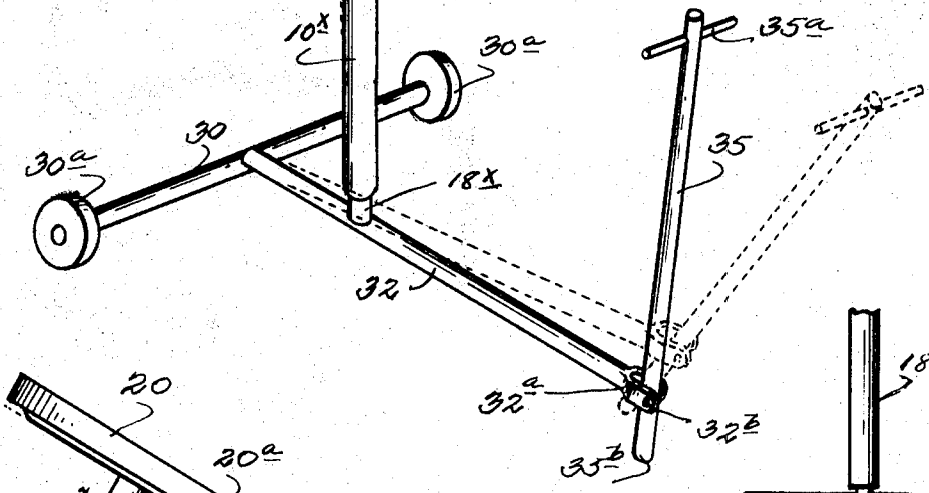


Fig. 7.



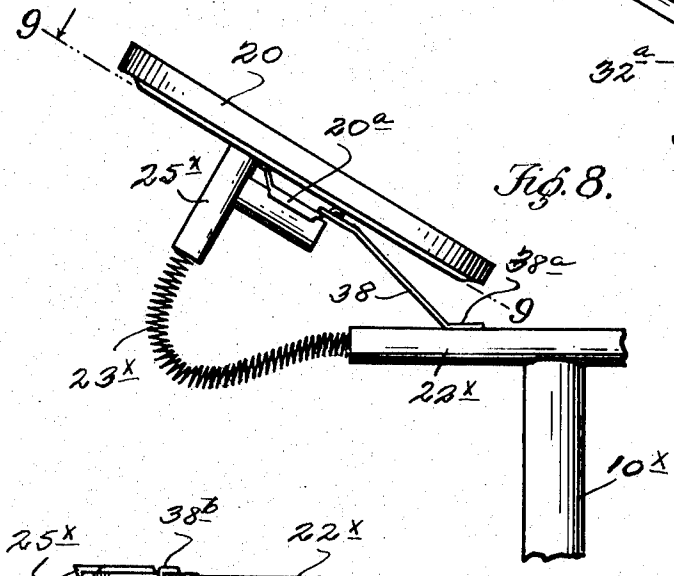


Fig. 8.

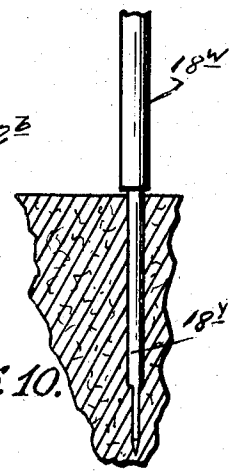


Fig. 10.

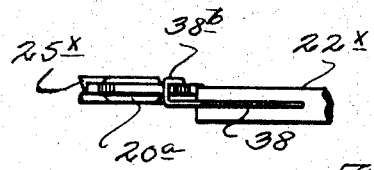


Fig. 9.

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GARBAGE CAN HOLDERS

My invention relates to garbage can holders, the present application being a continuation-in-part of copending application Ser. No. 598,993, filed Dec. 5, 1966 now abandoned.

Garbage cans are usually placed in back of buildings or behind lawn fences and are often tipped over or knocked down by passing children or dogs in search of food. The lid of a fallen garbage can is easily dislodged in such event and the contents of the can strewn over the ground, presenting an unsightly and unsanitary condition. Also, garbage cans standing on the ground often become wet or slimy underneath from rain or sprinkling of lawns, and rust out, shortening their period of usefulness. In view of these disadvantages, it is one object of the present invention to provide means for supporting garbage cans off the ground and in a position where they cannot be upset or knocked down.

A further object is to design a support of the above character which holds garbage cans in a manner to yield laterally and at a receding angle, so that the paws of an animal will slide off a can when attempting to engage or knock the same over.

Another object is to provide a support in the nature of a center post suitable for suspending a garbage can on each side, rotatable to bring either can into handy reach for purposes of filling or removal, and secured in a permanent base against removal or theft.

An additional object is to construct the center post of the holder with means to support the upper part of each can from the handle on the inner side thereof, while the post itself serves as a lateral support for the cans at the bottom.

A further object is to extend tie means from the center post to the lids of the cans supported by the same, and also provide retaining means for the lids at the top of the center post when they are removed from the cans in order to allow the same to be filled or emptied.

A further object is to provide a wheeled support for the garbage can holder and means to draw it to a location where the handling, removing or emptying of the garbage cans may be more convenient.

Another object is to provide a garbage can holder which is wheeled at the rear and receives a handle as a frontal support, the lifting and drawing of the handle propelling the holder in forward direction if it is to be moved to a different location.

A still further object is to extend a tongue in forward direction from a rear wheel axle forming part of the holder, and support a center post of the same at a point spaced forwardly from the axle in order that the weight of the cans may not tilt the holder rearwardly and upset it.

A better understanding of the invention may be gained by reference to the accompanying drawings, in which:

FIG. 1 is an elevation of the improved garbage can holder, partly broken away;

FIG. 2 is a fragmental duplication of the holder showing one garbage can removed and its lid taken off and secured in an out-of-the-way position at the top of the holder;

FIG. 3 is a plan view of the lid as seen in FIG. 2, partly broken away;

FIG. 4 shows end fragments of a crossbar situated near the top of FIG. 1, partly in section and on a larger scale;

FIG. 5 is an enlarged section on the line 5–5 of FIG. 1;

FIG. 6 is an enlarged plan view of a crossbar seen at the top of FIG. 1;

FIG. 7 is a perspective view of the improved holder with the can covers closed;

FIG. 8 is an enlarged elevation of the top left-hand portion of FIG. 7, showing the cover in that region raised off the can and hung on a temporary support;

FIG. 9 is a section of the central portion of FIG. 8, taken on the line 9–9 of that FIG.; and

FIG. 10 shows a fragment of the holder post modified to receive a ground-engaging center rod instead of the wheeled support.

Referring specifically to the drawing, the center post is of tubular construction and indicated at **10**; and the garbage cans

mounted on opposite sides thereof are indicated at **11**. The cans are supported by a side-bar-providing frame **13** situation between them and receiving the post **10** in the middle; and the side bars of the frame are secured to the post by welds **13***a*. The side bars terminate with upward hooks **13***b* and cross pins **13***c* suitable for impaling the handles **11***a* projecting from the inner sides of the cans **11** as seen in FIG. **1**. The cans are thus suspended with an inward slant, and receive lateral support at the bottom from the post; FIG. **2** shows one can raised off the related hook **13***b*.

In order to bring either garbage can **11** within handy reach for filling, or removal from the related hook **13***b*, the center post is swiveled in a base **15**; the latter is of heavy metal and set in a concrete ground foundation **16**. While any suitable method for swiveling the post may be employed, the one shown uses a stub shaft **18** rising from the base **15** into the center post and formed with an annular groove **18***a*; and the bottom of the center post is reinforced by an external collar **10***a*, and carries a pin **10***b* directed freely into the groove **18***a*.

Tie means are provided for the lids **20** of the garbage cans to render them handy and prevent their loss. Thus, FIG. **1** shows a horizontal crossbar **22** welded at **22***a* to the center post, the crossbar being tubular for receiving one of the end portions of a pair of coil springs **23** in the ends of the crossbar; and such end portions are welded to the crossbar as indicated at **23***a* in FIG. **4**. Each lid **20** is made with a conventional handle **20***a*; and for the present purpose a short tube **25** is welded at **25***a* to the handle. It is noted that the supporting frame **13**, the crossbar **22**, the lid handle **20***a* and the tubes **25** are all in alignment; and the outer end portions of the coil springs **23** are fitted into the inner ends of the tubes **25** and welded to them, in the same manner as the inner ends are connected to the crossbar **22**. The springs therefore serve as flexible and yieldable attaching means for the lids **20**.

When either lid **20** is removed, the invention makes provision for its temporary support in a handy place. Thus, the top of the center post receives a crossbar **27** whose middle part is welded to the post as indicated at **27***a*. The end-portions of the crossbar **27** are bent on the same side thereof to form hooks **27***b* facing each other, as seen in FIG. **6**. FIG. **2** shows that the left-hand lid **20** has been inverted, and its handle **20***a* linked into the left-hand hook **27***b* of the crossbar **27** to form a retentive support for the lid.

It will now be apparent that the invention has a number of advantageous features. Thus, the center post is a fixture erected on a permanent base and constituted to support a pair of garbage cans in compact and balanced relation. Further the center post is swiveled to allow either can to be moved close for filling or removal. Further, the cans are mainly supported by anchoring their inner handles he where the cans will tilt and bear at the bottom against the center post, the lateral yieldability of the cans and their receding positions making it impossible for animals to secure a hold on either can with intent to upset it. Further, the cans are suspended well of the ground, so that they will be dry on the bottom and serve without deterioration over a long period of use. Further, means are provided to keep the can lids tied to the center post whether on or off the cans, and to be mounted out of the way when taken off the cans. Finally, the novel holder is made up of few and sturdy parts, and serves to maintain the garbage cans in a stable and sanitary condition.

As will be appreciated from examination of FIG. **5** of the drawings, the spacement of the hook-providing side bars of the frame **13** is such that the outer surfaces of the hooks **13***b* will be closely adjacent to the ends of the can handles **11***a*. This is important because it keeps the cans **11** from shaking and wobbling laterally in the wind. The cross pins **13***c* of FIG. **5** are also important in that they reinforce and perpetuate the spacement of the side bars of said frame **13**.

DESCRIPTION FIGS. 7—10

Except as hereinafter noted, the FIGS. 7—10 and FIGS. 1—6 forms of the invention are the same, and identical parts in FIGS. 7—10 are designated by the FIGS. 1—6 reference characters. Corresponding, but structurally slightly different FIGS. 7—10 parts, are indicated by the earlier used reference character followed by *x*.

Thus, in FIGS. 7—10 the tubular post is 10*x* and a shaft 18*x* (FIG. 7) may replace stub shaft 18 of FIG. 1; and also the coil springs of FIGS. 7 and 8 are 23*x*, their lid-carried securing tubes 25*x*; and the tubular post-carried crossbars which secure the other spring (23*x*) ends are 22*x*.

The means for mounting the can covers 20 of FIGS. 7—10 in overhead out-of-the-way position of FIG. 8 comprises in each instance, a wire rod 38 having a foot 38*a* welded to the crossbar 22*x*, each rod 38 rising slantwise in outward direction to terminate with a side hook 38*b* (see FIG. 9). FIGS. 8 and 9 show the inner end of the can cover handle 20*a* as engaged by the hook 38*b*; and the heavier outer portion of the cover 20 pivots by its weight from the hook 38*b* to prevent inner post direction creeping of the cover over the related rod 38. This is an important point, as will be appreciated.

As shown, the wheeled can holder, or support, of FIG. 7 provides the wheel-ended rear axle 30 having the forwardly extending tongue 32. An upstanding functional integral pivot rod 18*x* rises from the tongue 32 forwardly of axle 30 and into the tubular post 10*x* to support it at its closed top as indicated in FIG. 7; 30*a* indicates the axle-carried wheels. Placing the weight of the post 10*x* and supported cans 11 forwardly of the axle 30 prevents the assembly from tilting backwards and upsetting the cans. The post can be rotated for nearest access to either of the garbage cans 11 illustrated.

The rolling post 10*x* support or carrier, has its tongue 32 provided with a long upstanding handle 35 having an upper hand grip 35*a*. The front end of the tongue 32 is forked as indicated at 32*a*, to make a pivoting connection 32*b* with the handle above its foot (35*b*) providing bottom portion. Such foot portion 35*b* therefore serves as front-end support for the can-carried tongue 32 when the carrier is stationary, and maintains the center post 10*x* in a vertical position. However, if it is desired to move the can carrier or holder to a different place for more convenience, it is only necessary to draw upwardly on the handle 35, this imparting a slight rearward tilt to the tongue 32 and post 10*x*, as indicated by finely-dotted lines in FIG. 1. Now the foot 35*b* of the handle 35 is free from ground engagement, and it is an easy matter to draw the carrier or holder forwardly by means of the handle 35.

In case a wheeled support is not desired for the tubular post 10*x*, a modification of the post-pivoting rod 18*x* is indicated at 18*w* in FIG. 10 as a rod with a spike end 18*y* to be embedded in the grounds shown in FIG. 10.

Regarding the FIGS. 7—10 form of invention, it will be apparent that the improvements described lend the garbage can holder greater efficiency. Thus, the center post 10*x* is made shorter by eliminating the top bar 27 of the FIGS. 1 and 2. Instead, a pair of simple wire rods 38 attached to the main crossbar 22*x* suffice to suspend the can covers 20 in the overhead positions of FIGS. 7 and 8. Further, a major improvement lends the can holder mobility by the use of a carriage with a single wheeled axle 30 and a tongue 32 extended from the same in forward direction. In front a simple handle 35 serves either to station the carriage against self-rolling movement or raise the same slightly for forward hand propulsion. The center post 10*x* assembly also exerts its weight on the carriage to keep it in place, and bears on the handle pivot 32*b* to normally maintain the foot 35*b* of the handle in ground engagement. Further, offsetting the center post 18*x* in forward direction from the axle 30 imposes sufficient weight on the tongue 32 to keep the center post 18*x* from tilting rearwardly and upsetting the cans 11 when the handle is raised to propel the holder by hand. The improved holder therefore has the advantages of efficiency, few and simple parts, and convenience in use.

I claim:

1. In a holder for a garbage can or the like, having handles ta opposite sides, and a removable lid, each handle having inturned opposite end portions connected to the can, said holder comprising a post adapted to be erected on the ground, a support fixedly carried by the post and extending laterally from one side of the latter, said support providing laterally spaced arms, the outer terminal of each arm providing an upwardly extending hook, reinforcing spacer means connecting said arms at the site of said hooks, said hooks engaging in a can handle adjacent opposite inturned ends of the latter, whereby to support a can with an outward tilt with its bottom bearing against the post, the close adjacency of the outer surface of the hooks to the inturned end portions of the handle preventing lateral movement of the can in its hook-supported position, a laterally extending second support carried by the post and located above the can and its lid, and means in part carried by the lid and said second support for anchoring the lid to the latter in an out-of-the-way position after it has been removed from the can.

2. The structure of claim 1, and said interengaging means comprising a U-form handle secured to the outer lid surface, and a hook carried by said second laterally extending support and engageable with said lid handle.

3. The structure of claim 1, and there being a second can also having a removable lid and likewise providing handles at opposite can sides with each handle having inturned opposite end portions connected to said second can, the arms of said support having laterally spaced continuation portions extending beyond the opposite side of said post, duplicate upwardly extending hooks providing the outer terminals of said continuation arm portions for engagement between the handle ends of said second garbage can, reinforcing spacer means connecting the last mentioned arms at the site of said hooks, there being an extension portion of said second support extending above the upper end of the second can, interengaging tie means in part provided by the extension portion of said second support and in part by the second can lid for securing the latter to the second support extension in an out-of-the-way position at the opposite side of said post from said first can.

4. In a holder for garbage cans or the like, a center post, means for supporting cans on opposite sides of the post, covers for the cans formed with arched handles, a crossbar at the top of the post, flexible tie means between the handles and the end portions of the crossbar to permit the covers to be raised and inverted over said crossbar end portions, and wire rods extending endwise from the latter and rising slantwise to terminate with side hooks, said handles seating in the side hooks.

5. The structure of claim 4, said seating being retentive by projecting heavier portions of the covers beyond the hooks.

6. Apparatus for supporting a plurality of refuse cans or the like comprising:

a support base;

an elongated post journaled at one end on said support base for rotation about its longitudinal axis;

a can support intermediately of said post and including at least one portion extending radially therefrom;

said can support having substantial transverse width and an upwardly opening terminal hook portion;

a refuse can having an open top and at least one intermediate, transverse handle having an opening substantially complementary to said terminal hook portion for removable receipt thereon;

said hook portion and handle being so conformed and cooperating to prevent relative lateral movement when interengaged;

said can having a lower edge engageable with an intermediate portion of said post when said can handle is engaged over said hook portion whereby the can and post will rotate as a unit about said base, when engaged, and said can is canted upwardly and outwardly from the longitudinal axis of said post;

said can including removable lid means on said open top; and

said post including can-lid support means for holding said lid means in an accessible position when the refuse can is being filled or emptied.

7. The structure as claimed in claim 6 in which:

said can support extends diametrically of said post and includes similar terminal hook portions at both ends;

a second refuse can, corresponding to that first mentioned, said refuse cans being removably supported on said terminal hooks and diverging from opposite sides of said post; and

each refuse can including a removable lid means, said can-lid support means accessibly supporting each lid means of the respective cans.

8. The structure as claimed in claim 6 in which said can lids are connected to a flexible, springlike element, said springlike element being terminally anchored to an upper portion of said post.

9. The structure as claimed in claim 6 in which said support base comprises a vertical shaft, said post being telescopically received on said shaft.

10. The structure as claimed in claim 6 in which said support base is vehicular and comprises a T-shaped element including wheels journaled at opposite ends of the crosshead member of said T-shaped element, said post being journaled on an intermediate portion of leg of said T-shaped element, and a handle means at the end of said leg opposite the wheels.

11. The structure as claimed in claim 10 in which handle means comprises a rod member intermediately pivoted on a transverse axis of said leg of the T-shaped element for providing a lower ground engaging support when the T-shaped element is not being moved.

12. In a holder for garbage cans or the like, a tubular center post, means carried by the latter for supporting cans alongside the center post, a carriage below the latter, and a rod rising from the carriage into the post to support it rotatably, the carriage having a wheeled rear axle, a tongue extending forwardly from the same, an upstanding handle hinged horizontally near its lower end to the forepart of the tongue to project with a foot in ground engagement and prevent the self-movement of the carriage, and a hand grip at the upper part of the handle adapted to be drawn in forward direction to free said engagement and permit the manual propulsion of the carriage.