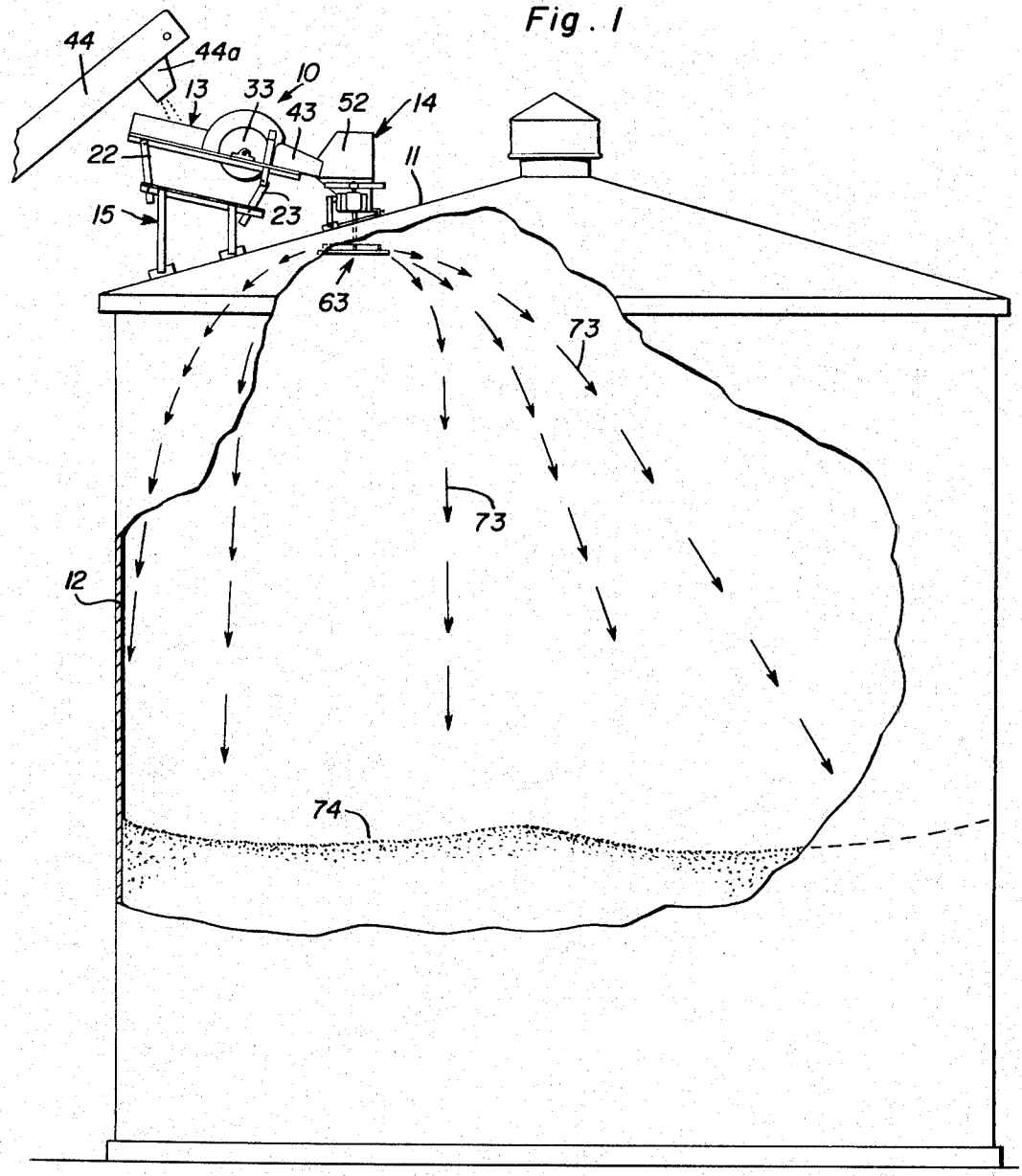
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GRAIN SCREEN AND SPREADER

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Fig. 1



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Fig. 2

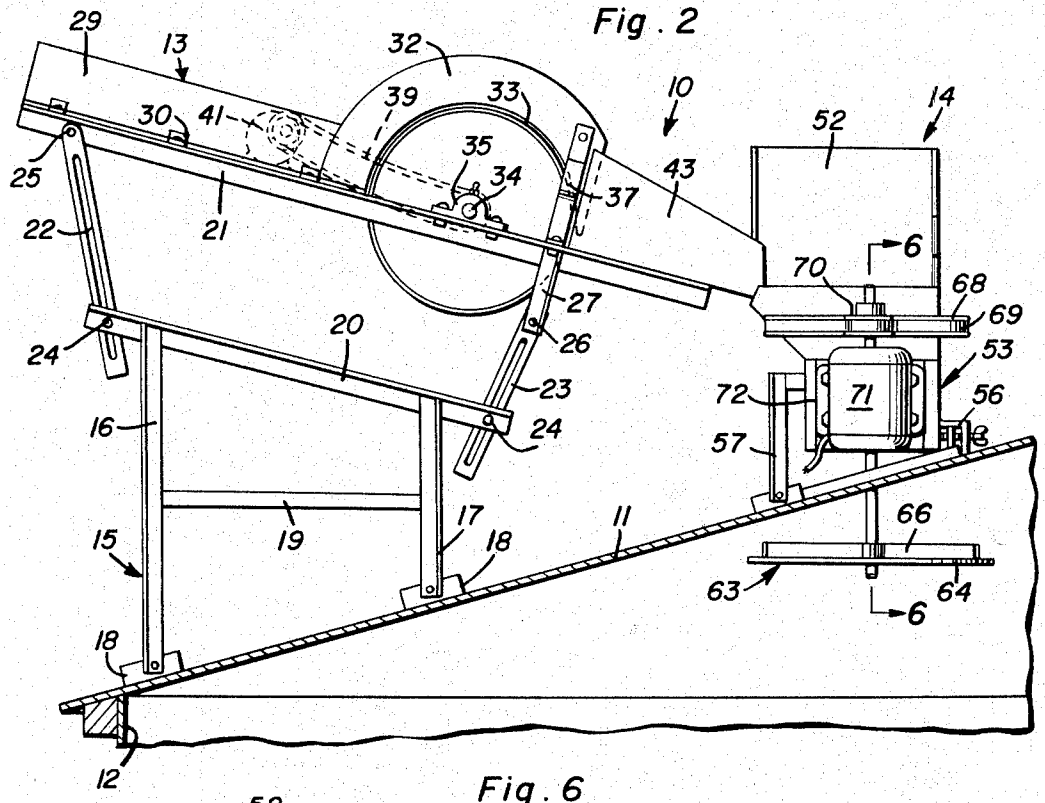
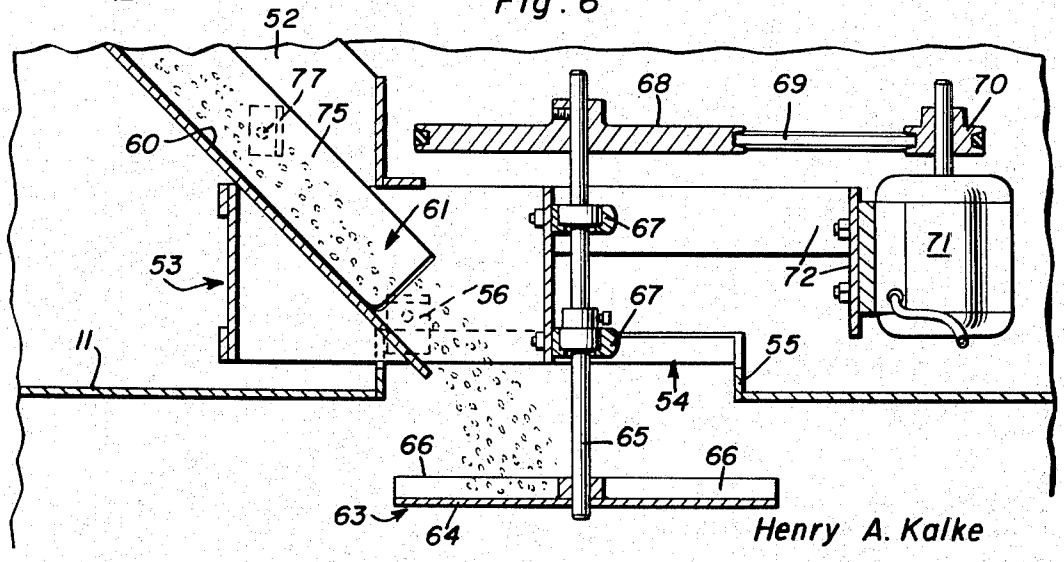


Fig. 6



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Fig. 3

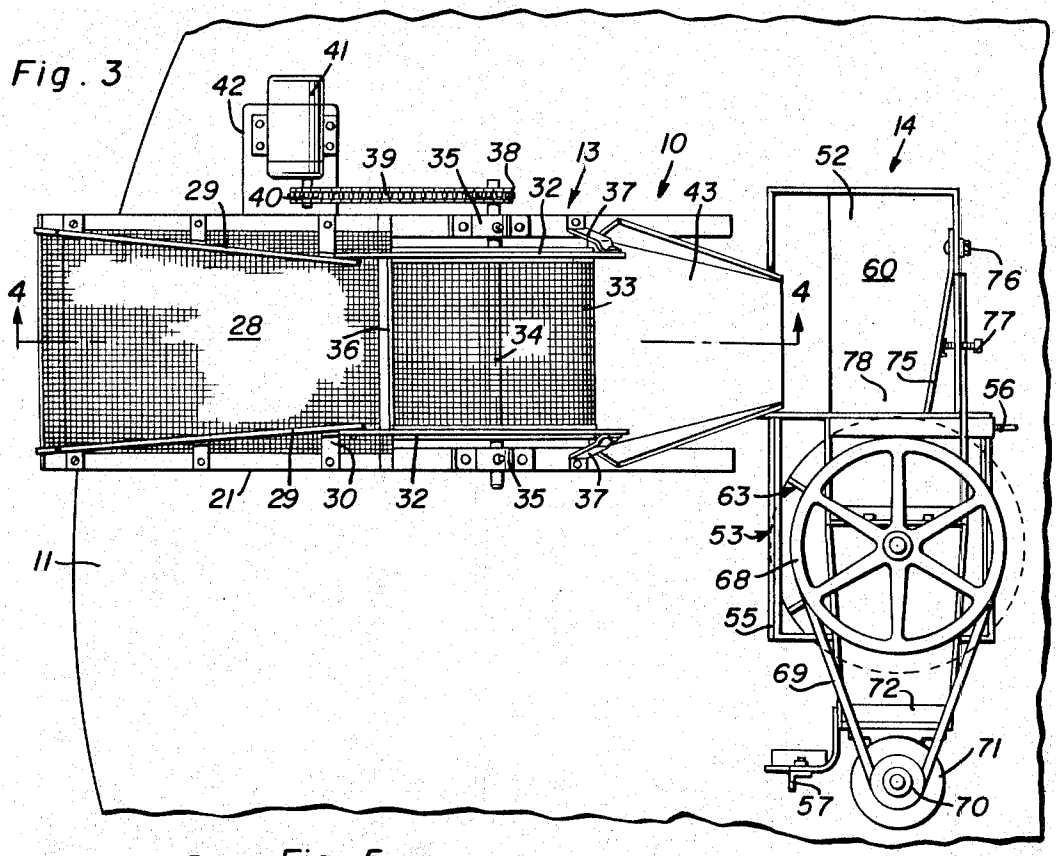
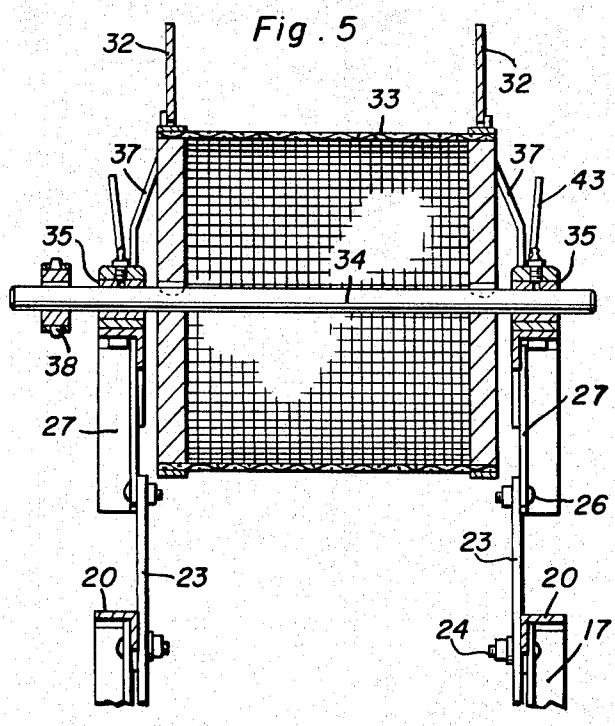


Fig. 5



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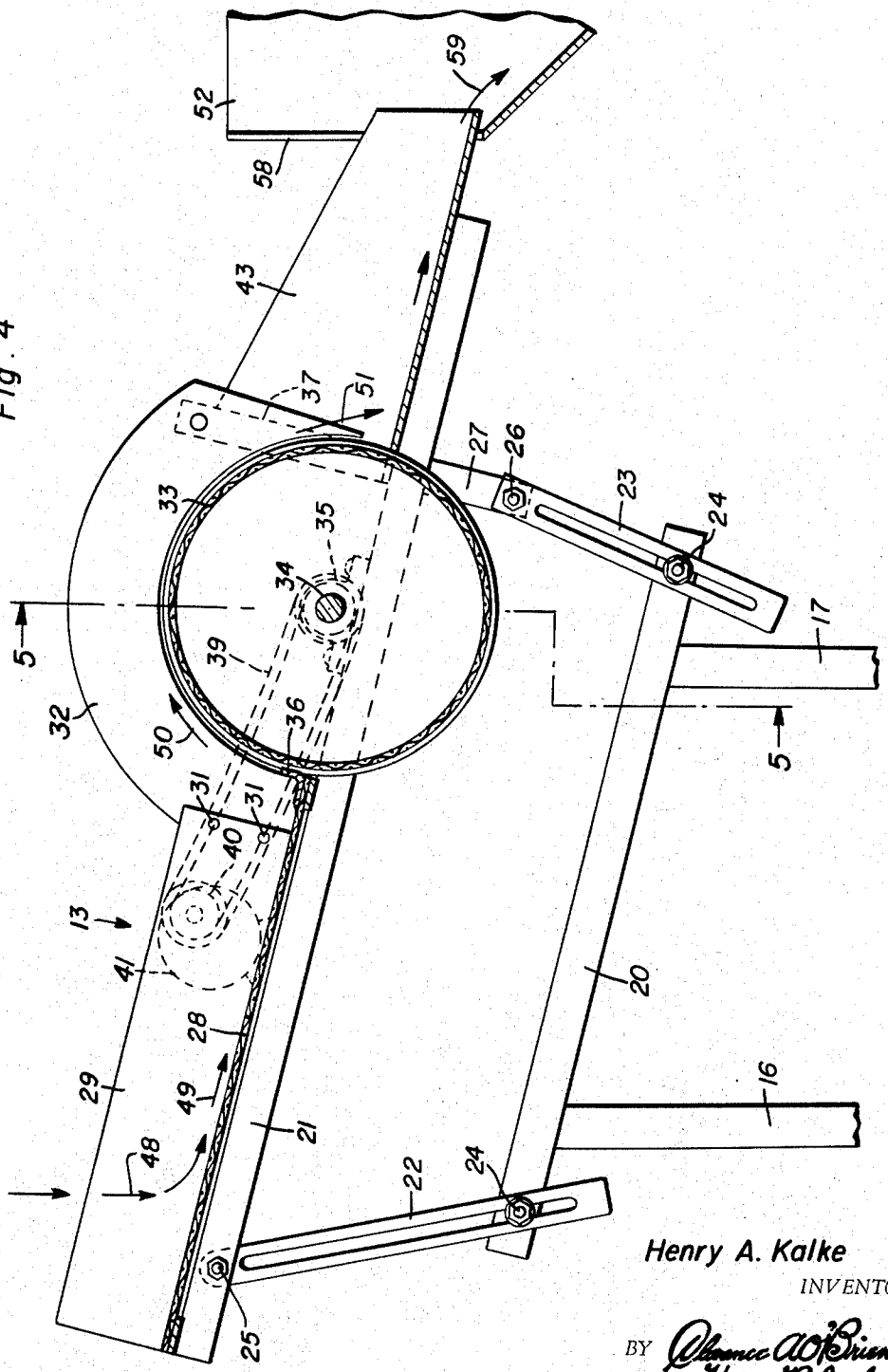
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Fig. 4



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3,361,258

GRAIN SCREEN AND SPREADER

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10 Claims. (Cl. 209—234)

This invention relates to new and useful improvements in apparatus for screening and spreading granular material such as grain, and the principal object of the invention is to provide an apparatus of this type which may be conveniently and effectively employed in association with a grain storage bin for the purpose of screening grain before it is delivered into the bin, as well as spreading or distributing the grain so that it is deposited in the bin in a uniform manner.

It is very important to remove foreign materials as well as fine or cracked grain before the grain is spread for drying or storing purposes. Such foreign materials prevent air from circulating freely through the grain, and clean grain keeps better while in storage. The present invention provides efficient screening means for removing foreign materials and fine or cracked grain from the grain which is to be stored, as well as means for efficiently distributing the clean grain in the storage bin.

The apparatus of the invention is mounted on a sloping roof of a conventional storage bin and is adjustable to compensate for various roof slopes of different bins. Briefly, the apparatus includes a screening unit which is adapted to receive grain from a suitable conveyor, and a spreader unit which receives clean grain from the screening unit. The roof of the bin is usually provided with an inspection opening or manhole, and the spreader unit includes a vertical shaft which projects downwardly through the roof opening into the bin and carries a rotary distributing disk. The clean grain received from the screening unit by the spreader unit is delivered through the roof opening onto the distributing disk, and is thereby uniformly distributed in the storage bin.

The apparatus of the invention is simple in consrtuction, efficient in operation, and lends itself to economical manufacture.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIGURE 1 is a side elevational view of a grain storage bin with the screening and spreading apparatus of the invention applied thereto, the bin being shown as partially broken away to reveal the interior thereof;

FIGURE 2 is an enlarged fragmentary vertical sectional view showing a portion of the bin roof with the apparatus mounted thereon;

FIGURE 3 is a fragmentary top plan view of the apparatus shown in FIGURE 2;

FIGURE 4 is an enlarged, fragmentary sectional view, taken substantially in the plane of the line 4—4 of FIGURE 3;

FIGURE 5 is a fragmentary cross-sectional view, taken substantially in the plane of the line 5—5 in FIGURE 4; and

FIGURE 6 is an enlarged, fragmentary sectional view, taken substantially in the plane of the line 6—6 in FIGURE 2.

Referring now to the accompanying drawings in detail, the grain screening and spreading apparatus of the invention is designated generally by the reference numeral **10** and is adapted to be mounted on a sloping roof **11** of a conventional grain storage bin **12**. The apparatus **10** comprises two primary components, namely, a screening unit **13** and a spreader unit **14**.

Dealing first with the screening unit **13**, the same includes a framework having a fixed base portion **15** mounted on the sloping roof **11** of the bin, preferably adjacent the marginal edge of the roof, as shown. The base **15** of the framework may be formed from angle iron, including upright legs **16**, **17** provided at their ends with roof engaging feet **18** and having their intermediate portions connected by brace means **19**, as will be apparent from FIGURE 2. The upper ends of the legs **16**, **17**, carry longitudinals **20** which project beyond the legs as shown. It may be noted that the legs **17** are shorter than the legs **16** to accomodate the pitch or slope of the bin roof **11**, and while the roof slopes downwardly and outwardly, the longitudinals **20** of the frame base are preferably sloped downwardly and inwardly toward the center of the roof.

The framework of the screening unit **13** also includes an upper frame portion **21** which is elongated and is supported in an inwardly sloping position above the frame base **15** by pairs of adjustable braces **22**, **23**. These braces are longitudinally slotted and suitable bolts **24** are employed for adjustably securing the braces to the end portions of the longitudinals **20** of the base frame **15**. The upper end of the brace **22** is fastened to the relatively high or raised end portion of the top frame **21** by suitable screws **25**. The upper ends of the braces **23** are similarly attached by suitable screws **26** to depending brackets **27** which are provided adjacent the relatively low end of the top frame **21**, as will be clearly apparent from FIGURE 2, 4 and 5.

A flat, stationary screen **28** is mounted on the raised end region of the top frame **21** and a pair of side plates **29** are secured to the top frame at the opposite side of the stationary screen. The side plates **29** are supported on the top frame by suitable angle brackets **30** and as will be apparent from FIGURE 3, the side plates are downwardly convergent and have their lower ends secured as at **31** (see FIGURE 4) to a further pair of side plates **32**, hereinafter described.

The side plates **32** are in the form of arcuate segments disposed at the opposite ends of a screening drum **33** which is rotatably mounted on a cross shaft **34** journaled in bearings **35** on the top frame **21**. The circumference of the screening drum **33** is closely adjacent to the lower end of the stationary screen **28**, but a transverse angle member **36** may be provided at the lower edge of the stationary screen adjacent the circumference of the drum so as to prevent grain from dropping therebetween.

As already stated, the lower ends of the first mentioned side plates **29** are secured as at **31** to the segment shaped side plates **32** and the side plates **32** are additionally secured to the top frame **21** by braces **37**. It will be understood, of course, that the purpose of the side plates **29** is to prevent grain from dropping off the sides of the stationary screen **28**, while similarly, the purpose of the side plates **32** is to prevent grain from dropping off the ends of the screening drum **33**.

One end of the drum shaft **34** carries a sprocket **38** which is operatively connected by an endless chain drive **39** to a sprocket **40** driven through reduction gearing (not shown) by an electric motor **41**. The motor **41** is supported by a suitable platform or bracket **42** provided at one side of the top frame **21**, as will be apparent from FIGURE 3.

The lower end portion of the top frame **21** carries a discharge spout **43** which is tapered as shown and has flared side walls which straddle the aforementioned side plates **32** as illustrated.

Grain to be stored is delivered to the screening unit **13** by a suitable conveyor **44** shown in FIGURE 1, so that the grain discharged through the spout **44***a* of the conveyor falls onto the stationary screen **28** as indicated by

the arrows 45 in FIGURE 4. The slope of the screen 28 causes the grain to flow downwardly thereover as indicated at 49, whereupon the grain is picked up by the rotating drum 33 as indicated at 50, and transferred as at 51 to the discharge spout 43. It will be understood that as the grain flows over the stationary screen 28 and over the rotating screening drum 33, foreign material and fine or cracked grain will be separated through the screens, while clean grain will be discharged through the spout 43.

The spout 43 discharges into a hopper 52 of the spreader unit 14, but before describing the spreader unit in detail, attention is directed to an adjustment of the screening unit 13 as facilitated by the slotted braces 22, 23. It will be apparent that by adjusting the slotted brace 22 on its fastener 24, the high end of the top frame 21 may be raised or lowered while pivoting about the fastener 26 on the brace 23, thus permitting the high end of the top frame and, consequently, the stationary screen 28, to be properly located with respect to the outlet spout 44*a* of the conveyor 44. On the other hand, by adjusting the slotted brace 23 on its fastener 24, the low end of the top frame 21 may be raised or lowered with a pivotal movement about the fastener 25 of the brace 22, so that the discharge spout 43 may be properly located with respect to the hopper 52 of the spreader unit 14. Also, either or both braces 22, 23 may be adjusted to compensate for varying slopes of roofs on different storage bins, as will be understood.

The spreader unit 14 includes a frame 53 mounted on the sloping roof 11 of the bin above the usual inspection opening or manhole 54 with which the bin roof is customarily provided. As shown in FIGURE 6, the roof opening 54 is defined by an upstanding flange 55, and any suitable clamp means 56 may be provided on the frame 53 for securing the frame to the roof flange. In addition, the frame 53 is equipped with leg means 57 resting on the roof, as is best shown in FIGURE 2.

The aforementioned hopper 52 is carried by the frame 53, the hopper being open at the top thereof and being provided with an open side portion 58 through which the discharge spout 43 of the screen unit 13 projects into the hopper as shown in FIGURE 4, for delivery of clean grain into the hopper as indicated by the arrow 59.

The hopper 52 has a sloping bottom 60 leading to a side outlet 61 (see FIGURE 6) which overlies the opening or manhole 54 in the bin roof 11.

The grain discharged from the hopper outlet 61 falls through the roof opening 54 onto one side portion of a rotary distributor disk 63 which is disposed within the bin below the roof opening.

The distributor disk 63 comprises a circular plate 64 secured to the lower end of a vertical shaft 65, the disk being provided on its upper surface with a plurality of radial ribs 66.

The shaft 65 is rotatably journaled in a pair of vertically spaced bearings 67 carried by the frame 53 and the upper end of the shaft 65 has secured thereto a relatively large pulley 68. The pulley 68 is operatively connected by an endless belt 69 to a relatively small pulley 70 on the armature of an electric motor 71, mounted by suitable bracket means 72 on the frame 53. It will be apparent that when the motor 71 is energized, the distributor disk 63 will be rotated and that grain discharged through the hopper outlet 61 and through the roof opening 54 onto the disk 63, will be efficiently and uniformly scattered by the ribs 66 of the disk, as exemplified by the arrows 73 in FIGURE 1, so that the grain is substantially uniformly deposited in the bin as at 74.

The grain discharged through the outlet 61 of the hopper 52 falls only on one side portion of the distributor disk 63 rather than on the whole area of the disk, for more efficient scattering. Also, by utilizing the existing opening 54 in the bin roof 11 and extending the shaft 65 through such opening, the motor 71 and driving means 68, 69, 70 may be disposed on top of the roof rather than inside the bin, and it is possible to position the distributing disk 63 close to the roof for an efficient grain scatterng operaton. By a similar token, the grain hopper 52 is disposed on top of the roof rather than inside the bin, the flow of grain from the hopper onto the distributing disk 63 being possible through the existing opening 54 and the necessity of providing additional openings in the roof of the bin is avoided.

Means are provided for regulating the flow of grain from the hopper onto the distributing disk, these means comprising a resiliently flexible baffle or strip 75 made of spring steel, or the like. The baffle or strip 75 has its lower edge resting on the sloping bottom 60 of the hopper 52 and one end of the strip 75 is fastened to the outer side wall of the hopper, as by a fastener 76 shown in FIGURE 3. An adjusting screw 77 is provided in the outer side wall of the hopper and bears against the strip 75, so that when the screw 77 is tightened, the strip 75 is moved inwardly as indicated by the arrow 78. Conversely, when the screw 77 is loosened, the strip 75 is moved outwardly, that is, in a direction opposite to the arrows 78, by the inherent resiliency of the strip. In this manner the flow of grain from the outlet of the hopper may be directed so that the grain falls closer to further away from the center of the distributing disk 63. If the baffle strip 75 is adjusted to direct the grain flow more toward the center of the distributing disk, a more effective over-all spreading of the grain will be attained. On the other hand, if the grain flow is directed more toward the periphery of the disk, the grain will be spread more to one side than to the other. In this manner, the grain spreading action performed by the distributing disk may be efficiently controlled to distribute the grain either uniformly around the disk, or to one side as desired.

This advantage is particularly important when the apparatus is installed on Quonset type bins, railroad boxcars, and the like, where it may be desirable to spread grain more to one side and to throw it further. In this regard it may be noted that the distance to which the grain is thrown by the distributing disk is determined by the speed of rotation of the disk, which may be varied by using a larger or smaller diameter drive pulley 70 on the armature shaft of the motor 71.

It may be also noted that by positioning the distributing disk 63 below the lower opening 54 in the roof 11 rather than directly below the peak of the roof, the apparatus does not obstruct the peak portion of the roof in a manner which would interfere with free passage of air through the ventilator at the roof peak. In other words, if the distributing disk 63 were mounted directly below the ventilator at the peak of the roof, free passage of air through the ventilator would be obstructed and condensation of moisture would take place, which would drop back into the grain being dried in the bin. Thus, by positioning the distributing disk at one side of the roof peak, below the roof opening 54, free passage of air through the roof ventilator at the peak is permitted and condensation of moisture does not occur.

It may be also added that the apparatus of the invention may be used with bins of various types, as well as with railroad boxcars, river barges, ocean freighters, and the like. Also, the grain screening unit 13 and the spreader unit 14 may be used either together as already described, or they may be used separately when so desired.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed as new is as follows:

1. The combination of a grain storage bin having a sloping roof provided with an opening, a grain screening

unit mounted on said roof in spaced relation from said opening, said screening unit being adapted to receive grain from a conveyor and including a discharge spout for screened grain, and a grain spreader unit also mounted on said roof, said spreader unit including a hopper having said spout of the screening unit discharging thereinto, a motor-driven vertical shaft projecting downwardly through said roof opening into said storage bin, a distributing disk secured to the lower end of said shaft below said roof, and a side outlet provided on said hopper for discharging grain therefrom through said roof opening onto said distributing disk.

2. The combination as defined in claim 1 wherein said screening unit includes an adjustable supporting frame mounted on said roof, said frame having adjustment means to compensate for various roof slopes while maintaining said discharge spout in proper relation to said hopper.

3. The combination as defined in claim 1 wherein said screening unit includes a stationary screen supported in a slanting position in spaced relation from said discharge spout, a rotatable screening drum interposed between the lower end of said stationary screen and said spout, and means for rotating said drum, said stationary screen receiving grain from a conveyor and delivering the same to said drum by which the grain is transferred to said discharge spout.

4. The combination as defined in claim 1 wherein said hopper side outlet of said spreader unit is positioned to overlie and deliver grain onto one side portion of said distributing disk only.

5. A grain screening and spreading apparatus for grain storage bins, comprising in combination a grain screening unit including a supporting frame adapted to be mounted on a sloping bin roof, said frame having a fixed base portion, an elongated top portion, and adjustable brace means mounting said top portion in a sloping position above said base portion, said brace means being adjustable to permit the top portion to be selectively raised and lowered at either end thereof, a stationary screen provided on the relatively high end region of said slanting top portion, a rotatable screening drum mounted on the top portion downstream from said stationary screen, a discharge spout provided on the relatively low region of the slanting top portion, and means for rotating said drum whereby grain deposited on said stationary screen and flowing therealong to said drum may be transferred by the drum to said discharge spout, and a spreader unit receiving grain discharged by said spout.

6. The apparatus as defined in claim 5 together with upstanding side plates provided on said top portion of said frame at opposite sides of said stationary screen and screening drum.

7. A grain screening and spreading apparatus for grain storage bins, comprising in combination a grain screening unit adapted to be mounted on a sloping bin roof and having a discharge spout for screened grain, and a spreader unit including a frame also adapted to be mounted on a bin roof, a hopper carried by said frame and receiving screened grain discharged by said spout, a sloping side outlet provided on said hopper, a vertical shaft rotatably journaled in said frame and projecting downwardly therefrom, a distributing disk secured to the lower end of said shaft, said hopper outlet overlying and delivering grain onto one side portion of said disk only, and means for rotating said shaft.

8. The apparatus as defined in claim 7 wherein said distributing disk comprises a circular plate secured in a horizontal position to said shaft, and a plurality of radial ribs provided on the upper surface of said plate.

9. The apparatus as defined in claim 7 together with a grain flow directing baffle adjustably positioned in the outlet of said hopper for regulating flow of grain toward and away from the center of said one side portion of said distributing disk.

10. The apparatus as defined in claim 7 wherein said means for rotating said shaft comprise a motor mounted on the frame of said spreader unit, and means operatively connecting said motor to said shaft.

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