Nov. 2, 1954 W. E. BOX ET AL 2,693,279

IMPROVEMENT RELATING TO MAGNETIC FLOOR SWEEPERS

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FIG.1.

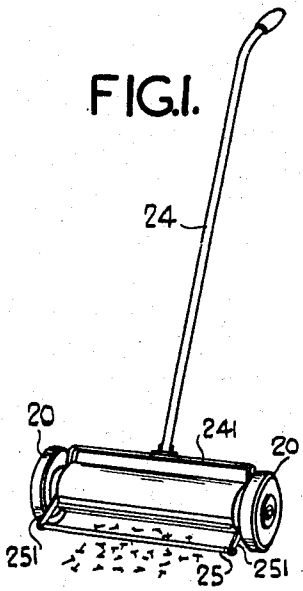


FIG.2.

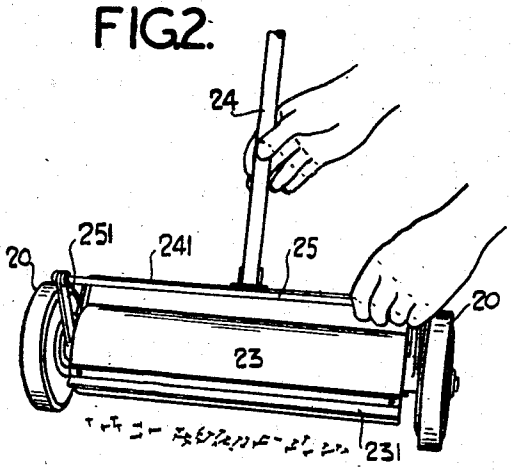


FIG.3.

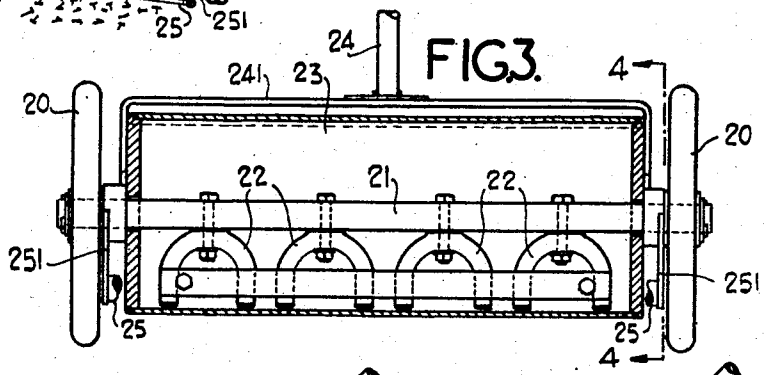


FIG.4.

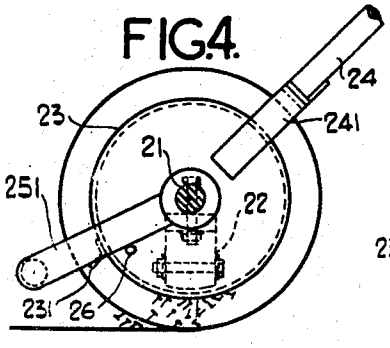
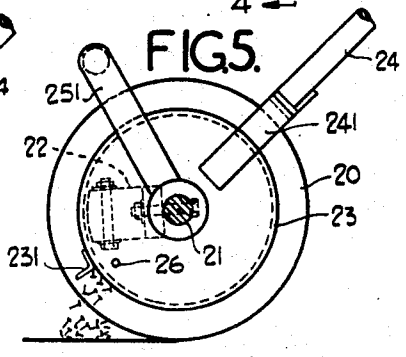


FIG.5.



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FIG.6.

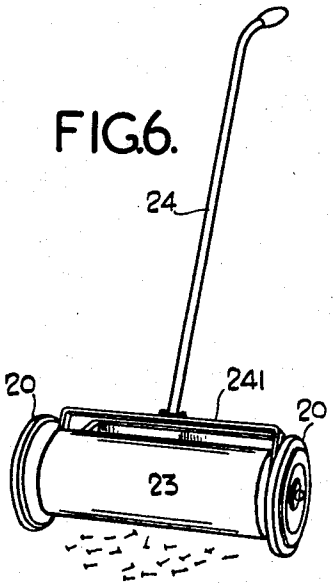


FIG.7.

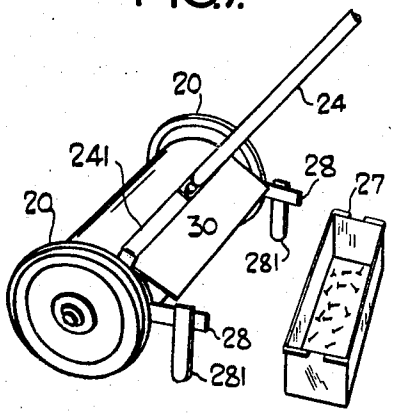


FIG.8.

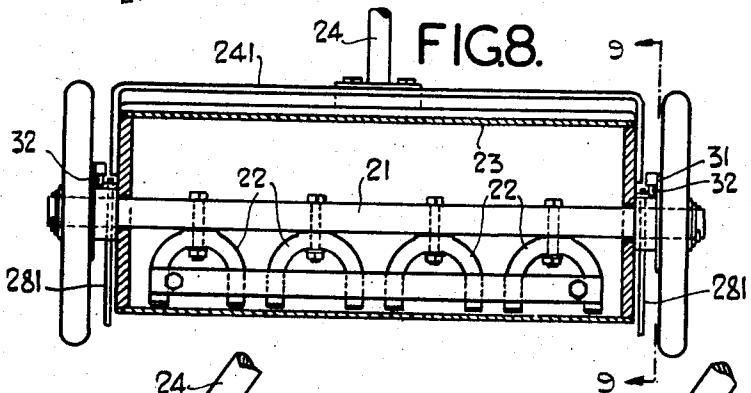


FIG.9.

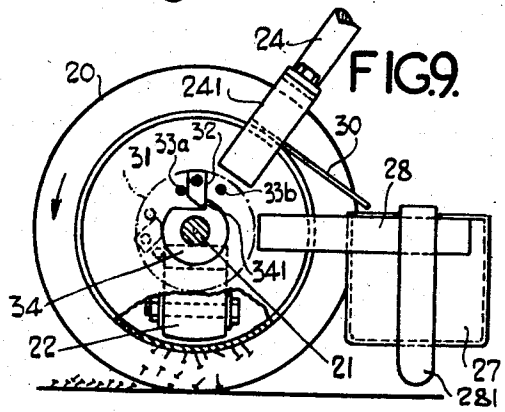
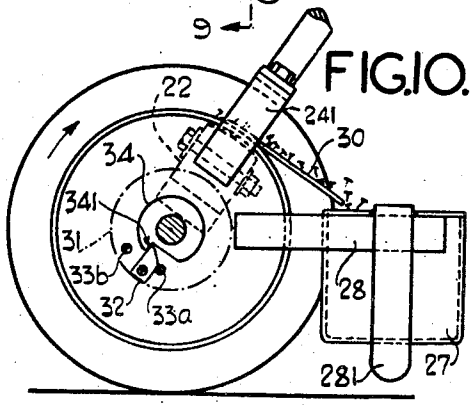


FIG.10.



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IMPROVEMENT RELATING TO MAGNETIC FLOOR SWEEPERS

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Application April 21, 1951, Serial No. 222,256

Claims priority, application Great Britain April 26, 1950

5 Claims. (Cl. 209—215)

This invention has reference to improvements relating to magnetic floor sweepers. As is well known magnetic floor sweepers as generally constructed incorporate a cylindrical drum the outer surface of which serves as the collecting surface, a magnetic force producing means located within the drum and wheel means for enabling the drum to be traversed over a surface from which the material is to be collected and the present invention has for its object to provide an improved magnetic floor sweeper of this kind in which the removal from the collecting surface of any collected magnetic material is facilitated.

According to the invention an improved magnetic floor sweeper incorporates a cylindrical drum the lowermost portion of the outer surface of which serves as the collecting surface for the magnetic material to be collected, wheeled supporting means for said drum, handle means for propelling the drum over the floor surface from which magnetic material is to be collected, magnetic force producing means located within said drum with the magnetic poles located normally in proximity to the inner surface of the lowermost portion of the drum, means for turning the said magnetic force producing means from the position occupied during sweeping so that any magnetic material collected on the drum can follow the magnetic force producing means as it is turned and means for arresting the movement of the collected material after the magnetic force producing means has been turned to a pre-determined extent so that after the collected material has reached the arresting position continued turning of the magnetic force producing means results in the collected material being subjected to a diminishing field of force whereby the collected material is released for collection or disposal.

The invention also resides in magnetic separators constructed and adapted for use substantially as will be described hereinafter.

Embodiments of the invention will now be described with particular reference to the accompanying drawings wherein:

Figure 1 is a perspective view of a magnetic floor sweeper constructed in accordance with the invention.

Figure 2 is a fragmentary view of the magnetic floor sweeper illustrated in Figure 1 showing the manner of removing the magnetic material collected by said sweeper.

Figure 3 is a fragmentary view mainly in longitudinal vertical section but partly in front elevation of a portion of the magnetic floor sweeper illustrated in Figures 1 and 2.

Figure 4 is a fragmentary sectional view showing the relative disposition of the parts during sweeping the section being taken on the plane indicated by the line 4—4, Figure 3, looking in the direction of the arrows to said line.

Figure 5 is a similar view to Figure 4 but showing the relative disposition of the parts when the removal of any collected magnetic material is being occasioned.

Figure 6 is a front perspective view of another construction of magnetic floor sweeper in accordance with the invention.

Figure 7 is a rear perspective view of the magnetic floor sweeper illustrated in Figure 6 with the collecting trough for magnetic material removed.

Figure 8 is a fragmentary view mainly in longitudinal vertical section but partly in front elevation of a portion of the magnetic floor sweeper illustrated in Figures 6 and 7.

Figure 9 is a fragmentary sectional view showing the relative disposition of the parts of the magnetic floor sweeper illustrated in Figures 6–8 during sweeping, the section being taken in the plane indicated by the line 9—9, Figure 8, looking in the direction of the arrows to said line.

Figure 10 is a similar view to Figure 9 but showing the relative disposition of the parts when the removal of any collected material is being occasioned.

According to the embodiment of the invention illustrated in Figures 1–5 the improved magnetic floorsweeper incorporates a pair of rubber tyred road wheels **20** which are freely mounted on the ends of an axle **21** to which is bolted a plurality of permanent magnets **22** which tend to hang vertically under the influence of gravity, see Figures 3 and 4.

The permanent magnets **22** aforesaid are enclosed within a close fitting concentric cylindrical shield **23** of sheet metal which is fixed to the ends of a yoke **241** constituting the lower portion of the handle **24**. The shield **23** is provided at the front with an outwardly projecting longitudinally arranged flange **231** hereinafter termed the stop flange **231**.

Rigidly connected to the end portions of the axle **21** externally of the ends of the shield **23** is a pair of outwardly projecting arms **251** which are interconnected by a bar **25** which is located in front of the shield **23** and the wheels **20**, said bar **25** being referred to hereinafter as the bumper bar **25**.

At each end the shield **23** is provided with outwardly projecting pins **26** which co-operate with the arms **251** to serve as stop pins for supporting the bumper bar **25** when the magnets **22** are hanging vertically.

The handle **24** may be provided with a depending strut not shown which serves as a foot when the apparatus is at rest.

In readiness for use the bumper bar **25** rests with its arms in contact with the stop pins **26** with the permanent magnets **22** occupying the vertical position and with the arcuate surface of the magnets **22** adjacent to the inner surface of the portion of the shield **23** immediately above the floor level, see Figure 4.

The apparatus may then be propelled over a floor to be swept in the manner of the usual magnetic floor sweeper.

When it is desired to remove any collected magnetic material the apparatus is held in a position of rest and the bumper bar **25** drawn upwardly thereby occasioning a turning of the permanent magnets **22** so that the curved outer surfaces thereof move upwardly inside the fixed shield **23**. The turning of the permanent magnets **22** as aforesaid causes the collected material adhering to the underside of the outside of the shield to follow the magnetic field of force but when the traverse of the magnets **22** is such that the collected material strikes the stop flange **231** further movement of the said collected material is prevented so that as the magnetic field further recedes, the collected material drops and may be removed as desired, see Figure 5.

When the collected material has been removed the bumper bar **25** is released thus allowing the magnets **22** to resume the initial depending vertical position.

It will be seen that the improved magnetic floor sweeper in the embodiment described dispenses with the use of the usual rotatable shield with its complications of construction and furthermore enables magnets of much smaller bulk to be used since it is only necessary to provide for an intensive magnetic field at the place of collection namely immediately above the floor level, thus making for a material reduction in first cost and in the weight of the apparatus as a whole.

According to the embodiment of the invention illustrated in Figures 6–10 the rubber tyred road wheels **20** again are freely mounted on the ends of an axle **21** to which is bolted a plurality of permanent magnets **22** which tend to hang vertically under the influence of gravity.

As in the embodiment first described the magnets **22** are enclosed by a close fitting cylindrical shield **23** of non-magnetic sheet material said shield **23** likewise being fixed to the ends of a yoke **241** associated with a handle **24**.

Disposed at the rear of the shield **23** is a removable trough **27** of sheet metal for the reception of any collected magnetic material, said trough **27** being adapted to be supported by arms **28** fixed to and projecting rearwardly from the ends of the shield **23**.

Associated with the arms **28** are struts **281** which serve as feet when the sweeper is at rest.

Fixed to the upper portion of the shield **23** is a deflector plate **30** which inclines downwardly and rearwardly with its lower end disposed above the trough **27** when supported by the arms **28**, see Figures 9 and 10.

Fixed to the inner side of each wheel **20** is a disc **31** each of which has pivoted thereto a finger **32** which tends to assume the pendant position under the action of gravity.

Disposed on either side of the fingers **32** are pegs **33***a*, **33***b* which are located at different distances from the centres of the respective wheels **20**.

The fingers **32** co-operate with the noses **341** of cams **34** fixed to the axle **21**.

The location of the pegs **33***a*, **33***b* is such that when the apparatus is propelled in a forwards direction the fingers **32** strike the pegs **33***a* and ride clear of the noses **341** of the cams **34** so that a free forward movement is permitted see Figure 9 and such that when the apparatus is drawn in a backwards direction, the fingers **32** come into contact with the pegs **33***b* and with the tips of the said fingers **32** engaged with the noses **341** of the cams **34** thus coupling the road wheels **20** to the axle **21**. Consequently if backwards movement is continued after the fingers **32** engage the noses **341** of the axle **21** the magnets **22** are turned in a clockwise direction whereby any collected material is carried around the shield **23** on to the deflector plate **30** and is caused to fall into the trough **27** when the backwards movement is arrested and the magnets **22** permitted to resume their vertical position under the action of gravity.

Thus when it is desired to remove the collected magnetic material from the collecting surface of the device, the sweeper is drawn in a backwards direction until the tips of the said fingers **32** engage with the pegs **33***b* and with the noses **341** of the cams **34** and occasion the turning of the magnets **22** in a clockwise direction as seen in Figures 9 and 10 until the magnets **22** have been turned to an extent sufficient to bring the collected material on to the deflector plate **30** when subseqeunt backwards movement increases the air gap between the deflector plate **30** and the magnets **22** so that the collected material which is thus removed from the influence of the magnetic field of force is permitted to fall down the deflector plate **30** into the collecting trough **27**.

It will be appreciated that a magnetic floor sweeper in accordance with the embodiment last described is simple in construction, efficient in operation and admits of the ready discharge of any collected material as and when required without the operator being under the necessity of releasing the handle by means of which the sweeper is propelled.

It is to be appreciated that in the case of magnetic separators using fixed shields as in the embodiments illustrated and described with reference to Figures 1–9, the said shields may be made of either magnetic or non-magnetic material although the use of non-magnetic material is to be preferred.

Further it is to be appreciated that when permanent magnets are employed as is the case in all the embodiments illustrated, the magnets may be of the finger or solid or indented types and may be built up of magnets of the same polarity or of alternating polarity.

In addition it is to be appreciated that when permanent magnets are employed the bulk of the magnets may be reduced by using inductor bars of a less expensive magnetic material thereby reducing the initial cost without materially impairing the intensity of the effective magnetic field of force.

Moreover it is to be appreciated that the invention is not limited to magnetic separators using permanent magnets as it may be applied to magnetic separators using electro-magnets.

We claim:

1. A magnetic floor sweeper incorporating a cylindrical drum the lowermost portion of the outer surface of which serves as the collecting surface for the magnetic material to be collected, wheeled supporting means for said drum, handle means for propelling the drum over the floor from which magnetic material is to be collected, magnetic force producing means located within said drum with the magnetic poles located normally in proximity to the inner surface of the lowermost portion of the drum, means for turning the said magnetic force producing means from the position occupied during sweeping so that any magnetic material collected on the drum can follow the magnetic force producing means as it is turned, and means for arresting the movement of the collected material after the magnetic force producing means has been turned to a predetermined extent so that after the collected material has reached the arresting position continued turning of the magnetic force producing means results in the collected material being subjected to a diminishing field of force whereby the collected material is released for collection or disposal.

2. A magnetic floor sweeper incorporating a cylindrical drum the lowermost portion of the outer surface of which serves as the collecting surface for the magnetic material to be collected, a supported means disposed axially within said drum and turnable relatively thereto, said supporting means having outwardly projecting portions at each end thereof, wheels mounted on the outwardly projecting portions of the supporting means, handle means for propelling the drum over the floor from which magnetic material is to be collected, magnetic force producing means fixed to and depending from the supporting means aforesaid with the magnetic poles located normally in proximity to the inner surface of the lowermost portion of the drum, means for turning the said magnetic force producing means from the position occupied during sweeping so that any magnetic material collected on the drum can follow the magnetic force producing means as it is turned, and means for arresting the movement of the collected material after the magnetic force producing means has been turned to a pre-determined extent so that after the collected material has reached the arresting position continued turning of the magnetic force producing means results in the collected material being subjected to a diminishing of the field of force whereby the collected material is released for collection or disposal.

3. A magnetic floor sweeper incorporating a cylindrical drum the lowermost portion of the outer surface of which serves as the collecting surface for the magnetic material to be collected, a supporting means disposed axially within the said drum and turnable relatively thereto, the said supporting means having outwardly projecting portions at each end thereof, wheels mounted on the outwardly projecting portions of the supporting means, handle means for propelling the drum over the floor from which magnetic material is to be collected, one way clutch means for connecting the wheels to the supporting means, said one way clutch means permitting the wheels to turn freely on the outwardly projecting portions of the supporting means when the sweeper is propelled forwardly but connecting the wheels to the supporting means when the sweeper is drawn backwardly so that the supporting means turns with the wheels when the sweeper is drawn backwardly, magnetic force producing means fixed to and depending from the supporting means with the magnetic poles located normally in proximity to the inner surface of the lowermost portion of the drum, and arresting means for the collected material located at the rear of the drum whereby when the sweeper is drawn rearwardly with a consequential turning of the magnetic force producing means any collected magnetic material follows the magnetic force producing means as it turns until arrested by the arresting means so that as the magnetic field diminishes with continued movement of the magnetic force producing means away from the arresting means the collected material is released for collection or disposal.

4. A magnetic floor sweeper incorporating a cylindrical drum the lowermost portion of the outer surface of which serves as the collecting surface for the magnetic material to be collected, a supporting means disposed axially within said drum and turnable relatively thereto, said supporting means having outwardly projecting portions at each end thereof, wheels freely mounted on the outwardly projecting portions of the supporting means, handle means for propelling the drum over the floor from which magnetic material is to be collected, magnetic force producing means fixed to and depending from the supporting means with the magnetic poles located nor-

mally in proximity to the inner surface of the lowermost portion of the drum, a longitudinal bar located in front of the separator and connected to the supporting means whereby the magnetic force producing means can be turned from the position occupied during sweeping so that any magnetic material collected on the drum can follow the magnetic force producing means as it is turned, said bar serving also as a bumper, and a longitudinal projecting means arranged on the outer periphery of the drum which serves to arrest the movement of the collected material after the magnetic force producing means has been turned to an extent so that after the collected material is arrested by the said longitudinal projecting means continued turning of the magnetic force producing means results in the collected material being subjected to a diminishing field of force whereby the collected material is released for collection or disposal.

5. A magnetic floor sweeper incorporating a cylindrical drum the lowermost portion of the outer surface of which serves as the collecting surface for the magnetic material to be collected, a supporting means disposed axially within said drum and turnable relatively thereto, said supporting means having outwardly projecting portions at each end thereof, wheels mounted on the outwardly projecting portions of the supporting means, handle means for propelling the drum over the floor from which magnetic material is to be collected, one way clutch means for connecting the wheels to the supporting means, said one way clutch means permitting the wheels to turn freely on the outwardly projecting portions of the supporting means when the sweeper is propelled forwardly, but connecting the wheels to the supporting means when the sweeper is drawn backwardly so that the supporting means turns with the wheels

when the sweeper is drawn backwardly, magnetic force producing means fixed to and depending from the supporting means with the poles located normally in proximity to the inner surface of the lowermost portion of the drum, a collecting receptacle at the rear of the drum, and a scraping edge associated with the collecting means and arranged in substantial contiguity with the drum at the rear whereby when the sweeper is drawn backwardly with a consequential turning of the magnetic force producing means any collected magnetic material follows the magnetic force producing means as it turns until the collected material attains the position occupied by the scraper edge and whereby the continued movement of the magnetic force producing means after the collected material has been arrested by the scraper edge results in the collected material being subjected to a diminishing field of force so that the collected material is forced and discharged into the collecting receptacle.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
148,517	Smith	Mar. 10, 1874
1,326,561	Ady	Dec. 30, 1919
1,425,235	Bradley	Aug. 8, 1922
1,630,987	Turner	May 31, 1927
2,258,194	Queneau	Oct. 7, 1941
2,426,795	Sjostrom	Sept. 2, 1947
2,455,319	Stearns	Nov. 30, 1948
2,461,008	Stearns	Feb. 8, 1949
2,502,096	Kotilinek	Mar. 28, 1950
2,564,515	Vogel	Aug. 14, 1951