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MAGNETIC ARTICLE GRIP FOR TOY HOISTS

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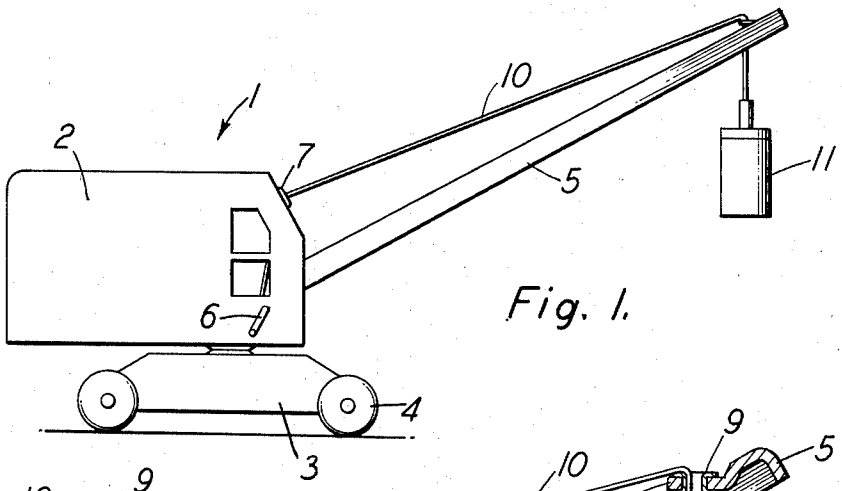


Fig. 1.

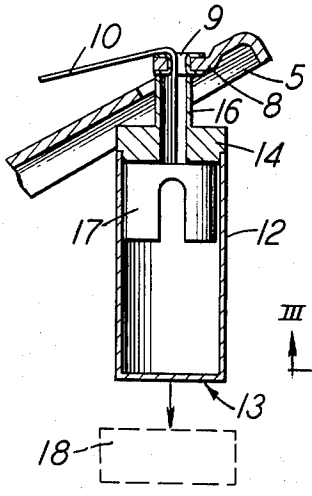


Fig. 4.

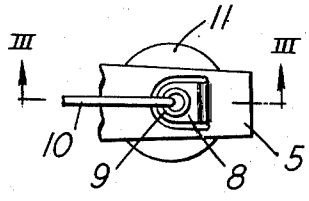


Fig. 2.

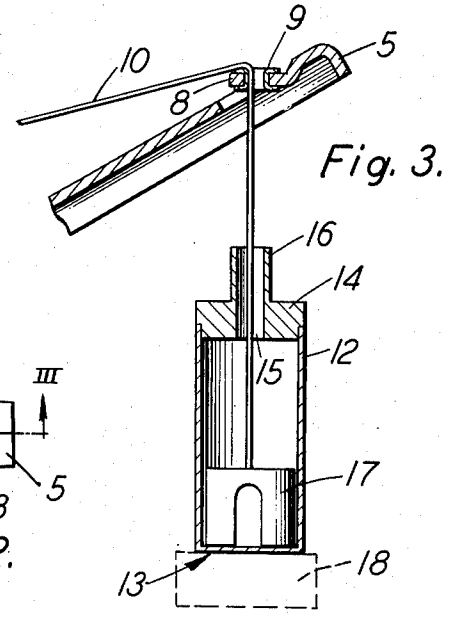


Fig. 3.

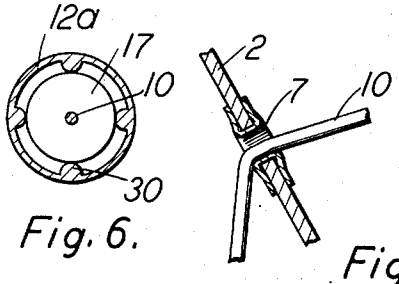


Fig. 6.

Fig. 5.

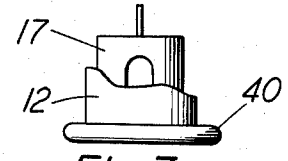


Fig. 7.

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MAGNETIC ARTICLE GRIP FOR TOY HOISTS

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6 Claims. (Cl. 294—65.5)

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This invention relates to toys and more particularly to an improved magnetic grip for a toy crane.

The desirable objective in designing a toy is providing a unit of simple, economical construction but of a dynamic rather than static character. Toy cranes capable of grasping an object and raising it have the desired characteristic of being dynamic. Many types of grips have been designed for these cranes, among them magnetic grips. However, these grips have been complicated, complex to operate and relatively expensive to fabricate. I have observed that children playing with toy cranes have a fairly constant pattern of operation. When the beam of the crane is made adjustable in height they seldom, if ever, use the beam except at its upper limit of travel. Therefore, it is unnecessary to design the crane with a beam of adjustable elevation. I have also observed that they prefer to play with toys operated by means of a single control such as a crank or lever. The use of two or more controls tends to confuse them. Thus, it is desirable to combine the controls for all of the moving parts of the toy into a single unit. It is also preferable to design the toy to appear and operate in a fashion as nearly as possible simulating the full scale machine from which it is copied.

Existing toy cranes employing a magnetic grip have failed to provide the desired combination outlined above. They fail to solve the problem of discharging the object held by the magnet by means of a simple, inexpensive mechanism. Since temporary magnets require a source of electrical power and a switch to control them, they are too expensive for the average toy. Therefore, permanent magnets have been employed with the load discharged by withdrawing the magnet from the load. To accomplish this, the magnet is surrounded by a non-magnetic frame against which the load is drawn by the magnet. To release the load, the magnet is moved away from the load while restraining the load from following by means of the frame. However, since this principle involves the relative separation of two suspended parts, it has been common practice, until my invention, to firmly secure the frame to some stable support. Thus, existing magnetic grips employ a frame or shell securely mounted to the end of the crane beam whereby it was necessary to lower the entire beam in order to bring the magnet in contact with the article to be picked up. This required two separate controls. One control regulated the elevation of the beam and the other control the operation of the magnetic

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grip. The resulting structure failed to simulate a standard crane either in appearance or operation. Further, it required an excessive number of parts and lacked the desired simplicity of operation to appeal to children.

My invention solves this problem by suspending the magnetic grip from a flexible cable whereby the grip is vertically movable independently of the beam. The flexible cable is capable of both elevating the grip and causing the grip to release the load. Thus, by means of my invention, the single control for raising and lowering the magnetic grip also functions to release the load held by the grip.

It is, therefore, a primary object of my invention to provide a toy crane having a magnetic article grip vertically movable independently of the crane's beam.

It is a further object of my invention to provide a toy crane having a magnetic article grip in which the grip is so designed that the articles may be discharged from it by means of the same cable by which the magnetic grip is suspended.

It is an additional object of my invention to provide a toy crane having a magnetic article grip in which all of the controls are combined in a single lever and adapted to economical manufacture.

These and other objects of my invention will be immediately seen by those acquainted with the design and manufacture of toys upon reading the following specification and the accompanying drawings.

In the drawings:

Figure 1 is a side elevation view of a toy crane equipped with my improved magnetic article grip.

Figure 2 is an enlarged fragmentary plan view of the free end of the beam of the toy crane.

Figure 3 is a sectional elevation view of the free end of the crane beam and of my improved magnetic article grip taken along the plane III—III of Figure 2 showing the unsectioned magnet in operating position.

Figure 4 is a sectional elevation view of the free end of the toy crane and my improved magnetic article grip taken along the same plane as Figure 3 but showing the magnet in discharge position.

Figure 5 is a fragmentary sectional elevation view of the cable passage through the body structure of the toy crane.

Figure 6 is a sectional plan view of a modified design for my improved toy magnetic article grip.

Figure 7 is a fragmentary side elevational view

of a further modified design for my improved toy magnetic article grip.

In executing the objects and purposes of my invention I have provided a toy crane having a beam of fixed elevation supporting a flexible cable having a magnetic grip suspended on its free end. The magnetic grip consists of a magnet vertically adjustable within a housing and having a collar for contacting the beam of the crane whereby the magnet may be moved upwardly relative to the housing for discharging its load.

In the following description the terms "forwardly" and "rearwardly" are frequently used and are to be taken as meaning "forwardly" in the direction of the free end of the beam of the crane and "rearwardly" away therefrom. The terms "upwardly" and "downwardly" are also frequently used and are to be taken as "upwardly" in the direction in which the crane is normally used and as shown in Figure 1 and "downwardly" away therefrom.

Referring now to the drawings in greater detail, the numeral 1 indicates a crane having a housing 2 pivotally mounted on a base 3. The base 3 is supported by any convenient means such as the wheels 4. At the forward end of the housing 2 an elongated beam 5 is fixedly mounted to the housing 2. The beam 5 extends away from the housing 2 in an upwardly and forwardly direction.

A crank 6 is mounted on the housing 2. The crank 6 extends across the entire width of the housing 2 whereby it may be journalled in each side of the housing 2. Means are provided whereby the crank 6 may be locked against rotation in either direction. Midway between the sides of the housing 2 an opening is provided through the upper portion of the forward face of the housing 2. The opening is surrounded by an eyelet or grommet 7 (Fig. 5).

Adjacent the free end of the beam 5, the beam is equipped with a tab 8 extending substantially horizontally when the beam 5 is in its inclined position. The horizontal position of the tab 8 facilitates manipulation of the hereinafter described magnetic grip 11. An opening passes centrally through the tab 8 and is surrounded by a grommet 9. A flexible cable 10 having its free end depending below the tab 8 passes through the grommet 9, along the beam 5 and through the grommet 7. The end of the flexible cable 10 within the housing 2 is anchored to the crank 6 whereby rotation of the crank 6 in one direction will wind the cable 10 upon the crank and rotation of the crank 6 in the opposite direction will unwind the cable from the crank.

At the free end of the cable 10, below the tab 8, a magnetic grip 11 is mounted on the cable 10. The magnetic grip 11 consists of a nonmagnetic, tubular housing 12 having a closed lower end 13. The upper or open end of the housing 12 is closed by means of a nonmagnetic plug 14 of substantial thickness. A passageway 15 passes upwardly through the center of the plug 14. On the upper side of the plug 14 an elongated tubular collar 16 is mounted concentrically with the passageway in the plug 14. The cable 10 extends through the tubular collar 16 and the passageway 15 and interiorly of the housing 12 is attached to a permanent magnet 17 slidably seated within the housing 12. The length of the housing 12 relative to the magnet 17 is such that the magnet is free to move longitudinally of the housing 12 a substantial portion of the housing's length, such as a third or half. As will appear more fully hereinafter, the length of permissible travel of the magnet 17 within the housing 12 is of substantial importance to my invention.

The various parts making up the beam 5, base 3 and housing 2 and the crank 1 may be made of any suitable material, such as wood, sheet steel or aluminum. The materials, however, used for the magnetic grip 11 are important. The housing 12 must be made of a material, such as aluminum or plastic, which is nonmagnetic whereby it will not be attracted to the magnet 17. The plug 14 must also be of a nonmagnetic material whereby there will be no magnetic attraction between the plug 14 and the magnet 17 when the magnet is in raised position. Unless this is true the housing will not move freely relative to the magnet. It is also essential that the housing be made of a material having a thin wall which will not seriously impair the magnetic field, particularly when the magnet is used to draw an article tightly against the lower end 13 of the housing 12. It is also desirable that the total weight of the housing 12, the plug 14 and the collar 16 be small, thus reducing the proportion of magnetic energy necessary to maintain the housing in its raised position relative to the magnet when the magnet is supporting an article drawn tightly against the lower end 13 of the housing 12. The magnet itself is made of a material suitable for permanent magnets, such as a nickel or cobalt alloy.

The operation of my toy is extremely simple. The crank 6 is turned in such a manner that the cable 10 is unwound, thus lowering the magnetic grip 11. When the magnetic grip 11 is not operating, the magnet 17 is normally at the upper limit of its travel within the housing 12. This results from a downward travel of the free housing 12 under the influence of gravity. As the crank 6 is rotated in such a fashion as to unwind the cable 10, the magnetic grip 11 is lowered. When the magnetic grip 11 approaches an article attracted by the magnet, the housing 12 will strike the article, and continued release of the cable 10 will permit the magnet under its own weight to move toward the article. As the distance between the article and the magnet decreases the magnet will be drawn toward the article, thus moving the magnet toward the lower end of the housing 12. If the article is light, the magnet will attract the article toward it, thus the article will force the housing 12 upwardly about the magnet until contact is made between the magnet 17 and the lower end 13 of the housing 12.

Once the magnet has gripped the article, the direction in which the crank 6 is rotated may be reversed, withdrawing the cable and raising the magnetic grip. Under the influence of the magnet 17 the article indicated by the numeral 18 will be lifted by the magnet. The magnet will continue to hold the article until the collar 16 strikes the grommet 9 in the tab 8. Upon contact between the grommet 9 and the collar 16, further upward movement of the housing 12 is prevented. However, since the cable is attached to the magnet 17 only and is free to move relatively to the housing 12, continued withdrawal of the cable 10 will pull the magnet upwardly relative to the housing 12. Since the article 18 is held against further upward movement by the lower end 13 of the housing 12, the continued upwardly movement of the magnet 17 will separate the magnet

from the article. By the time the magnet 17 has reached the upper limit of its travel within the housing 12, the influence of the magnet 17 over the article 18 will become so weak that the article will fall from the magnetic grip under the force of gravity. These ends may be accomplished since the force with which a magnet and an article having paramagnetic characteristics are attracted is directly proportional to the strength of the poles and inversely proportional to the square of the distance between them. Thus, the length of travel of the magnet within the housing that is necessary to permit the magnet in one position to effectively grip the article and in another position to release the article is dependent upon the strength of the magnet. However, due to the rapid decrease of the force of attraction between a magnet and a paramagnetic article as the magnet and article are separated, this distance for the average magnet need not be very great. Therefore, it is the length of the housing which is critical in providing a magnetic grip of this type capable of efficiently attracting and discharging paramagnetic articles.

The collar 16 serves as a bumper and travel limit for the housing 12. It is possible to eliminate the collar and permit the plug 14 to contact the beam for effecting the same purpose. However, the collar spaces the magnetic grip from the beam at the time of discharge of the article 18, thus giving the entire crane a more realistic appearance. In addition, inasmuch as the beam 5 is normally inclined, unless there is provided some contacting means, such as the collar and tab, normal to the direction of travel of the magnetic grip 11, the magnetic grip will be forced into an inclined position upon contacting the beam 5. This is not desirable both from the appearance standpoint and the resulting strain on the cable 10. It is seen from this description of my invention that the single operation of winding and unwinding the cable 10 affects not only the raising and lowering of the articles supported by the magnetic grip 11 but also effectively controls the discharge of the magnetic grip when such is desired.

When small, light objects such as pins or paper clips, are picked up by the magnetic grip 11, some of these objects may cling to the side of the grip as well as to the end of it. Sometimes these objects climb the side of the housing 12 following the magnet 17 as it withdraws upwardly in the housing. This results in a failure to properly discharge these objects since the field of the magnet never becomes sufficiently spaced from the objects. This condition may be eliminated in several ways including providing a housing having thick side walls and a thin end or bottom member. The same result may be obtained by providing thin side walls and equipping them with internal ribs to space the magnet substantially from the side walls. In both of these constructions the design effects a greater spacing between the magnet and the objects in the side wall areas of the housing, thus, weakening the magnetic field in this area. The tendency of the smaller objects to cling to the side wall of the housing will be reduced but not entirely eliminated. However, the magnetic field will not be strong enough to cause them to follow the magnet up the housing. Thus, they will be discharged when the magnet is withdrawn.

The construction utilizing the internal ribs is illustrated in Figure 6 wherein a thin walled housing 12a of larger external diameter than the housing 12 is used. The magnet 17 is cradled between the internally extending ribs 30, thus, spacing the magnet substantially from the external surface of the housing 12a.

Another construction suitable for preventing small objects from following the mgnet 17 in its upward travel within the housing 12 is shown in Figure 7. The housing 12 at its lower end is equipped with a radially extending flange or ring 40 of nonmagnetic material. The ring 40 extends radially outwardly from the housing 12 a sufficient distance that at its periphery the magnetic field is too weak to attract any of the objects. The use of the ring not only prevents incomplete discharge of small objects but entirely prevents them from becoming attached to the side of the magnetic grip. The ring 40 may be a separate ring of the same or different material as the housing 12 and attached to the housing in any suitable manner. It may be made integral with the housing 12 or it may be simply a radial extension of the lower end member of the housing. The selection of one of these constructions is dependent upon the particular fabricating problems involved.

Numerous other modifications of my invention may be made without departing from the principle of my invention and each of these modifications is to be considered as included in the hereinafter appended claims unless these claims by their language expressly provide otherwise.

I claim:

1. In a toy crane for lifting magnetically attracted articles, said toy crane having a beam including a free end extending outwardly therefrom, a rotatable crank and a cable having one of its ends attached to said crank and the other of its ends depending from said free end of said beam, the improvement in said crane comprising: a nonmagnetic, elongated, hollow housing open at one of its ends and closed at the other of its ends; a nonmagnetic plug for closing said open end of said housing; the walls of said plug defining a central aperture therethrough for slidably receiving said cable; a permanent magnet slidably mounted within said housing, said magnet having a length substantially less than the spacing between said plug and said closed end of said housing; said magnet abutting said closed end of said housing when said magnet is supporting an article; means for attaching said depending end of said cable to said magnet whereby as said cable is moved toward said free end of said beam and said magnet is supporting an article movement of said housing will be stopped by said beam and continued movement of said cable will urge said magnet toward said plug for reducing the strength of the magnetic field at said closed end of said housing and releasing said article.

2. A toy crane as described in claim 1 wherein an annular collar is mounted on said plug concentrically with said aperture, said collar extending from said plug in a direction away from said housing whereby said collar will contact said free end of said beam for limiting travel of said housing in one direction.

3. In a toy hoist comprising: a cable vertically, reciprocably movable parallel to its axis; an article gripping magnetic element mounted on one end of said cable; a nonmagnetic, vertically elongated, hollow housing having an upper end and a lower end; said housing slidably mounted on said magnetic element and supported thereby; said magnetic element, in article holding posi-

tion, seated at said lower end of said housing; a stop fixedly positioned in relation to said cable for slidably receiving said cable exteriorly of said housing; said housing movable with said magnetic element and said cable whereby said cable, when travelling upwardly, will move said housing to cause said upper end of said housing to contact said stop and continued upward movement of said cable will move said magnetic element longitudinally of said housing for repositioning the magnetic field of said magnetic element away from said lower end of said housing.

4. A toy hoist as described in claim 3 wherein said housing is equipped with a plurality of inwardly extending ribs for contacting said magnetic element whereby said magnetic element is spaced from the inner wall of said housing.

5. A toy hoist as described in claim 3 wherein said housing is equipped with a radially outwardly extending, nonmagnetic flange at said lower end whereby said article may not follow said magnet up said housing as said magnet is moved toward said upper end of said housing.

6. In a toy hoist, a magnetic grip for supporting an article, the improvement in said magnetic grip comprising: a cable of adjustable length; a magnet supported on the end of said cable; an elongated, nonmagnetic housing having end walls

and defining a central chamber for slidably receiving said magnet; one of said end walls of said housing defining an aperture for receiving said cable; said one end wall of said housing normally resting upon said magnet for supporting said housing; a fixed stop surrounding said cable exteriorly of said housing, said cable freely movable through said stop; said magnet, in article supporting position, seated at the end of said housing remote from said aperture with said housing supported by the article; whereby as said cable is moved toward said stop, movement of said housing with said cable will be halted upon contact between said stop and said housing and continued moving of said cable will urge said magnet away from said article for releasing said article.

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