

Oct. 28, 1958

W. H. GARBADE ET AL
REVERSIBLE SLAT ASSEMBLAGE

2,857,634

Filed Feb. 9, 1956

3 Sheets-Sheet 1

FIG. 1

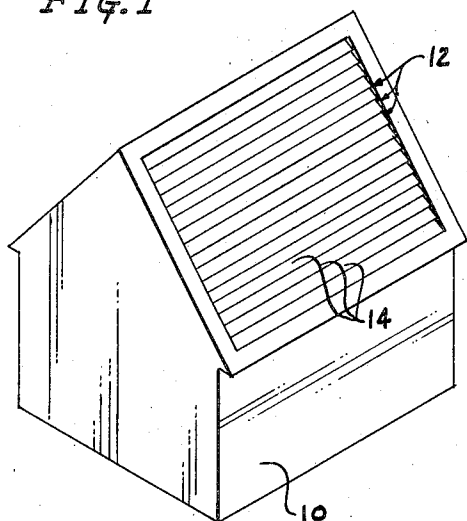


FIG. 2

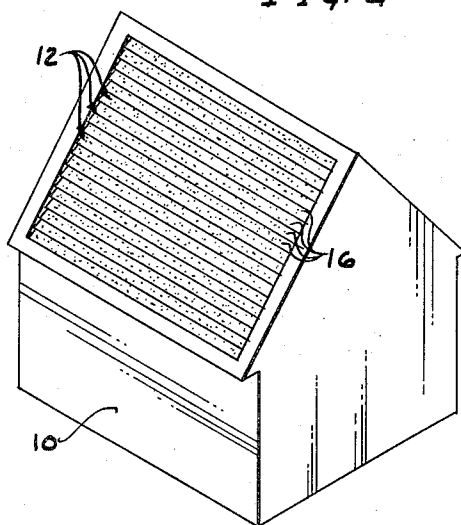
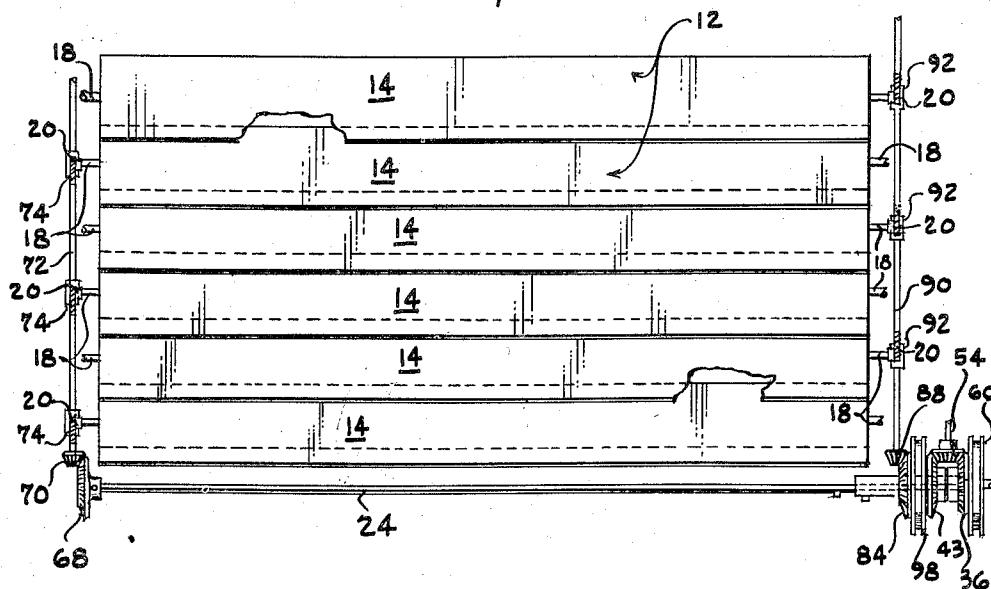


FIG. 3



INVENTOR.
WILLIAM H. GARBADE
NILS K. ANDERSON
BY
Thiess, Olson, Macklenburger,
von Holst and Cottman
Attorneys

Oct. 28, 1958

W. H. GARBADE ET AL
REVERSIBLE SLAT ASSEMBLAGE

2,857,634

Filed Feb. 9, 1956

3 Sheets-Sheet 2

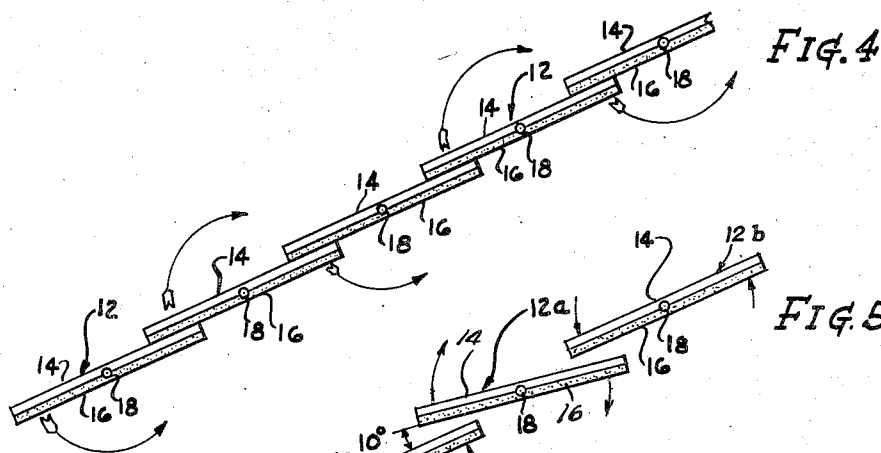


FIG. 4

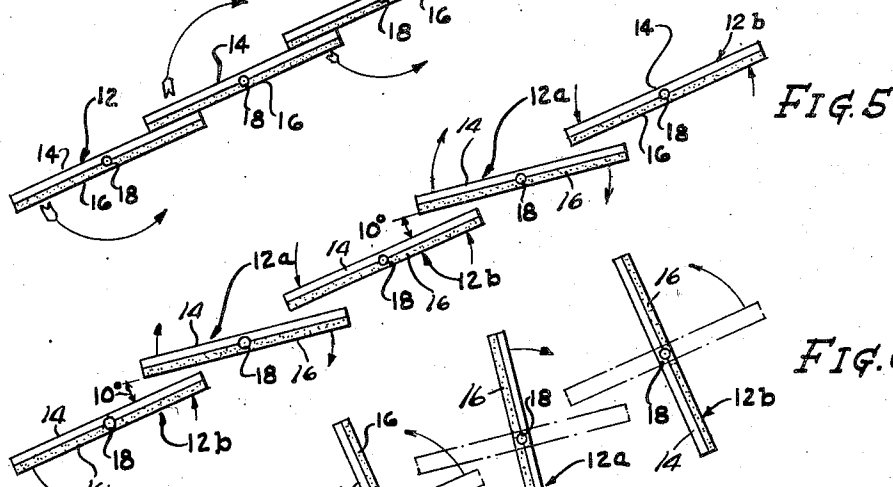


FIG. 5

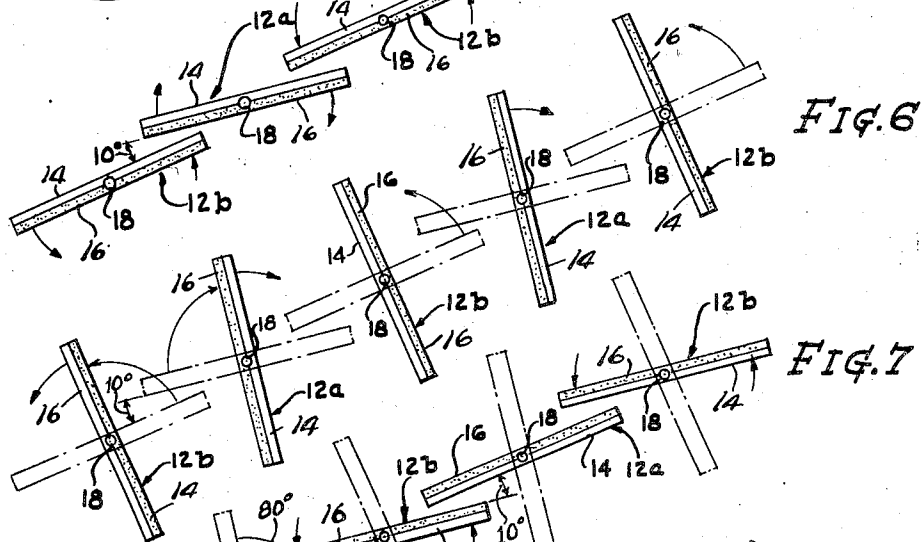


FIG. 6

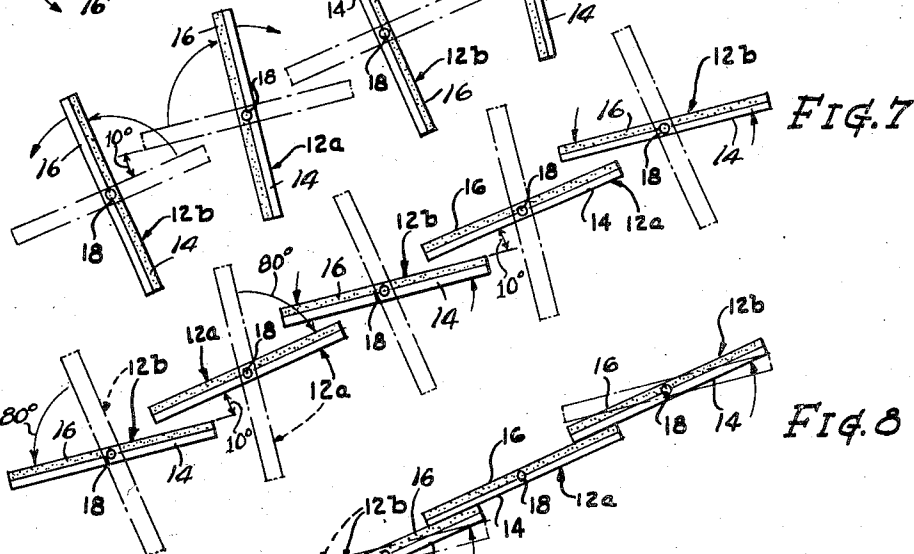


FIG. 7

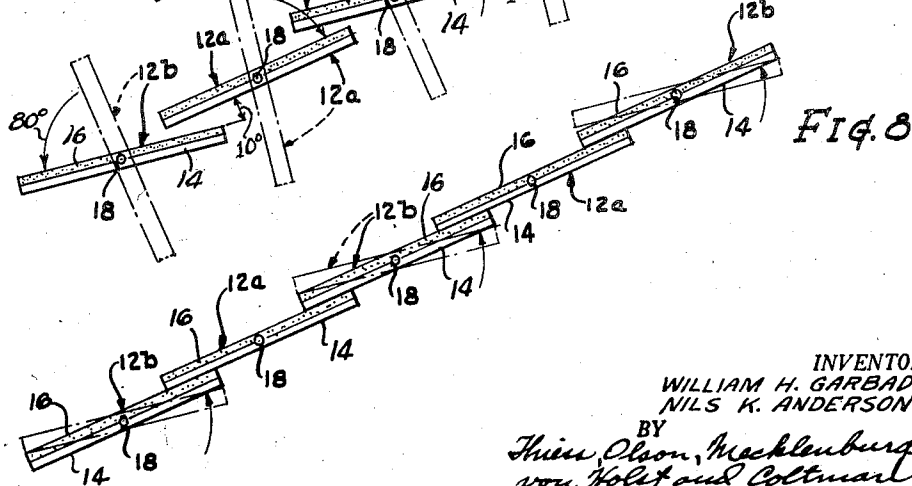


FIG. 8

INVENTOR.
WILLIAM H. GARBADE
NILS K. ANDERSON
BY
Thien Olson, Meskenburger,
von Holst and Coltmann
Attorneys.

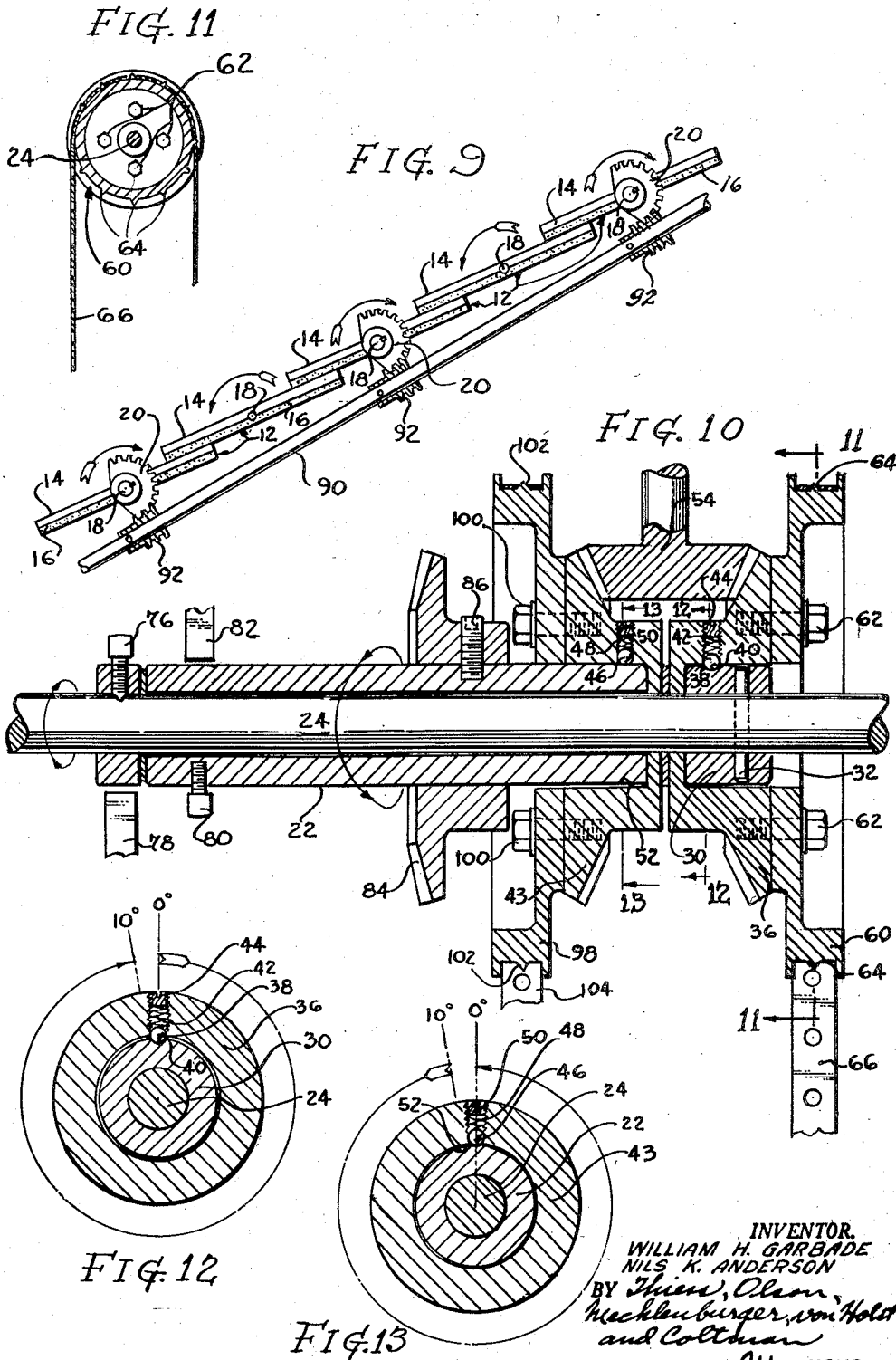
Oct. 28, 1958

W. H. GARBADE ET AL
REVERSIBLE SLAT ASSEMBLY

2,857,634

Filed Feb. 9, 1956

3 Sheets-Sheet 3



1

2,857,634

REVERSIBLE SLAT ASSEMBLAGE

William H. Garbade and Nils K. Anderson, Tulsa, Okla.;
said Anderson assignor to said Garbade

Application February 9, 1956, Serial No. 564,494

12 Claims. (Cl. 20—62)

The present invention relates to a reversible slat assembly.

It is well known that the usual Venetian blind construction comprises a plurality of aligned slat members in which the overlapping arrangement thereof is reversed upon reversal of the slats. Thus, when Venetian blinds are viewed from the exterior of the room in which disposed, the higher slat member overlaps the lower adjacent slat member. If each of the slats is reversed 180°, the slats will then assume an alignment as viewed from the exterior in which the lower slat construction overlaps the adjacent higher slat.

Since blind members are usually arranged so as to present an alignment of slats in which the upper slat overlaps a lower adjacent slat as viewed from the exterior of the room in which disposed for purposes of providing the most pleasing arrangement, and most efficient arrangement for excluding light, the same slat surfaces must of necessity always be disposed inwardly or outwardly relative to the room interior.

It is an object of this invention, therefore, to provide a slat assembly in which reversal of slat surfaces may be effected without reversing the overlapping arrangement of the slats.

Thus, slats may have a separate color disposed on each surface. It may be desirable to have a first color disposed toward the room interior during a certain period of the day and the second color disposed toward the room interior during the remainder of the day for purposes, for instance, of changing the decor of a room. Utilizing the slat assembly hereinafter to be disclosed, such color change may be effected without disturbing the overlapping slat arrangement which provides the most pleasing appearance when viewed both from the exterior and interior of the room in which disposed.

It is a further object of this invention to provide a slat assembly particularly adapted for incorporation in a roof structure whereby the energy of the sun may be used to optimum advantage as will hereinafter be explained in greater detail.

It is a further object of this invention to provide a slat assembly which is adapted to function as a roof structure which controls the structure temperature while maintaining a substantially leakproof overlapping alignment.

It is another object of this invention to disclose a novel drive arrangement adapted to reversibly rotate slat members defining an assembly.

The above and other objects will become more apparent from the following description, accompanying drawings and appended claims.

In one embodiment of this invention, a plurality of slats having a rod member running through the longitudinal central portion of each are maintained in uniform overlapping relationship. The rods and slats are divided into two series in which all members of each series are rotatably moved simultaneously. Each series is composed of alternate slat members which are driven

2

through an interconnecting gear system by one of two concentric drive shaft members. The drive shafts are rotatably movable in opposite directions by means of an interconnecting gear and clutch arrangement hereinafter to be described in greater detail. Two clutches utilized in the driving mechanism enable one series of slat members always to begin rotational movement in advance of the second series whereby undesirable frictional or rubbing action between adjacent slats is avoided. As a result of the slat movement in opposite directions, the overlapping alignment of the reversed slats remains the same although the surfaces are now in reversed position after all slats have been rotated 180°.

For a more complete understanding of this invention, reference should now be had to the drawing, wherein:

Figure 1 is a perspective view of an enclosure in which slat members assembled in accordance with the principles of this invention are shown forming an upper roof portion;

Fig. 2 is a perspective view of the enclosure illustrated in Fig. 1 in which the slat members comprising the roof portion have a second surface disposed outwardly but retain the same overlapping relationship;

Fig. 3 is a fragmentary top plan view of a plurality of slat members and the driving mechanism therefor illustrated in one position of overlapping relationship;

Figs. 4 through 8 are end elevational views illustrating the manner in which the slat members assembled in accordance with the principles of this invention are completely reversed by rotating over dissimilar intervals of time and in opposite directions;

Fig. 9 is a fragmentary end elevational view of interconnecting means which rotatably move the slat means of the provided invention;

Fig. 10 is a fragmentary sectional view illustrating the concentric drive shafts for rotatably moving the slat members of this invention and their attached gear and clutch mechanisms;

Fig. 11 is an elevational view taken on line 11—11 of Fig. 10;

Fig. 12 is a sectional view taken on line 12—12 of Fig. 10; and

Fig. 13 is a sectional view taken on line 13—13 of Fig. 10.

Referring now to the drawings, and more particularly to Figs. 1 and 2, an enclosure 10 which may comprise a poultry house, for instance, is illustrated in which slat members 12 are aligned in overlapping relationship defining a sloping roof portion of the enclosure 10. Each of the slat members 12 has two unlike surfaces 14 and 16. Surface 14 is preferably light or white in color and, consequently, functions to reflect rays of the sun. Surfaces 16 of slats 12, however, are dark and may be black in color so as to function as a heat absorbing surface, absorbing the radiant energy from the sun. It is obvious that during hot periods of the year the heat reflecting surfaces 14 of the slat would be disposed to the exterior, and during cold periods of the year, heat absorbing surfaces 16 would be disposed outwardly so as to contact the sun's rays.

It is desirable that in each instance, whether the surfaces 14 or the surfaces 16 are disposed outwardly, the slat members 12 be arranged in overlapping relationship in a manner such as is illustrated in Figs. 3 and 4. It will be noted from Fig. 4 that each slat member 12 overlaps at its bottom portion the upper portion of the immediately underlying slat member 12. When viewed from the side, therefore, the slat members illustrated in Fig. 3 are seen to define a steplike arrangement wherein each slat member has its upper portion disposed beneath the adjacent slat member disposed above it. It is apparent that such a steplike arrange-

3

ment is desirable in a roof construction so that any water which may fall thereon will rapidly run off and not seep in between two adjacent contacting slat members.

It is known that in the ordinary Venetian blind construction commonly found in the home, upon completely reversing the slat members 180° the overlapping relationship of the slat members is also reversed. Consequently, the same surface in the ordinary Venetian blind found in the home is continually disposed outwardly from the interior and the same surface is disposed inwardly toward the interior of the room in order that the same desirable overlapping relationship of the slats may be had. In the usual home blind arrangement, the slats are arranged so that looking at the same from the exterior of the home an upper slat overlaps a slat disposed therebeneath. Such an arrangement is not only the most pleasing in appearance but the most efficient in excluding the sun's rays which enter the room from a point above the house structure. Upon the reversing of the slats of the blind 180°, the stepped arrangement of the slat members is reversed, where upon viewing the slats from the exterior of the house each slat member is overlapped by a slat member disposed immediately beneath it.

In order to enable either surface of a slat assemblage to be exposed toward the exterior without altering the desired stepped arrangement of the individual slat members 12, the apparatus illustrated in Figs. 9 through 13, inclusive, has been provided. Utilizing the mechanism hereinafter to be described in these figures, alternate slat members will be rotated in the same direction; that is, adjacent slat members will be rotated in opposite directions. In order, however, to prevent scraping or frictional engagement between overlapping portions of adjacent slat members, it has been found that by rotatably moving one series of slat members away from the adjacent slat which it overlaps previous to moving the remaining slat members, all frictional engagement or other deleterious rubbing action between adjacent slat members is obviated. This principle is clearly illustrated in Figs. 4 through 9.

In Fig. 4 five slat members 12 forming a portion of the roof of the structure 10 illustrated in Figs. 1 and 2 are illustrated. In Fig. 4 the slats 12, which may have a rod 18 disposed through the longitudinal central portions thereof, have their heat reflecting surfaces 14 disposed upwardly. It will also be noted that the slat members 12 are in the desirable overlapping stepped arrangement wherein each slat member overlaps the adjacent slat member beneath it. Utilizing this system no crevices are available for water, dirt, or other material to enter or seep through.

If, after assuming the position in Fig. 4, it is found desirable to expose the heat absorbing surface 16 outwardly, the following procedure takes place. One series of slats, which will be designated 12a for purposes of illustration, are initially rotated clockwise away from the slats which they overlap, as illustrated in Fig. 5, while the remaining slat members, which will be designated 12b for purposes of illustration, remain in their original position. After having moved through the initial angle of about 10° illustrated in Fig. 5, slat members 12b begin their counterclockwise movement, as illustrated; and both slat members 12a and 12b are simultaneously rotatably moving so as to have their heat-absorbing surfaces 16 disposed outwardly. In Fig. 6 the solid line representations of slats 12a and 12b are illustrated after they have simultaneously rotated 90° from their dotted line positions or positions of Fig. 5. In Fig. 7 the first-to-move slats 12a are shown in their final position of rest with the slats 12b still moving 10° behind. In Fig. 8 both slat series are at rest. The dotted line figures in Figs. 7 and 8 represent the respective slat positions in the previous figures.

It is apparent that, by allowing the slats 12a to ini-

4

tially move through a small angle of about 10°, slats 12b do not contact the slats 12a in the course of their rotational movement. In Fig. 8 the slats 12a and 12b are once more in the identical stepped arrangement as illustrated in Fig. 4, although they have been reversed 180° with a dissimilar surface exposed outwardly.

As will be noted from Fig. 3, each of the rod members 18 has affixed or keyed thereto at one end limit a spur gear 20. It will be noted from Figs. 3 and 9 that the disposition of the spur gears 20 on the ends of the rods 18 alternates with successive rod members. The slat members, as mentioned in the description of Figs. 4 through 8 are, therefore, divided into two series, those having spur gears disposed on the right hand portions of the slat rods and those having the gears disposed on the left hand portions of the slat rods 18. These two series 12a and 12b are intended to arcuately rotate 180° over partially dissimilar intervals of time as above described.

The means for rotatably moving the spur gears 20 and the corresponding slat member to which it is associated comprises two concentric drive shaft members 22 and 24 illustrated in Fig. 10. A collar portion 30 is rotatable with the inner drive shaft 24 by reason of the pin 32 which secures the collar 30 to the latter shaft. A bevel gear member 36 is rotatable with the collar member 30 when a clutch ball member 38 engages a recess 40 in the collar periphery. The ball 38 is maintained in the recess 40 by means of the spring member 42. The latter spring member is in turn maintained in place by means of a screw member 44. Consequently, as long as the ball member 38 engages the recess 40 of the collar member, bevel gear 36 will be rotatable with the collar 30 and the inner drive shaft 24.

The outer drive shaft 22 has bevel gear 43 engageable with the periphery thereof by a similar clutch assembly comprising a ball member 46, a spring member 48, and a screw member 50. The ball member 46 of the latter clutch assembly is adapted to engage recess 52 disposed in the periphery of the outer shaft; and, during such engagement, the bevel gear 43 is rotatable with the outer drive shaft 22. Interposed between the two bevel gears 36 and 43 is a follower gear 54 which is journaled in a fixed support, not shown, and which when rotatably movable by the bevel gear 36 will impart rotational movement of an opposite direction but identical speed to bevel gear 43 and, thus, rotate the outer drive shaft 22 in a direction opposite to the direction of rotational movement of inner drive shaft 24 when both clutch assemblies engage their respective shaft members. It is thus seen that, when the inner shaft 24 and the outer shaft concomitantly rotate, they will do so at identical speeds by virtue of the follower gear 54 interposed between the two bevel gear members 36 and 43.

A centerless wheel 60 rotatably drives bevel gear 36 and is secured to the same by means of bolt members 62 or other similar means. The centerless wheel 60 has teeth or sprocket members 64 disposed about its periphery which in turn engage an apertured belt member 66 which connects the wheels 60 to a motive means, not shown. The nature of the wheel 60 may be more clearly seen from Fig. 11, which illustrates the latter wheel in front elevation.

In the normal course of reversing the slats 12 of an assemblage such as the roof portion in Figs. 1 and 2, a mechanical motive means, or manual manipulation, rotates the bevel gear 36, which is secured to the collar 30 by means of the clutch ball 38, in a clockwise direction, as illustrated in Fig. 12. Since the ball 38 of the clutch is in place, the collar 30 and attached inner shaft 24 will simultaneously rotate in a clockwise direction.

Referring now to Fig. 3, it will be seen that the inner shaft 24 has keyed to the end limit thereof a bevel gear member 68 which engages a conical gear 70 keyed to

5

one end limit of a shaft 72 as illustrated. Affixed to predetermined portions of the latter shaft are worm segments 74 similar to segments 92 shown in Fig. 9. The worm segments 74 in the normal course of rotation of the inner shaft 24 are rotated because of the rotational movement of the bevel gears 68 and 70 and, thus, rotatably move the spur gears 20 disposed at the end limits of the shafts 18 which run through the central portion of each slat member 12. As will be noted from Fig. 3, the shaft 72 will rotatably move every second slat member in the same direction of rotation. The shaft 24 will cease to rotate when the projection 76, illustrated in Fig. 10, and secured to the central shaft 24, engages a shaft stop member 73. This latter stop member defines the end limit of the rotational movement of the inner drive shaft 24, which end limit corresponds to the position at which one half of the slat members 12 (those driven by shaft 24) have rotatably moved 180°. As the bevel gear 36 proceeds to rotate after the projection 76 has engaged the stop 73, the clutch ball 38 illustrated in Fig. 10 will become disengaged, allowing gear movement without shaft movement.

The rotational movement of the outer shaft 22 during the course of the above-described rotational movement of the inner shaft 24 will now be described. To enable the series of slats 12 driven by the inner shaft 24 to be rotatably moved before the other series of slats which are driven by the outer drive shaft 22, the second clutch assembly comprising ball 46, screw 50, spring 48 and recess 52 is utilized, as illustrated in Fig. 12. Upon rotation of the bevel gear 36 in a clockwise manner, the inner shaft 24 will immediately move, since the clutch ball 38 is in place in the collar recess 40. However, as will be noted from Figs. 10 and 13, the ball 46 is not in its recess 52 disposed on the outer shaft 22, and thus the gear 43 will be rotatably driven in a direction opposite (counterclockwise) from that of the movement of gear member 36, until the ball 46 engages the recess 52 in the shaft 22. It will be noted from Fig. 13 that the recess 52 has been spaced apart from the ball member 46 an angular distance corresponding to movement of 10° by the shafts 18 driven thereby. Thus, although the inner shaft 24 will immediately rotate in a clockwise direction upon motivation of the gear 36, the outer shaft 22 will not rotatably move in a counterclockwise direction until gear 43 has moved, enabling the ball 46 to engage the shaft recess 52. Although the ball 46 and recess 52 are illustrated as being 180° apart in Fig. 10 for purposes of illustration, recess 52 is intended to be some other small predetermined number of degrees away from the ball 46 as illustrated in Fig. 13, which is equivalent to an angle of rotation of approximately 10° by the slat shafts 18 driven thereby.

As illustrated, therefore, gear member 36 will be driven in a clockwise direction by means of the belt 66, as soon as the belt 66 moves. Simultaneously with this movement, the drive shaft 24 will move, concomitantly driving the series of slats engaged by the worm segments 74, illustrated Fig. 3. After gear 36 has rotatably moved a short arcuate distance, the clutch ball 46 will engage recess 52 in the outer shaft 22, and the outer shaft 22 will then simultaneously move with the inner shaft 24. After the inner shaft 24 has rotatably moved the slats actuated by the worm segments 74, 180°, the projection 76 of the inner shaft 24 will abut against the shaft stop 78, illustrated in Fig. 10. Further movement of the central shaft 24 will thus be prevented. However, although the central shaft 24 no longer rotates, gear 36 will continue to rotate and in doing so will continue to rotate the gear 43 in the opposite direction and the outer shaft 22 in an opposite direction until a shaft projection 80 affixed to the outer periphery of the outer drive shaft 22 engages a shaft stop 82, shown in Fig. 10.

During the rotational movement of the outer shaft 22, a bevel gear 84 secured thereto by means of a set screw

6

86 engages a conical gear 88, as illustrated in Fig. 3. This latter gear is affixed to the end of a shaft member 90 which has worm segments 92 affixed thereto at predetermined intervals (see Fig. 9). These latter worm segments engage the gear members 20 affixed to the rods 18 of the second series of slats 12. It is thus seen that, as gear member 84 rotates, one series of slats 12 will be rotated in a direction opposite to the rotational movement of the other series of slats 12 rotatably moved by the inner shaft 24.

It is apparent that, since the slats driven by the gear 36 initially rotate 10° before the series of slats rotated by the bevel gear 43 begins to rotate, the latter slats must rotate 10° after shaft 24 ceases to rotate or after the ball 38 has become disengaged from the recess 40. When the gear 43 finally comes to rest because of the abutting of the projection 80 against the shaft stop 82, both series of slats 12 will have been rotated 180° and will still retain the same overlapping relationship they initially possessed, although a second slat side will now be disposed upwardly.

It will also be apparent that when gear 43 ceases to rotate, the ball 38 will be disengaged from the recess 40 and ball 46 will be engaged with the recess 52 in the outer shaft 22. Thus to again reverse the two series of slats 12 in the opposite direction, a reverse direction of rotation will be imparted to the gear 43 by means such as a wheel 98 secured thereto by means of bolt members 100 or other suitable means. The latter wheel has teeth or sprockets 102 disposed about its periphery which engage an apertured belt 104 which interconnects the wheel 98 with a second motive means, not shown. In reversing the slats 12, once again a reverse procedure is followed, whereby the outer shaft 22 and the slats driven thereby will immediately rotate, since the clutch interposed between outer shaft 22 and wheel 43 is engaged. After gear 36 rotates through a small angle, the ball 38 of the clutch of gear 36 will engage and the two drive shafts will concomitantly rotate in opposite directions through 170°. At the end of this time, the slats driven by the outer drive shaft 22 will have been rotated 180° and the slats driven by the inner shaft 24 will be 10° from rest and will be driven these latter 10° as the ball 46 becomes disengaged from the recess 52 of the outer shaft 22. At the end of these latter 10°, both series of slats 14 will have been rotated another 180° and the mechanism will be back in the position illustrated in Figs. 10, 12 and 13.

It is thus seen that a mechanism has been provided whereby slat members defining an assemblage and having a predetermined desired overlapping relationship may be reversed 180° and, at the end of this time, still retain the desired overlapping relationship. Although an angle of 10° has been disclosed as the desirable angle at which one series of slats rotates in advance of a second series, this angle is not critical and may be varied within practical limits, which may be readily found by anyone skilled in the art. It is further obvious that limit switches or equivalent means may be employed with the motive means, not shown, which will immediately stop the rotating mechanism of Fig. 10 after the second series of slats 12 have rotated the full 180°. In addition, it is also apparent that other mechanisms may be employed which will rotate two series of alternate slats in opposite directions over partly dissimilar time intervals. This invention, therefore, is not to be limited by details of the rotating mechanism illustrated in Fig. 10. Instead, this invention is to be limited only by the scope of the appended claims.

We claim:

1. In combination, a plurality of rotatable slats, shaft means engaging the longitudinal substantially central portion of each of said slats, two series of gear means affixed to alternate end limits of successive slats, separate interconnecting means engaging said gear means and adapted to rotatably move the same, and concentric drive

shaft means rotatably moving in opposite directions for rotatably driving each of said series by means of said interconnecting means whereby said latter series rotate in opposite directions.

2. In combination, a plurality of rotatable slats, shaft means engaging the longitudinal substantially central portion of each of said slats, two series of gear means affixed to alternate end limits of successive slats, separate interconnecting means engaging said gear means and adapted to rotatably move the same, concentric drive shaft means rotatably moving in opposite directions for rotatably driving each of said gear series by means of said interconnecting means whereby said latter series rotate in opposite directions, bevel gear means disposed on each of said concentric drive shaft means, a follower bevel gear rotatably engaging each of said bevel gears whereby rotational movement imparted to one drive shaft will be imparted to the other of said shafts, and motive means rotatably driving at least one of said concentric shaft means.

3. In combination, a plurality of rotatable slats, shaft means engaging the longitudinal substantially central portion of each of said slats, two series of gear means affixed to alternate end limits of successive slats, separate interconnecting means engaging said gear means and adapted to rotatably move the same, concentric drive shaft means rotatably moving in opposite directions for rotatably driving each of said gear series by means of said interconnecting means whereby said latter series rotate in opposite directions, bevel gear means disposed on each of said concentric drive shaft means, a follower gear rotatably engaging each of said bevel gears whereby rotational movement imparted to one drive shaft will be imparted to the other of said shafts, and discrete motive means rotatably driving each of said concentric shaft means.

4. In a drive assembly for rotatably moving a plurality of slats or the like in opposite directions, the combination comprising unconnected concentric drive shaft means, gear means disposed on each of said shaft means peripheries, clutch means interposed between each of said gear means and said shaft means, a follower gear interconnecting said gear means, projecting means disposed on the periphery of each of said concentric drive shaft means, and stop means disposed in the path of said projecting means arcuate movement, said stop means being so disposed so as to enable said two projecting means to abut against said two stop means at dissimilar instances of time, said clutch means disengaging each of said gear means when its respective projecting means abuts against its cooperating stop means.

5. In a drive assembly for rotatably moving a plurality of slats or the like in opposite directions, the combination comprising unconnected concentric drive shaft means, gear means disposed on each of said shaft means peripheries, clutch means interposed between each of said gear means and said shaft means, a follower gear interconnecting said gear means, projecting means disposed on the periphery of each of said concentric drive shaft means, stop means disposed in the path of said projecting means arcuate movement, said stop means being so disposed so as to enable said two projecting means to abut against said two stop means at dissimilar instances of time, said clutch means disengaging each of said gear means when its respective projecting means abuts against its cooperating stop means, and drive means engaging one of said concentric shaft means and rotatably moving the same, said drive means being reversible.

6. In combination, a plurality of rotatable slats adapted to be maintained in overlapping steplike configuration, a plurality of shaft means, each of said shaft means engaging the longitudinal substantially central portion of each of said slats, first gear means affixed to one end limit of each of said shaft means, said first gear means being disposed on alternate end limits of successive shaft

means, worm drive means engaging each of said first gear means and adapted to rotatably drive the same, concentric drive shaft means rotatably moving in opposite directions for rotatably driving each of said worm drive means, second gear means disposed on each of said concentric drive shaft means, clutch means interposed between each of said second gear means and the drive shaft means on which disposed, projecting means affixed to the periphery of each of said drive shaft means, stop means for stopping the rotational movement of each of said drive shaft means by engaging said stop means, and reversible motive means rotatably driving at least one of said concentric drive shafts.

7. The combination as recited in claim 6 in which said motive means utilizes limit switch means limiting the length of operation thereof.

8. In combination, a plurality of slat members having a heat-reflecting and a heat-absorbing surface, said slats being adapted to be disposed on an inclined plane in the normal position of use wherein all of said slats have a similar surface disposed outwardly, said slats being disposed in overlapping stepped arrangement in the normal assembled position with each of said slats overlapping the slat disposed therebeneath, and actuating means for rotatably moving said slat members whereby either of said slat surfaces of all said slats may be disposed outwardly, said actuating means rotatably moving alternate slats in said one direction of rotation prior to moving the remaining slats in the opposite direction of rotation.

9. The combination as recited in claim 8 in which a clutch means is interposed between said actuating means and said slat members for enabling said alternate slats to be rotated about 10 degrees prior to rotation of said remaining slats.

10. In a combination, a plurality of slats in steplike configuration, means for rotating a first series of slats, comprising alternate slats of said plurality, in one direction of rotation; means for rotating a second series of alternate slats interposed between said first series in a direction of rotation opposite to that in which said first series of slats move, means for actuating said means for rotating said first series of slats through an angle of rotation great enough to enable said second series of slats to be rotated without engaging said first series of slats, and means for actuating said means for rotating said second series of alternate slats after said first series of slats has moved through said angle of rotation.

11. In a combination, a plurality of slats in step-like configuration, means for rotating a first series of said slats in one direction of rotation, means for rotating a second series of said slats in the direction of rotation opposite to that imparted to said first series, the slats of said first and said second series comprising alternate slats in said plurality, means actuating said rotating means for said first series of said slats and said rotating mean for said second series of slats, said actuating means actuating said rotating means for said first series of slats before actuating said rotating means for said second series of slats in the normal course of operation whereby said slats of said first series will rotatably move through an angle of rotation before the rotary movement of said second series of slats.

12. In a combination, a plurality of slats arranged in steplike configuration, means for rotating a first series of slats comprising alternate slats of said plurality in one direction of rotation through an arc of 180°, means for rotating a second series of alternate slats interposed between said first series in a direction of rotation opposite to that through which said first series of slats move through an arc of 180°, means for actuating said means for rotating said first series of slats through an initial arc great enough to enable said second series of slats to be rotated without engaging said first series of slats, means for actuating said means for rotating said second

series of alternate slats after said first series of slats have moved through said initial arc, said actuating means for said first and second rotating means regulating the speed of both of said rotating means whereby said first and second series of slats rotate at substantially uniform speed. 5

References Cited in the file of this patent

UNITED STATES PATENTS

1,639,474	Whitmore	Aug. 16, 1927
2,370,794	Houmère	Mar. 6, 1945