Aug. 31, 1954 E. H. BICKLEY 2,688,099

SCANNING MECHANISM FOR COLOR SORTING MACHINES

Original Filed Sept. 14, 1949

Fig. 1.

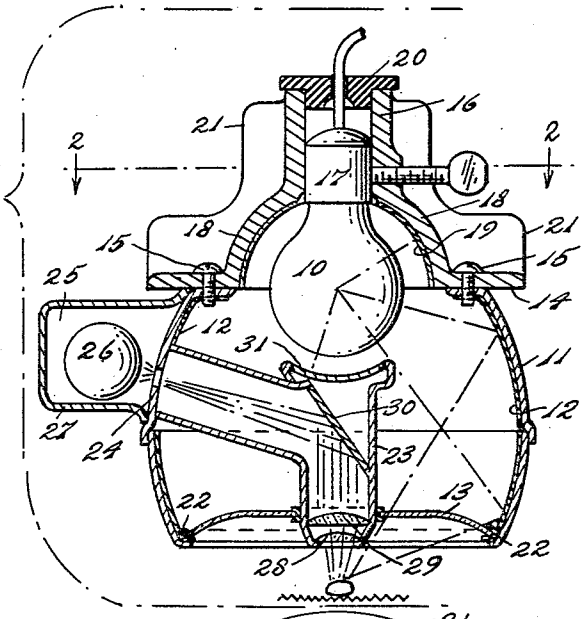


Fig. 2.

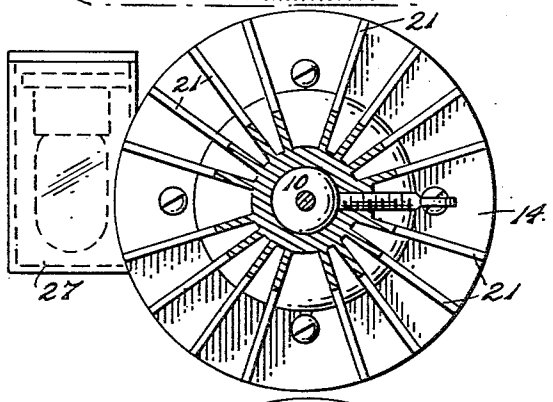
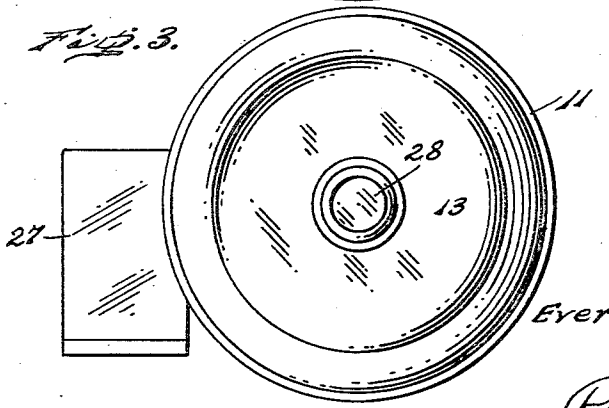


Fig. 3.



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SCANNING MECHANISM FOR COLOR SORTING MACHINES

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Original application September 14, 1949, Serial No. 115,609, now Patent No. 2,665,388, dated January 5, 1954. Divided and this application March 31, 1953, Serial No. 345,786

5 Claims. (Cl. 250—237)

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The present invention relates to the color sorting of beans, peas, rice and other objects of varying color, and relates more particularly to a novel head for scanning the objects as the latter travel across an inspection point.

This aplication is filed as a division of applicant's co-pending application Ser. No. 115,609, filed September 14, 1949, issued January 5, 1954, No. 2,665,388.

In sorting machines heretofore devised it has been proposed to illuminate an object at an inspection point by reflecting means so arranged with respect to a light source as to bathe the object in diffused light and consequently require a relatively high wattage for the light source. Even so, it is impossible to obtain the required critical light value for dark colored objects. Furthermore, by reason of the multiplicity of light rays incident to the diffused light, uncontrolled glare elements from each ray is present and proper color appraisal for uniform results practically unattainable.

Some of the objects of the present invention are to provide an improved scanning head for machines used for sorting objects by color; to provide a color sorting machine scanning mechanism wherein the object is illuminated by focussed images produced by reflected light rays; to provide a color sorting machine scanning mechanism wherein a photo-electric cell is protected from the heat of a source of light; to provide means for reducing the disadvantageous glare of an object inspected under light rays and increasing the sensitivity of the scanning operation; to provide a scanning unit for color sorting wherein means are provided for accurate sorting of dark objects as well as light objects with minimum illumination, without excessive heat being transmitted to the photo-cell, and without excessive cost of electricity; and to provide other improvements as will hereinafter appear.

In the accompanying drawings, Fig. 1 represents a sectional elevation of a photo electric scanning unit embodying one form of the present invention, such unit being used for scanning beans, peas, rice, coffee, dark seeds, nut kernels, and other objects for color sorting; Fig. 2 represents a section on line 2—2 of Fig. 1; and Fig. 3 represents a bottom plan of the unit.

Referring to the drawings, the rays of light from a lamp 10 are confined within a globe-like shell 11 of opaque material having an inner concave reflecting side surface 12 formed by chromium plating, a bottom 13, and a top closure 14. The shell 11 is made of two arcuate sections

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soldered or otherwise fastened together in end to end relation, such assembly permitting each section to be spun into shape and thereafter internally chrome-plated to form the aforesaid reflector 12. This closure 14 is attached to the shell 11 by screws 15 or other fastening means and comprises a socket 16 for receiving the lamp base 17, which socket opens into a spherical segment 18 spaced from, but partially encircling, the lamp 10 and having its inner face chromium plated to form a reflector 19. The lamp wires are brought to the outside by way of a cap 20 of Bakelite or other insulating material. Also, the body portion of the closure 14 is formed with integral radially disposed spaced ribs 21 for conducting heat from the lamp away from the shell 11. The bottom 13 is formed of a light-transmitting film-coated crystal with its periphery attached to the shell by a gasket 22 preferably of plastic. As mounted, the crystal bottom 13 is bowed inwardly of the shell to provide an inner convex face and an outer concave face whereby rays of reflected light are better directed upon a bean as it is fed transversely across the axis or center of the bottom 13. At this center the bottom 13 is apertured to seat one end of a light or image-guiding tube 23 which leads by an angular bend to an annular mask 24 in the side of the shell communicating with a compartment 25 in which a photo-cell 26 is mounted in proper alinement with the axis of the tube 23. The compartment 25 is formed by an offset 27 fixed to a side of the shell in any light sealed manner. The mask 24 cuts off rays which would otherwise project undesirable images and confuse the object image.

For accurate and sensitive scanning of the light rays reflected from a bean, preferably two plano-convex lenses 28 and 29 are mounted transversely of the light inlet to the tube 23 to direct the reflected light image of the bean against a mirror 30 so disposed angularly within the tube 23 to reflect and focus the image within the orifice of the mask 24 into relatively close proximity to the photo-cell 26 for the desired uniform ray distribution upon the photo-cell 26.

In order to further increase the light intensity, a spherical segmental reflector 31 is mounted on the elbow of the tube 23 with its reflecting surface juxtaposed to the lamp 10. This construction also reflects a portion of the light from the lamp back upon the lamp filament whereby the filament voltage can be slightly decreased and thus result in a lower cost of operation.

It will now be apparent that a novel unitary scanning head has been devised for color com-

parison sorting machines, wherein two reflector surfaces are located below the plane of the lamp filament and operate to focus the light from the filament, as well as the light from the upper spherical reflector behind the lamp, on a bean coming in at a low angle at all sides, except where cut off by the photo-cell light-transmitting tube. This construction gives many times as much light as any scanning head heretofore known. Furthermore, since the bean in approaching the scanning head approaches the photo-cell tube so that the glare point on the nose of the bean is cut off as it enters the light and consequently objects of a dark color can be sorted more accurately and precisely than heretofore.

Having thus described my invention, I claim:

1. A scanning mechanism for color sorting machines, comprising a shell formed of opaque material having internal concave reflecting surface sides, a bottom for said shell formed of transparent material and having an opening to pass reflected light rays, a top closure of opaque material for said shell having an inner concave reflecting surface, a source of light juxtaposed to said top reflecting surface, an offset from said shell forming a compartment, a photo-electric cell in said compartment, a tube forming a passage between said bottom opening and said compartment, and a mirror in said tube for directing reflected light to said photo-cell from an object at the focus of light rays reflected from said shell reflecting surfaces and passing through said bottom.

2. A scanning mechanism for color sorting machines, comprising a shell formed of opaque material having internal concave reflecting surface sides, a bottom for said shell formed of transparent material and having an opening to pass reflected light rays, a top closure of opaque material for said shell having an inner concave reflecting surface, a source of light juxtaposed to said top reflecting surface, an offset from said shell forming a compartment, a photo-electric cell in said compartment, a tube forming a passage between said bottom opening and said compartment, a mirror in said tube for directing reflected light to said photo-cell from an object at the focus of light rays reflected from said shell reflecting surfaces and passing through said bottom, and means for radiating heat from said light source.

3. A scanning mechanism for color sorting machines, comprising a shell formed of opaque material having internal concave reflecting surface sides, a bottom for said shell formed of transparent material and having an opening to pass reflected light rays, a top closure of opaque material for said shell having an inner concave reflecting surface, a source of light juxtaposed to said top reflecting surface, an offset from said shell forming a compartment, a photo-electric cell in said compartment, a tube forming a passage between said bottom opening and said compartment, a mirror in said tube for directing reflected light to said photo-cell from an object at the focus of light rays reflected from said shell reflecting surfaces and passing through said bottom, and ribs integral with said top closure for radiating heat from said light source.

4. A scanning mechanism for color sorting machines, comprising a shell formed of opaque material having internal concave reflecting surface sides, a bottom for said shell formed of transparent material and having an opening to pass reflected light rays, a top closure of opaque material for said shell having an inner concave reflecting surface, a source of light juxtaposed to said top reflecting surface, an offset from said shell forming a compartment, a photo-electric cell in said compartment, a tube forming a passage between said bottom opening and said compartment, a mirror in said tube for directing reflected light to said photo-cell from an object at the focus of light rays reflected from said shell reflecting surfaces and passing through said bottom, and a reflector on said tube juxtaposed to said light source.

5. A scanning mechanism in accordance with claim 1, wherein an axially disposed reflecting means is positioned between said light source and said tube for increasing the intensity of the light focussed on said object.

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